

PART II

**ANALYZING THE CURRENT MASSACHUSETTS BAYS MANAGEMENT SYSTEM
AND ASSESSING ITS IMPACTS**

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PART II: ANALYZING THE CURRENT MASSACHUSETTS BAYS MANAGEMENT SYSTEM

Introduction

Part II of this report examines important elements of the system of governance in place for Mass Bays lands, waters, uses, and resources. It provides an analysis of the major legal authorities comprising the Bays system and examines the roles of federal, State, and local agencies and governments in operating the system. Where possible, it specifies important decision points in this complex management system, especially in coordinating the activities of multiple State and federal agencies affecting Mass Bays lands, waters, uses, and resources; identifies the role and need for better technical information, assistance, and expertise, particularly at the local government level to operate the system effectively; and, based upon the results of the study, considers the appropriateness of a method or strategy to manage the Mass Bays system. In addressing the latter point, the authors of the report have recommended that the networking of State, federal, and local authorities and programs which comprises the Massachusetts Coastal Zone Management Program (MCZMP) could provide an effective organizational structure for the Mass Bays Program. The MCZMP has operated successfully for many years, enjoys strong public support, and has available significant intergovernmental coordinative mechanisms that will be critical to implementing the Mass Bays CCMP.

Part II is organized into two Sections. Although there is some overlap between these two Sections, they concentrate upon two different sets of interactions: local-state and state-federal. Thus, Section One considers local and state authorities and programs primarily in the areas of water quality control, land use planning and management, and critical area management. Section Two considers state and federal laws and programs in special and critical area management and water quality control, but gives significant attention to the

problems of coordinating effective Mass Bays area and resource management under State and federal authorities and to legal issues affecting this management system: possible changes in regulatory takings law and the management potential of the public trust doctrine, both with important implications for Mass Bays managers. Introductory information in both Sections explains these different interactions (local-state, state-federal) in more detail.

Part II's review and analysis of authorities and programs making up the Mass Bays management system complements the work done in Part I. Part I of the report describes a method to determine the influence of environmental contaminants on Mass Bays resource use and to estimate the changes in resource value that would result from improvements in environmental quality. Part I like Part II highlights problems associated with nonpoint source pollution and the role of local governments in the Mass Bays system. The ability to incorporate the resource value information generated through the approach adopted in Part I in an effective resource management program requires an understanding of the strengths and weaknesses of the current Mass Bays system, which is the subject of Part II.

SECTION ONE. LOCAL-STATE AUTHORITIES AND PROGRAMS IN MASSACHUSETTS BAYS MANAGEMENT.

Introduction.

The Massachusetts Bays Program has recognized the crucial role which local governments play in Bays resource management and the importance of local and regional decision-making in determining future options for Bays resource use. The purpose of this review is to examine the use of selected local management authorities in the areas of land use and water quality planning and management, and critical area protection.

The analysis focuses on nonpoint source management needs and opportunities, rather than upon point source control issues, which are discussed in other sections. Preliminary analysis indicated that nonpoint source management issues appropriately illustrate several key management concerns. In addition, we hoped to point up the need for development of a coordinated approach to management of inter-related land use- nonpoint source problems at the state level in Massachusetts.

An effort has been made to review the elements of the local decision-making framework which are a) most important in Bays resource management generally; b) most affected by fundamental state policy decisions; and c) most likely to be influenced by appropriately focused state level investments in monitoring and technical assistance. We have attempted to show which decision points are most vulnerable to a lack of technical guidance and where statutory adjustments are critically needed to provide both guidance and needed flexibility. We have also attempted to show where basic institutional limitations in the local environmental management framework, if not addressed, will continue to affect the degree to which resources of regional concern are protected, and will limit communities' abilities to

make appropriate use of emerging tools and strategies that could otherwise serve Bays management.

Local bylaws of four Massachusetts Bays communities were examined in detail. The four communities were selected based upon geographic distribution around the Bays, range of management issues faced, and relationship to the analysis contained in Part I of this study. Although these communities (Gloucester, Nahant, Scituate, and Brewster) were perceived to be facing management issues confronted by other Bays towns, the analysis was neither limited to these communities nor to communities bordering the Bays. An effort has been made to address watershed management issues common to upstream communities as well.

In the first portion of this analysis of local-state authorities and programs, an analysis of important local authorities is presented. Included are zoning and non-zoning regulations governing land use, wetlands protection, regulation of septic system siting, and control of stormwater and eroded sediment. Specific strengths and weaknesses in local regulatory authorities and decision-making practices are discussed as they relate to Bays management, and opportunities for enhanced use of local authority are identified.

In the second portion of the local-state analysis, a discussion of identified issues and concerns is presented in the context of the use of broader planning authority. Central findings are summarized and recommendations for action are proposed. Fundamental management concerns discussed in the second section include the need for:

1. control of consumptive development patterns that affect Bays ecosystem function.
2. improved management of the cumulative impacts of development.
3. a consistent approach for proactive management of resources shared among jurisdictions.

4. enhanced local administration and management effectiveness.
5. aggressive advancement of local planning and growth management agendas.
6. improved linkages among planning and regulatory authorities.
7. adjustment of technical resource management capacity to capitalize on local and regional resource management opportunities, especially where opportunities for retrofitting and restoration are concerned.

USE OF LOCAL REGULATORY TOOLS FOR BAYS RESOURCE PROTECTION AND MANAGEMENT.

Municipalities have the authority (generally via the "police powers") to regulate land use in order to protect and promote public health, safety, and welfare. These powers offer towns considerable authority to advance programs for effective resource protection and management. At the same time, local powers may be used to support state laws or regulations related to land use, and to enforce state laws directly where enabling authority exists. Similarly, local laws may exceed the stringency of state law where proper enabling legislation exists. Though broadly defined, these local powers are not always implemented to their greatest effect.

Other important provisions are designed to protect the general welfare of the local population, rather than to regulate land use specifically, although they may have fundamental land use implications. The general bylaw or ordinance authority, which has traditionally been used to protect the general welfare of the inhabitants, is now being used for environmental protection as well. For example, general bylaws or ordinances have been used for wetlands protection, control of hazardous materials, and groundwater protection. These general bylaws

and ordinances must set out a clearly identified public purpose and contain reasonable provisions to accomplish that purpose which are not inconsistent with state law. The utility of this approach is also discussed in the context of the Non-zoning Regulations section below.

This research focuses mainly on the regulatory tools which are available at the local level, although consideration is given to the manner in which the regulatory process relates to other factors affecting implementation, such as the availability of pertinent information and the use of planning, management, and administrative capacity to enhance or constrain the overall process. The main regulatory tools evaluated include zoning bylaws, subdivision rules and regulations, wetland bylaws, and public health regulations.

The following sections point to ways in which local laws and authorities serve as tools for Massachusetts Bays management and point to means of improving their effectiveness within the overall framework of government control.

Tools Using Zoning Authority.

Role of Zoning.

According to M.G.L. Chapter 40 A, the Commonwealth's zoning enabling legislation, cities and towns may enact zoning ordinances and bylaws to protect public health, control the type and density of land uses; to provide for public water supply, drainage, sewerage, open space and conservation of natural resources; and to prevent blight and the pollution of the environment. Included in the purposes of zoning is the implementation of a comprehensive plan. Although the Euclidian approach to zoning sought to segregate uses into districts subject to a uniform set of use standards, modern zoning laws, including that of the Commonwealth, provide for the use of special permits by which uses within districts may be adjusted at the discretion of local appeal boards on a case-by-case basis.

Among planners interviewed for this study, there was general agreement that in Massachusetts, the use of zoning authority as a resource planning tool has often been problematic, due to the inconsistency between historically-established zoning standards (for density and types of use) and the actual "resource based" carrying capacity of the land. This is a persistent problem, due to the failure of many towns to rezone lands so as to achieve consistency with these natural limitations, as well as with comprehensive plans and capital improvement objectives.

Although conventional zoning is a blunt-edged tool, effective use of zoning authority is fundamentally important, in that zoning establishes the foundation, in terms of allowable land use, upon which all other local tools are applied, sets the stage for use of other local authorities, and determines the degree to which state authorities can be used effectively in water resource protection. As a practical matter, the effectiveness of zoning as a Bays management tool depends upon the degree to which permitted uses within specific zones are designed to: 1) consistently protect the functions of the Bays' dynamic resource systems, and 2) recognize the potential for impacts to these resources and establish standards to avoid or mitigate future adverse impacts.

Preservation of natural resources is clearly provided for in Chapter 40 A, and a reasonable basis must be established for the uses of land in each district. Support for resource protection can be enhanced by the lot regulations themselves, which govern the character and form of development. In the Town of Plymouth, for example, lot regulations address natural features and conservation requirements directly, limiting disturbance to topography, restricting drainage alteration, providing for erosion and sediment control, and promoting infiltration of stormwater onsite. Barnstable's zoning bylaw similarly recognizes wetland protection needs.

Unfortunately, most zoning districts were initially established with little understanding of the capacity of various landscape types to accommodate development, and/or little regard for the need to maintain the functioning capability of inter-related water resource systems. Hence resource management constraints are often poorly reflected in land development patterns. If inflexible standards are in place, few options may be available to adjust standards and alter land use patterns so as to accommodate resource protection obligations. Towns which have largely been platted, and are seeking to prevent eutrophication of enclosed embayments face these constraints, as do those in which partially developed industrial zones lie over recharge areas. In many old plots, dense siting of conventional onsite disposal systems and leaching pits takes place in discontinuous pockets of sandy "percable" soil meeting outdated Title V soil suitability requirements. Zoning regulations and standards play a critical role in resource protection. Where resource functional capabilities are poorly linked to measurable standards, goals cannot be consistently translated into practice.

In some cases, more recent zoning decisions and amendments have been made with insufficient consideration of water resource protection needs. Several factors have served as obstacles to rezoning for environmental protection. Unlike planning legislation in Maine, Rhode Island, or Florida, the Massachusetts planning legislation provides little incentive, legal or economic, for communities to rezone to achieve consistency with comprehensive plans, or to ensure that zoning districts are consistent with land development capacities within and across town lines. An effective method of protecting shared coastal embayments, for example, would be for each community in a contributing watershed to rezone its portion of the watershed to a standard that would protect the embayment from excessive loadings of nutrients or other contaminants.

The Buttermilk Bay (Buzzards Bay) watershed communities took decisive action in this regard within the last year. Plymouth, Wareham and Bourne passed a tri-town watershed zone to control and/or reduce nitrogen loading for the Buttermilk Bay drainage area. Plymouth rezoned its overall residential density from 40,000 to 70,000 square feet (sf). Bourne downzoned from 40,000 sf to 80,000 sf, and Wareham, which had previously established a density of 130,000 sf in the Buttermilk Bay basin, revised its zoning bylaw to require that nitrogen loading be considered in the granting of special permits.

Among Massachusetts Bays communities, there are examples of community commitment to rationalized zoning. The Town of Plymouth zoning bylaw specifically references the town's comprehensive plan and specifies that "such plan shall provide the basis for the zoning and land use regulations of the Town." Zoning and rezoning decisions are strengthened in terms of their legal defensibility by this link to an adopted comprehensive plan.

In rezoning for environmental planning purposes, communities are frequently frustrated by the effects of S. 6 of Ch 40A, which, in the event of a zoning change, vests subdivisions for eight years on the basis of submission of a preliminary plan (if followed by an approved definitive plan within seven months). Plans for division of lands for which subdivision approval is not required (ANR lots) are vested for three years. Up to the voting date for a zone change, towns are frequently overwhelmed by applications. Hence development may be forced to occur prematurely and in an inappropriate manner.

As an example, when the town of Mansfield considered rezoning for aquifer protection in 1988, it received 33 applications for subdivisions and 55 for development of ANR "non-subdivisions." The town abandoned the zone change, yet has 530 new lots, of configurations that may not be protective of groundwater resources.

The Zoning Act does not provide legislative guidance on lot size and configuration in a manner that would consistently support use of effective growth management tools. Uniform large lot zoning is not discouraged by the act; nor is inappropriate or "leap-frogged" infrastructure extension. Two- and up to three-acre zoning has been supported by the courts for purposes of aquifer protection.

Unfortunately many communities have viewed two acre zones as an upper bound, and have been reluctant to zone at extremely low densities for agricultural land preservation or resource protection. Five acre zoning for aquifer protection has been supported by Rhode Island courts. Similarly, although the Chesapeake Bay watershed is characterized by a very different agricultural economy, twenty-five to forty acre minimum lot size zones and larger have been found necessary to discourage land speculation in the Chesapeake basin, according to the Chesapeake Bay Critical Area Commission. In order to protect village character and agricultural uses, very low density zoning of prime farmlands is generally necessary, supported by a sound comprehensive plan and appropriate clustering and mixed-use development provisions.

Regulation of percent impervious surface, bulk standards and frontage requirements by zoning category is of significant importance in nonpoint source control, as percent impervious area has been demonstrated to be the variable of primary importance in management of surface water runoff (U.S. EPA, 1987). Several important density transfer mechanisms that have been used in other states to protect vulnerable water resources (including transfer of development rights, for example) can only be effective where traditional bulk densities, setbacks, and frontages are relaxed. Use of these mechanisms is not specifically considered or encouraged by the Zoning Act.

In contrast, traditional zoning authority in Massachusetts is weakened in this regard by the lack of provision for dealing with road dimensions, construction, and paving. A planning board submits recommendations regarding town roads to the town meeting or council under the authority of M.G.L. Ch 82. The planning board has authority over roads designated as "scenic" and has authority to recommend adoption of an official map, but has only limited authority to regulate roads outside subdivisions. Primary authority for local road construction and repair falls to local departments of public works, while similar authority for state road construction and repair is held by the Massachusetts DPW. Historically, these agencies have been primarily concerned with meeting access, safety and engineering standards and providing for efficient use of emergency vehicles, rather than with water quality protection needs.

Municipal uses are a cause for concern, in part due to the fact that municipal agencies may be grandfathered under town bylaws. In fact, many uses may be exempt from zoning, such as state and municipal properties, schools, and churches.

The Massachusetts Zoning Act makes no provision allowing towns to require that an owner "re-combine" adjacent lots which fail to meet town zoning standards. This requirement is imposed by several towns in Rhode Island to reduce density in sensitive areas. This research revealed no examples of the use of this technique by Bays communities. The Act is also silent with regard to the phasing out of nonconforming uses. (Nevertheless, in this case Bays towns such as Scituate have recognized the impact that these uses can have on resource viability, and have included provisions in their zoning bylaws that regulate, phase out, or limit expansion of existing nonconforming uses.)

The granting of variances and exceptions to existing zoning can also have significant impacts on nonpoint source management. Density bonuses are frequently granted as an

element of negotiations surrounding Chapter 40 b. projects, and in return for open space or other public amenities. These bonuses are sometimes granted without proper analysis of land development capacities or offsite impacts. Unless a well-supported housing plan has been integrated with a town's comprehensive plan and is consistently used in the permitting process, local boards may attempt, again, to "balance" community housing needs in response to individual permit applications. The Cape Cod Commission Regional Policy Plan stipulates that density bonuses will be permitted only in cases where a "substantial" public benefit (e.g. affordable housing or treatment of sewage from existing non-sewered areas) can be demonstrated.

Resource Protection Districts and Other Overlay Districts.

The land use patterns established by zoning represent the "programmed" character of a community's development at build-out. Although towns have historically used large lot zoning and the prohibition of certain "noxious" activities to protect water resources, modern practice has involved the development of more innovative and flexible tools using zoning authority. Zoning overlays that apply only to limited geographic areas are widely used to ensure that consistent protective standards are met in sensitive areas. Towns have identified aquifer recharge areas, wetlands, floodplains, coastal hazard areas, and other sensitive resources, including historical resources, and have made efforts to protect these areas using zoning overlay districts.

Zoning overlays can be simple and effective tools, but as discussed in previous sections, a proliferation of districts should not be viewed as a substitute for a sound comprehensive plan or for more responsive environmental protection measures. Overlays must be carefully crafted. Cluster overlays and other land development regulations need to articulate criteria that ensure that development patterns conform to the objectives of the

zoning designation and that pollutants are treated to the maximum extent possible. Where development is proposed adjacent to land held for preservation or conservation, it is especially critical that performance standards insist on maximum attention of the resource of concern, and that the development configuration maximizes contiguous open space. As previously emphasized, a poorly written standard may otherwise be applied piece-meal to the lot in question, rather than with a view to its relationship to the integrity of the affected resource.

Likewise, special permit requirements and review procedures should be set out in such a way that the intent of the overlay bylaw, as well as the specific criteria, must be met in the review process. If boundaries cannot be drawn so as to conform to property boundaries, overlays also need to state clearly how an overlay boundary will be interpreted if an overlay district boundary crosses an individual property. A wide variety of resource protection overlays have been established. In particular, many communities have established water resource protection districts for water supply and recharge area protection that delineate areas where certain uses are prohibited or allowed only by special permit. In fact, all of the towns examined during the course of this study have at least one zoning overlay in place, although many allow intensive use (including cluster and mixed use development) only by special permit, or allow clustering only on large parcels.

To counter the documented special permit/parcel size disincentive, and to encourage land-conserving development, the Cape Cod Commission requires that a clustered plan be submitted for all subdivisions of five lots or more, and stipulates open space requirements for DRI projects (60 percent upland open space for residential DRIs; 40 percent upland open space for commercial DRIs). Focus communities have adopted various individual strategies. Brewster has had its Wetlands Conservancy District bylaw in place since 1979 and its Water Resource District in place since 1982. The conservancy district is designed to encourage

wetland identification in advance of the permitting process and to complement the Massachusetts Wetland Protection Act, the state's Wetland Restriction Program, and the Town's non-zoning wetland protection bylaw.

Scituate has a wide variety of zoning overlays in place, including a Saltmarsh and Tideland District, a Floodplain and Watershed Protection District, a Planned Development District, a Residential Cluster District, and an Open Space Preservation and Development District. The town's zoning bylaw, revised in 1989, sets out specifications for permitted uses and uses allowed by special permit in these districts. Among the different overlays, standards of review are variable in terms of their specificity and strictness.

For example, the purpose of the Saltmarsh and Tideland Conservation District is not clearly defined, and non-commercial docks are allowed as of right, as are municipal parking, recreation, and water supply use. An applicant may file a special permit application to construct a structure that "would have been permitted on said land prior to the adoption of this section" or for "filling, draining, dredging, or excavation." Notice to the conservation commission and the planning board is required, and no permit may be granted where "the natural character" of the area would be adversely affected. Here, no evaluation or performance standards are available that relate "natural character" to the functional properties of the resources. Considerable leeway is left open for interpretation, although other overlays, and the Town's wetland bylaw, lend support for protection.

The Scituate Floodplain and Watershed Protection District sets out clear purposes, including encouraging "the most appropriate and suitable use of the land." Permitted uses include conservation of various floodplain resources, and passive recreation. Uses allowable by special permit include alterations consistent with the National Flood Insurance Program and certain drainage improvements, among others. Prohibited uses include activities that "reduce

the natural storage capacity of any watercourse, or degrade the water quality of surface or groundwater, ..."

Scituate's Planned Development District, among its other provisions, specifies that a conservation restriction be put in place to ensure that open space be held "primarily in an open and natural state" and maintained by an association that charges maintenance assessments. The Town's Open Space Residential and Recreation District requires that a plan for restriction of the use of chemical additives be provided by the applicant as part of the special permit process. Among the specific review criteria that apply in the Marine Residential District, a project must "be designed so as to preserve the integrity of drinking water, ground water supply generally, floodplains, salt marshes, and any other sensitive environmental features."

Cluster overlays present an example of the need to arrive at a vision and establish guidelines that result in the desired development pattern. In Marshfield, one prominently placed, poorly-conceived, dense cluster development has made the town extremely reluctant to consider a cluster overlay district. Scituate's Open Space Preservation and Development (OSPD) district is conservative in some respects, placing the burden of proof on the applicant to prove that clustered development is more appropriate than a conventional pattern. However, the planning board is allowed to grant a reduction in the development intensity specified in the regulations of underlying zoning for all portions of an OSPD, if such a reduction "will result in better design, improved protection of natural and scenic resources, ..."

Thirty percent of the land in an OSPD in Scituate must be common open space, of which no more than 50 percent may be wetland. Layout and vegetation of open space is specifically prescribed. Despite its apparently clear provisions, however, the overlay language appears incomplete from the standpoint of Bays management. Here, the units in a coastal

area are not required to be placed as far back as possible from the dune or marsh. Unless the Town is able to negotiate a "larger than the minimum" buffer through its other bylaws and overlay provisions, units may be located quite near the shoreline, with dedicated open space may be relegated to the upland "back" portion of the property. From the standpoint of nonpoint source management and habitat protection, a buffer should be located between a development and the affected resource, and is effective in relation to its width, slope, extent of native vegetation, and linkage to adjacent shoreline buffer areas, among other factors. The Water Resources Protection District in Scituate provides specifically for a 150 foot non-disturbance buffer zone around the Tack Factory Pond reservoir and includes guidelines for infiltration and treatment of stormwater, and erosion and sediment control.

Flexible zoning has been used in western Massachusetts, but was not found to be in use among the Bays communities examined. A flexible zoning bylaw permits variation in lot size and frontage within a development, while maintaining the overall density of the development in conformance with established standards. Flexible zoning can be an effective tool in protecting contiguous buffer zones, riparian areas and habitats. Unlike cluster, flexible zoning does not require dedication of open space, but offers the opportunity to protect important features on individual lots. Lots varying from the established minimum frontage and lot size requirements may be developed as of right, provided frontage and density requirements are met overall.

An important addition to the resource protection zoning tools available to towns would be enabling legislation for "Residential Compounds," a zoning classification used in Rhode Island and elsewhere. Properties zoned as residential compounds may be divided into a small number of lots (usually less than ten) in exchange for substantial reductions in the improvements normally required to meet public standards. The main incentive to the property

owner is financial, in that the road remains private and therefore is not required to be upgraded to town standards. Standard requirements for utilities, frontage, bulk density, and other improvements may also be relaxed in exchange for a significant reduction in overall density and provision for open space protection. Using this tool, agricultural character can be preserved, and impervious area can be minimized. Although towns such as Scituate currently reserve the right to allow reduced density for purposes including resource protection, this provision would enhance towns' authority to relax infrastructure standards.

Special Permitting Authority.

Special permits are used to provide towns flexibility in implementing zoning bylaws, and to regulate specific uses more thoroughly on a town-wide basis. In general, zoning bylaws provide that, within a specific zoning district, certain uses are allowed as of right, others may be allowed by special permit on a case-by-case basis, and still others may be allowed as accessory uses. Variances, including use variances and bulk (building size) variances, may also be granted by the zoning board of appeals (or the selectmen acting as the ZBA) to allow alternative uses on a case-by-case basis. One respondent indicated that variances are sometimes granted in addition to special permits where boards do not clearly distinguish between the two. Boards can be misled by applicants in these instances.

Special permitting authority may be used to clearly establish conditions under which uses may be allowed, and thus complements the use of zoning overlay districts, in which certain incompatible uses are prohibited. Under certain circumstances, this authority may be used to regulate approval not required land divisions, subdivisions, and comprehensive permit developments (Dawson, 1988). Requirements and procedures for issuance of special permits may establish a broad range of permitting criteria and standards, may require applicants to

submit environmental and other assessments, and may establish maximum density limits and performance standards.

Issues surrounding the use of special permit granting authority are important in land use control in Massachusetts, and affect management of impacts to the Massachusetts Bays, since the authority is used very widely in Massachusetts Bays watershed communities. Where this authority is used in concert with zoning overlays to control specific land uses of concern in sensitive areas, its role in Bays resource protection may be especially noteworthy. The broadest uses identified in the current research were to implement aquifer protection and water resource protection overlay districts, PUD and cluster provisions, and to establish site plan review procedures.

The use of this authority introduces broad discretionary powers into the permitting process, and must proceed according to strict stipulations in Ch. 40A S. 9, which place limits on special permit uses in zoning bylaws. A community may decide whether the planning board, the selectmen/city council, or board of appeals will exercise the considerable discretion available to the special permit granting authority (SPGA) for different types of permits. Special permits are frequently a source of acrimony among boards having different interpretations as to how this authority should be exercised, and may result in litigation in communities that have a fragmented management structure. Because special permit uses are often reserved for large or complicated projects, approvals also result in litigation between towns. (For example, traffic concerns have led to consideration of inter-town litigation among south shore towns.)

With regard to resource protection, the manner in which the discretionary authority is exercised is highly dependent upon several variables. First is the attitude, composition, and expertise of the particular board acting as SPGA. Of equal importance is the language of the

local ordinance or bylaw that governs special permit requirements and the specific language of regulations adopted to establish design criteria, review procedures and performance standards. Clear, specific language is extremely important to ensure that the orientation of the particular board given review authority, and its changing composition and attitude through time, do not allow for unwanted inconsistency of interpretation.

Plymouth has adopted special permit procedures that set out environmental design criteria and establish a mechanism for advisory review by appropriate town boards and departments. A design review board of this type can be particularly important in assisting planning boards and boards of appeals in reviewing development applications, although an effective informal design review processes have been used in several communities.

Design review requirements can be used to establish requirements for dimensions and management of buffer zones, to require use of native landscaping or low-input turf as a complement to conventional lawn plantings, to establish lot cover standards that reduce impervious area, and to require alternative roadway designs. Similar design review requirements can be set out in subdivision regulations, as discussed in subsequent sections.

Aggressive use of special permitting authority may currently be influenced by a number of factors. First, the 1984 Massachusetts Appeals Court decision *SCIT Inc. v. Planning Board of Braintree* limited towns' abilities to establish districts in which all uses are subject to special permit. Communities have interpreted this decision as prohibiting mandatory cluster on a district basis. The decision could serve to limit effective management of cumulative effects on interconnected water resources, in that it seems to encourage "pyramid" zoning.

The degree to which special permit options are actually used by project proponents varies among towns, and depends upon a number of factors including the type of permit and process requirements involved and the composition of the boards having jurisdiction.

Among respondents interviewed, several differing issues surrounding use of special permits were reported. In several communities, special permit categories such as PUD and cluster are viewed as sufficiently contentious and time-consuming to strongly discourage their use, even where improved land development patterns and enhanced resource protection could result. As previously noted, use of cluster or open space zoning has been vigorously resisted in many Massachusetts Bays towns. To avoid conflict, developers frequently opt for what can be built as of right, to avoid the "unknowns" of a discretionary process. Local government respondents indicated that, for this reason, a significant portion of land suitable for PUD and cluster development is currently being developed according to traditional patterns.

This issue may be especially important in management of cumulative effects to resources, because requirements of traditional grid development, particularly for residential uses, offer little flexibility to avoid steep slopes, unstable soils, and areas bordering sensitive resource zones. Where use of special permit options is not strongly encouraged, towns may be less able to minimize the degree to which developers use exemptions in the state Wetlands Protection Act.

Although time in the permitting process was cited as a significant factor in developers' decisions to opt out of special permits, this may be a misperception. According to a member of the Marshfield Planning Board, special permits actually involve less time in the permit process. On average, a wait of roughly five months is generally required for a special permit decision, while three months is required for a traditional subdivision denial, and twelve months for a subdivision approval. Unfortunately, no respondents were able to comment on the permitting time involved where dual submissions of cluster and conventional lot configurations are required.

Site Plan Review.

Site plan review is an important tool in Bays resource protection, in that it provides a complementary mechanism by which communities can review a variety of significant developments that fall outside other town review authorities. If a well-crafted site plan review process is put in place, communities can provide for a simultaneous multi-departmental review of significant issues, and can avoid conflicts in interpretation and conditioning of permits. Towns make considerable use of site plan review to attach conditions to uses that are allowed as of right.

Traditionally, the site plan review process has provided a mechanism by which a municipality can ensure that proposed developments provide adequately for access, circulation, parking, utilities, landscaping, and protection of important resources. For protection of Bays resources, control of layout, buffers, landscaping, impervious area configuration and stormwater management planning are available through a sound site plan review process.

According to Metropolitan Area Planning Council data, a majority of communities that have site plan review in place use it to regulate commercial businesses and industrial uses. Fewer apply the procedure to review of residential developments -- particularly multi-family projects and large subdivisions. The Town of Framingham, a rapidly urbanizing town within the Bays basin, has used site plan review to impose impact fees. Outside the basin, Taunton has used site plan review to require off-site infrastructure improvements.

Although specific enabling legislation for site plan review has not been established, Bays communities trigger the review requirement in various ways -- as an element of applications for special permits, wetland permits, or projects within overlay districts; as a component of an environmental impact assessment; or as a building permit application

requirement. In order to establish a site plan review process, towns provide site-design guidelines and review standards in the zoning bylaw. The scope of review should be clearly specified in regulatory language, as should the weight and force to be given to site plan review findings.

From the standpoint of Bays management, site plan review offers a range of benefits. Of particular importance is the ability of the process to define a clear point of entry into the permit process -- otherwise absent in many communities because of the diverse missions of various boards' enabling legislation. Because site plan review demands a coordinated review process, administration can be markedly improved. In addition, because towns may require that every project in a zoning district submit to site plan review, the process can be used to clarify and rationalize the decision-making process for land uses affecting resource areas. The process involves a significant investment in review time, however, and so must be designed in consideration of the resources and staff available to town boards and the results desired.

Among focus communities, Scituate has established a site plan review process that is broad in purpose and seeks to further the objectives of the Town's Master Plan. Any "new land uses or additions to existing uses that are of a size that may have significant impact on neighborhoods or the town" are reviewed to ensure that they meet established standards and Plan goals and objectives. The review process specifically addresses many natural features, and considers the adequacy of the methods of sewage disposal and other waste disposal, and the adequacy of stormwater treatment. In the town's water resource protection district, additional standards apply to stormwater treatment, recharge and control of toxic discharges.

Brewster's Development Plan Review Bylaw is triggered by a variety of special permits and by certain types of subdivisions. Applicants proposing development of subdivisions of eight or more lots must prepare a comparative environmental analysis that automatically

involves an assessment of what measures would be necessary for each alternative to comply with the development standards of the Development Plan Review Bylaw.

Growth Management Tools Available Through Zoning Authority.

An important determinant of success in Bays resource management will be the overall ability of Bays communities to guide growth and development away from sensitive areas. In spite of a wealth of available documentation regarding the water quality impacts of sprawling development and the need to channel growth into areas where its inevitable impacts can be sustained, development in many Massachusetts Bays towns continues to proceed in a manner which generates impacts that cannot subsequently be reversed in a cost-effective manner. Although a comprehensive analysis of growth management initiatives among Bays towns is well beyond the scope of this document, the following sections present a brief summary of some techniques, and their use among Bays communities. As previous sections have stressed, comprehensive planning and sound resource protection bylaws are very important complements to these techniques.

Planned Unit Development (PUD). PUDs usually allow for a range of uses and/or varying residential types within a single development. Subdivision and zoning regulations apply to the whole project rather than to individual lots. PUD districts (or overlays) may provide significant flexibility in site design, allowing buildings to be clustered. Standards often promote comprehensive site development, and allow for innovative mixed-use development, larger contiguous open space, and enhanced protection of sensitive natural resources. Given greater design flexibility, developers can place structures so as to minimize impact to adjacent surface waters. (See also the description of Scituate's PUD district in previous sections).

Transfer of Development Rights. The Zoning Act does not specifically enable communities to use transferable development rights as a growth management tool. In Massachusetts, the

use of transfer of development rights has been limited, although Chapter 40A Section 9 provides that a SPGA may allow increases in density or intensity of use (up to limits established by the local bylaw) in return for the a developer's grant of "amenities." Although "amenities" are defined to include open space, density bonuses have more often been granted in an attempt to address affordable housing needs, rather than with the view of shifting density out of sensitive areas.

Development Scheduling and Phasing. This family of growth controls may be applicable to commercial and residential development. These controls restrict the rate at which permits are issued, manage the rate at which impacts are felt by the community, and allow a community time to provide services and plan for appropriate resource protection. Development scheduling generally places a maximum limit on new permits to be issued each year. Residential development scheduling generally applies to subdivisions and multifamily developments. Permits may be limited on the site level, within specific resource-limited areas, on a town-wide basis, by land use type, by development intensity, or by a combination of these measures. Bays towns using residential development scheduling include Rockport, Sandwich, Provincetown, and Orleans. Orleans also uses commercial development scheduling, and has imposed an overall annual building limitation.

Development impact scheduling may be used to limit the rate at which certain impacts may increase on a specific site over time. Impact limits must be based on documented constraints specified in the zoning bylaw. In 1984, Brewster considered a sewage disposal limitation tied to growth rate, but did not adopt the measure.

Phased development regulates the timing and geographic distribution of growth and encourages developments to locate in areas where they will be served by existing infrastructure and municipal services. A point system is used to rank development

applications on the basis of proximity to public services. Salem has adopted this growth management technique, as have Chilmark and other island towns, and several Pioneer Valley communities.

Non-Zoning Regulations.

Wetland Protection Authority.

The high value of wetlands and associated buffer zones as habitat, for protection of watershed hydrologic functions, and for nonpoint source pollutant processing and assimilation has been widely documented (see, for example, Groffman, et al, 1990; Nixon and Lee, 1986; Jordan, in press, and others).

Nearly 30 percent of the wetlands of the Commonwealth, including at least 20 percent of tidal wetlands, have been lost, according the Massachusetts Office of Coastal Zone Management (1992). Despite the relatively strong provisions of the Wetlands Protection Act (M.G.L., Ch.131, Section 40), losses gradually continue. Respondents cited a number of reasons for persistent incremental losses. These include uneven interpretation, administration, and enforcement of the WPA among local conservation commissions, poor control of land use and drainage alterations that influence wetland functions, ineffective buffer and floodplain protection, inconsistent review and enforcement of referred Orders of Conditions and citations by DEP regional staff, lack of success in mitigation and restoration efforts, and others.

The Commonwealth largely looks to one level of government to protect wetland resources -- the jurisdictions which are least able to look broadly, across jurisdictional lines, at the roles played by different wetland assemblages in a watershed. Absent this vision, local decision makers are frequently unable to define ecosystem protection goals in a cohesive manner, or to implement those goals based on an understanding of which watershed functions can most effectively be protected over the long term by the sum of specific types of

temporarily altered for these purposes, and allows discretion as to whether replication must be provided as a permit condition. Conservation commissions that are not supported by a local wetlands bylaw tend to have varying opinions regarding the extent of their authority to deny or impose conditions on these "limited projects."

In the mid-1980s a regulatory change in buffer zone jurisdiction created an "advisory" jurisdiction of 100 feet around bordering vegetated wetlands, banks, beaches, dunes and flats. If developers are able to engineer safeguards that eliminate alteration of the affected resource area, they may file a Request for Determination of Applicability (RDOA) and avoid filing a Notice of Intent. Unless an activity that proceeds under a negative determination subsequently alters the resource area, the conservation commission has no authority to enforce against a violator.

This "after the fact" jurisdiction places burden on the conservation commission to prove that resource alteration has occurred. Several respondents indicated that the interpretation and fulfillment of this responsibility has been problematic for conservation commissions, and has encouraged a reliance on piecemeal engineered solutions in the request for determination process. In addition, due to lack of staff, negative RDOAs (which eliminate WPA jurisdiction) are less likely to be reviewed by regional DEP offices than appeals of Orders of Conditions imposed by conservation commissions. Since proponents may legally proceed with work following a negative RDOA, whether or not it was issued in actual conformance with the Act, the technical accuracy of these initial conservation commission assessments becomes crucially important.

Other issues affect interjurisdictional consistency in terms of comprehensive resource management planning and local administration. With respect to wetland resource jurisdiction, conservation commissions have found it difficult to interpret limitations to the definitions of

ponds and streams that eliminate these areas from protection, along with the resource areas that border them. Other resources, such as coastal banks, are poorly defined in the WPA. Despite clarifying guidance from DEP concerning these definitional issues (DEP Policy 92-1), it nevertheless poses a challenge to conservation commission members to determine the proper means of assessing a resource area's significance to interests identified in the Act. Additional key areas of concern are definitions of "alteration" and the proper application of performance standards to buffer areas. Some of these issues have been addressed in DEP policy statements, and have been considered in new draft proposed regulations issued in February, 1992.

Since DEP has taken the position that the purpose of the Act is to protect the functions that wetlands perform, rather than the resources per se, and since functional attributes are reviewed on a case-by-case basis, commissions may face a significant challenge in maintaining a comprehensive view, particularly where accurate maps of wetlands and buffer area soils are unavailable, and wetland soils have not been "flagged" on plot maps. Developers can challenge presumptions of significance by showing that the resource in question functions atypically, or that the commission is imposing conditions designed to protect more of the statutory interests identified in the Act than can technically be deemed significant for the particular resource in question. The degree of evidence needed to overcome a presumption of significance is left to the judgement of the commissions, as are assessments of the adequacy of engineering solutions in meeting defined performance standards.

Local Wetland Protection Bylaws. As authorized by the Home Rule Amendment to the Constitution, municipalities may enact local wetlands bylaws supplementing the Massachusetts Wetlands Protection Act. Local bylaws generally require a separate permit, the application for which is evaluated and issued in parallel to the WPA permit, which the

commission must continue to administer. Several different formats have been adopted, reflecting a variety of review approaches. Towns have authority to establish definitions, performance standards, and design specifications that exceed the stringency of the WPA, as authorized by the Supreme Judicial Court in the case of (*Lovequist v. Conservation Commission of Dennis*), 379 Mass. (1979).

Local bylaws have been adopted for numerous reasons, many of which are important for management of Bays watershed resources. Among communities' primary motivations for enacting a bylaw are to expand the geographic scope of a local wetland resource protection program by clarifying jurisdiction over isolated wetlands, floodplains, seasonally-flooded buffer areas, and upland areas. Towns have used these local laws to prohibit wetland alteration or replication, and to require building and septic system setbacks for buffer protection, among other purposes.

Brewster's bylaw, which significantly expands the jurisdiction of the Conservation Commission into upland areas, is an example of this type. The Brewster bylaw allows the community to broaden its wetland protection purpose for more comprehensive protection of inter-dependent functioning elements of watersheds.

Both the values articulated in the WPA and the wetland types presumed to have resource value may be expanded. The Town of Scituate is adopting regulations that clarify language on bordering vegetated wetlands, bogs, and the floodway fringe, and establish a clear purpose and sound technical basis for protection of coastal banks, barrier beaches, and lands subject to coastal storm flowage. Again, some of the WPA definitions of these resources have proven troublesome to interpret, and DEP interpretations have not infrequently conflicted with those of town boards and commissions.

Town bylaws address other areas that have created controversy in WPA implementation. Although the activities regulated generally parallel those of the WPA (dredging, filling, removing, and altering) many towns have broadened the definition of "alteration." In addition, towns have frequently eliminated one or more exemptions aside from the utility exemption, including those for limited projects, emergencies, and "normal maintenance and improvement of land in agricultural or aquacultural use." The follow paragraphs describe some other resource protection enhancement approaches in use, drawn in part from Cape Cod Commission data. (In a few cases, effective resource protection provisions of towns outside the Mass Bays watershed are mentioned.)

Several towns have mapped resource areas and recharge areas (Yarmouth), have listed them by name (Scituate, Yarmouth), or have based the resource boundary on an elevation contour (Falmouth). Dennis and Barnstable specifically refer to public trust rights in trustlands.

Local bylaws have devoted considerable attention to activities involving the alteration of buffers and to activities allowed within buffer boundaries. Firm no-build buffers of 35 feet (Yarmouth, Dennis) to 50 feet (Barnstable, Brewster) have been established in some towns. Yarmouth, among other towns, has established performance standards. Scituate provides that a no-build buffer will be negotiated based on site-specific conditions, but is generally to be 25 feet or more. Eastham, Gloucester, and other Bays communities provide enhanced buffer protection within and adjacent to ACEC boundaries. Eastham prohibits roads in those areas. Falmouth provides that reconstruction of a buffer may be required where natural vegetation has been removed, and defines "pruning and clearing" to clarify allowable maintenance within the buffer. Brewster requires that applications describe an entire project

and all work within the buffer, even in cases where only a portion of the buffer will be included in proposed project boundaries.

Vegetated wetlands are defined in the WPA as characterized by 50% or more wetland vegetation, while unvegetated wetlands are defined based on geologic features and other distinguishing criteria established by state and federal guidelines (see discussion in State-Federal Authorities). Some communities have adopted definitions which include soil characteristics. The use of soil-based definitions can be extremely helpful, as delineation may be less ambiguous, and less subject to conflicting interpretation and seasonal variation. Soils are also less susceptible to wilful alteration. Further, soil-based definitions allow towns to establish more effective and defensible protection requirements for vegetated buffers, and enable communities to use soil-based site suitability criteria in zoning and subdivision controls.

Several Bays towns have also expanded jurisdiction over wetland resources. Truro regulates man-made as well as natural resource areas and claims jurisdiction over land altered or filled prior to the passage of the bylaw. Further, the Town can require permits for activities "likely" to alter a resource, and can attach conditions to a Determination of Applicability. Dennis defines cumulative effects in environmentally sensitive areas, while Barnstable claims jurisdiction to consider cumulative effects of docks and piers in permit evaluation.

Where septic systems are concerned, Boards of health and conservation commissions have overlapping jurisdictions and authorities, although DEP policies have provided some clarification. A mutually acceptable definition of wetland boundaries is of key importance to decision-making, as are consistent standards for siting septic systems in relation to wetlands. Several towns have attempted to remedy inconsistencies through their wetland bylaws. For example, Dennis and Falmouth use their wetland bylaws to require septic system upgrades when other work is done (Falmouth requires upgrades in the case of destruction by

floodwaters). The Falmouth bylaw specifically states that the Town's Board of Health regulations will not be considered sufficient in siting septic systems. Scituate restricts use of septic systems in geologically defined hazard zones.

Wetland bylaws have also been used to improve coordination among review boards and to facilitate enforcement. Dennis requires that an application for an Order of Conditions be submitted jointly to the shellfish constable and the harbor master for their comment. Many towns grant authority for entry onto private property, for referrals to police, for non-criminal penalties, and for use of performance bonds (up to 150 percent of the cost of restoration in Wellfleet). Eastham and Truro provide for citizen enforcement (ten citizens may petition for enforcement). To broaden enforcement capability, The Cape Cod Commission is promoting the use of "ticketing" procedures to impose non-criminal penalties on violators of local bylaws.

Mashpee has included an important "sunset" provision for nonconforming uses, in which an order of conditions may state that a particular structure will not be allowed in the future. Other towns have reinforced provisions of the wetland protection bylaw through zoning (Yarmouth, Barnstable). As previously noted, Brewster has a Wetland Conservancy Zoning District Bylaw that includes protection of wetland soils and prohibits many activities.

Of particular importance for nonpoint source management is that many wetland bylaws protect waterbodies as such, so that performance standards can be set which need not be precisely related to the presumed values of the particular wetland type at issue. Protection measures related to sediment control and stormwater quality and quantity may be imposed as permit conditions. These requirements may be set out in the regulations or may be included by reference to the regulations of another town agency (such as the Department of Public Works in the case of Scituate).

Because nutrients, sediment, metals, and other contaminants associated with stormwater may be at least partially managed when natural soil buffering capacity is preserved, effective protection of vegetated buffers is an important component of watershed management. Wetland bylaws have been used to expand regulation of work in the 100 foot regulatory setback established by the WPA, or to significantly extend the buffer. In its wetland protection bylaw, Gloucester has established an expanded buffer (200 feet in addition to the standard 100 foot requirement) to protect sensitive wetland areas associated with the Parker River ACEC, although regulations governing implementation of the bylaw have not yet been completed. Scituate has established basic design requirements for vegetated buffer strips, which allow the town to regulate, on a site-by-site basis, dimensions of the buffer, vegetation removal, maintenance, and recreation of buffers removed by construction activity.

Nahant's local wetland protection bylaw represents a common response to a different local government interest. Although the Nahant bylaw is conservative in tracking the WPA quite closely, the commission's decisions implementing the bylaw are reviewable on appeal not to DEP regional offices, but to the Superior Court. Several respondents mentioned that this formed an important incentive for passage of home rule wetland bylaws, since local boards felt that their decisions were overturned by the regional DEP offices on the basis of inconsistent interpretations of WPA regulations and policies.

At the present time, state and local wetland protection programs play a key role in Bays resource management. However, that effectiveness is limited by some important factors. First, the laws and regulations are complex and require a considerable knowledge of wetland biology and hydrology on the part of commission members, if sound and consistent implementation is to be ensured. In many respects, the core of implementation is conditioning of permits, particularly where interconnected resource areas are involved. (Issues of concern

with regard to conditioning Wetland Protection Act permits have been reviewed in previous sections.) In summary, boards have a very large responsibility, yet no specific experience is required of commission members, training is optional, though encouraged, and turnover among commission members is high.

Due to a revision in the WPA allowing conservation commissions to apply permit fees toward staff salaries, conservation commissions have begun to acquire staff. According to MCZM, three fourths of coastal communities' conservation commissions have some staff support, and one half have full time staff. Professional staff support is important, since many local bylaws exceed the stringency of the Wetland Protection Act, and necessitate additional review time, expertise, and documentation to support defensible decision-making.

Buffer regulation illustrates the challenges that towns face. Due in part to a lack of scientific data on the management practices needed to sustain the multiple functions of buffers (as stormwater and sediment management BMPs, extensions of the wetland system, and wildlife corridor habitat) many towns have been reluctant to establish clear, strong performance standards for activities allowed within buffer zones.

Basic restrictions are common, such as restrictions on the application of fertilizers, pesticides, and herbicides; restrictions on pruning; and prohibition of materials storage, and dumping. Yet few communities restrict pedestrian or recreational access to the degree that is needed to prevent channelization and loss of stormwater buffering function. Similarly, some buffer provisions forbid the direct discharge of stormwater and sediment, but neglect to specify design, performance, and maintenance standards that can ensure that proper pretreatment takes place. The Cape Cod Commission is addressing this issue by preparing a site-specific buffer area methodology to assist towns in establishing defensible permit

conditions where augmented buffer dimensions are required for sensitive wetlands and water bodies.

For the jurisdictional 100 foot buffer established by the WPA, as well as for local home rule bylaws, the lack of consistently applied performance standards has led to an extraordinary investment of board review time on this issue. No towns were found to use biological or hydrological criteria in setting requirements for maintenance of wetland buffer function. Other New England states such as Rhode Island have successfully used the S 401 Water Quality Certification program for protection of wetlands -- a strategy that has proven useful in supporting buffer delineation for runoff and sediment management.

Many town boards do not have available accurate, consistent, appropriately-scaled maps of soils, inter-related water resource areas, and habitats. Thus commissioners must frequently rely on evidence produced by project proponents in evaluating applications. The Association for the Preservation of Cape Cod has produced a fine set of maps, widely used by Cape communities, that defines resource areas within and across town lines. Convenient access to similar maps would benefit all of the Bays communities.

State enabling legislation empowers conservation commissions in towns that have passed local home rule wetland bylaws to retain consultants at the applicant's expense to perform needed reviews. Local and regional staff interviewed during the course of this study felt that this authority remains underutilized, though many towns use application fees to meet resource assessment needs. (Allowable application fee levels are set by state regulation.) A recent enabling law complements this authority, allowing planning boards to retain consultants at the applicant's expense to perform needed reviews and analyses for significant projects. The availability of this financing mechanism appears not to be widely recognized among local boards.

Only through the state wetland restriction program have resources been registered on deeds. Otherwise wetlands are only recorded when permits are granted, and monitoring requirements are generally not imposed in such a way that a town develops a good database from the permitting process. Although DEP is preparing a database, wetland losses are not recorded in such a way as to enable towns to effectively evaluate losses and target restoration efforts.

Cumulative losses and nonpoint source impacts may be especially important in headwaters streams, intermittent streams upstream of resource areas, and certain submerged lands. Subtidal wetlands and habitats continue to be altered by construction of docks and piers, dredging of public and private channels, increased boat activity, sediment deposition and stormwater runoff-borne pollutants. Conservation commissions and the state have found it extremely difficult to deny a dock permit, when others nearby in the same embayment have been approved, as the impact of the "last applicant's proposal" can rarely be assigned the blame for a violation of standards when no limit on resource use has been set. On the other hand, where submerged areas have been identified as a system and their values and habitat types specifically defined (as in the Town of Brewster) DEP and the courts have been reluctant to overturn local decisions. However, the language of local bylaws must specifically define the purpose of restrictions (preferably with reference to the public trust doctrine), and must clarify where projects may and may not be constructed in a critical habitat area. If towns have adopted a plan and established a framework on which to justify preemption, they are much more firmly supported in using the public trust doctrine in stating that certain activities may not enter the permit process.

Wetland compliance and permit enforcement continues to be a major source of concern. At best, enforcement of wetland violations is uneven. Where permit conditions are

insufficiently clear, enforcement is made more difficult. Respondents reported a large degree of frustration at the local level with respect to DEP's ability to follow through on local enforcement orders.

With regard to local enforcement, several Bays towns have attempted to augment staffing limitations by establishing provisions for citizen enforcement through petition, as described in previous sections. However, some Bays communities appear to have experienced significant difficulty in requiring violators to remove fill and restore functional values of resource areas. Violators are often able to convince conservation commissions that removal of fill would cause greater damage to adjacent waters than allowing the fill to revegetate in place.

Potential for Local Management of Bays Resources. Towns can enhance the effectiveness of the available wetland regulatory regime in a variety of ways: by broadening and strengthening jurisdiction in the areas cited previously, by ensuring that subdivision regulations call for prior wetland delineation, by restricting the use of filled land for any purpose (including OSDS setbacks) and by revising zoning bylaws to ensure that only the buildable portion of lots may be used in density calculations.

Specifically, towns can use local bylaws to ensure that isolated wetlands are protected, to ensure that applicable prohibitions apply to both private and public applicants, to improve enforcement authority, and to provide clearly for hiring of consultants. Again, Boards of Health and Conservation Commissions should apply consistent standards with regard to siting and retrofitting septic systems. Other non-regulatory enhancements are important as well, including fee simple acquisition, purchase of easements, and public education.

With regard to management of buffers, communities can improve protection of buffers by broadening the buffer jurisdiction through a local bylaw to address specific impacts (such

as discharge of nutrients, sediment, and stormwater). For defined buffer zones, clear management guidelines and standards should be established that limit clearing and use of chemical additives, outline acceptable means of providing access through buffers to the shoreline, and articulate appropriate restoration practices.

To ensure that buffers provide viable habitat, bylaws should provide for maximizing the area of contiguous buffers across property lines; and providing for management by a local conservancy or land trust where listed species are involved. Although MCZM, other government agencies, and non-profit organizations are beginning to provide assistance to communities in undertaking these initiatives, additional guidance and assistance will be needed to ensure that complex buffer management issues are properly dealt with at the local level.

Submerged lands protection can be improved through vigorous interpretation of the WPA to include protection of critical habitat areas, eelgrass beds, and shellfish beds, and through preparation and statutory approval/implementation of embayment plans and critical habitat protection provisions.

Communities can work toward integrated watershed protection by obtaining Natural Heritage program certification for vernal pools and other resource areas if not otherwise protected; by completing coordinated town-wide and watershed-wide inventories of wetland resources, associated wetland soils, and related aquifer recharge areas, streams, and floodplains; and by assessing and acting upon opportunities for protection and restoration. Cape towns have had coastal wetlands and some inland wetlands protected through the Inland and Coastal Wetland Restriction Acts. These programs, recently discontinued, provide for mapping wetlands and placing permanent restrictive orders on deeds.

Critical areas which will be mapped in the Cape Cod Commission's GIS include coastal habitats, submerged aquatic vegetation, areas of erosion potential, areas anticipated to be

affected by potential sea level rise and other sensitive areas, identified by soil type, topography, existing uses, and other factors. These consistently grounded delineations will facilitate designations of DCPCs as well as other critical area protection measures.

Communities can also capitalize on available authorities for regional water resource protection by participating in development of a regional water resource protection strategy and implementing its results. Towns can further enhance ACEC protection opportunities by adopting developed management plans as bylaws, and referencing plans in other applicable bylaws.

Progress in controlling stormwater can be achieved if communities complete coordinated town-wide and watershed-wide inventories of storm drainage systems and outfalls, and evaluate stormwater impacts on wetland and shellfish resources so that retrofitting needs can be ranked for appropriate attention. In many watersheds, impacts of stormwater runoff can best be addressed before development occurs, if jurisdictions work together to develop a comprehensive stormwater management plan that addresses protection of all natural watershed functions. Applicable bylaws, regulatory provisions, and town procedures can then be amended to implement the plans.

Documentation is available to support these needed initiatives. According to surveys completed by MCZM, the Cape Cod Commission, and the RPCs, many sound recommendations of the 208 Areawide Water Quality Management Plans prepared in the late 1970's were never carried out by local communities and remain applicable. In addition, new stormwater management planning techniques and treatment technologies offer significant opportunities to address planning and retrofitting needs comprehensively.

Subdivision Regulations.

Role of Subdivision Regulations. M.G.L. Chapter 41 ss. 81 L -81GG, the Subdivision Control Act, is the enabling legislation empowering local governments to regulate the design and placement of residential, commercial, and industrial subdivisions. Subdivision regulations are extremely important in Bays resource management. First, a high percentage of the land located directly landward of coastal tributaries and wetlands is developed or zoned for residential subdivisions. In addition, since the subdivision review process establishes the basic building type, density and layout of large tracts of land at one time, it can have a tremendous influence on local drainage patterns, nutrient loads, erosion and sedimentation impacts, and groundwater quality and quantity.

Furthermore, according to the Zoning Act Ch. 40 A S. 6, subdivision plans are exempt from complying with any new regulations for 8 years from the date of plan approval. This so-called "grandfathering" provision offers considerable protection for a subdivision plan and presents a formidable roadblock to communities attempting to strengthen local environmental protection regulations.

Generally subdivision rules and regulations provide standards for the construction of roadways, utilities, curbs, sidewalks, and other aspects of road, street, and building layout, including drainage and construction specifications. By establishing drainage requirements, subdivision regulations govern local quantities and patterns of surface and sub-surface flow, and can require flood control and hazard mitigation measures. Thus, water quality impacts of runoff and erosion can be significantly affected by the emphasis of these regulatory instruments.

Research sponsored by the MBP and the Buzzards Bay Project has confirmed that reliance on traditional drainage methods in developed coastal areas has significantly

contributed to the water quality degradation of important Bay tributaries such as the Sudbury, Merrimack and North Rivers as well as enclosed embayments in Massachusetts Bay, Cape Cod Bay, and Buzzards Bay.

Unfortunately, subdivision regulations have traditionally exacerbated contamination of receiving waters by focusing on the engineering aspects of design as opposed to the need of environmental protection. For example, typical subdivision regulations may include standards requiring features such as wide streets, curbs, piped drainage, double sidewalks, and paved driveways, all of which retard groundwater infiltration. In addition, most regulations require that runoff be collected in storm drains and directed to the nearest surface water channel, a practice which modifies watershed hydrology by limiting recharge, exacerbating downstream flooding potential, and speeding the transport of runoff-borne pollutants to receiving waters. Further, the tendency for subdivisions to include large percentages of lawn area has contributed to discharge of fertilizers and pesticides to receiving waters. In short, many subdivision regulations require updating to better control impacts of stormwater and lawn maintenance and to enhance review of site suitability.

The Massachusetts Subdivision Control Act was last revised in 1987, and its provisions regarding the allowable purposes of local review were broadened. Nevertheless, the provisions retain an engineering orientation, rather than a land use orientation, and the purposes for which a town planning board can review a subdivision are more limited than the scope given to the board of health.

Under precedent established by case law, planning boards cannot review offsite impacts of a subdivision. In fact, "drainage" is defined only to include flow entering and within the subdivision, a shortcoming in the enabling legislation which has contributed to the

difficulty that towns have had in upgrading stormwater management provisions. Only boards of health can consider flow discharged from a subdivision.

The planning board's power to regulate the impact of a subdivision on a community is limited by the specific language of the regulations, the manner in which those regulations interpret the flexibility of the Subdivision Control Act, and the degree to which other town bylaws and procedures complement the process.

In considering an application for subdivision of land, planning board review is limited to the design, location and construction of ways, utilities, drainage, and a preliminary review for septic system suitability. Respondents differed concerning the breadth of interpretation open to planning boards in redefining or enhancing their scope of review. (Bays communities such as Brewster have revised their subdivision bylaws to give the planning board broad authority to review environmental impacts).

With respect to wetland and habitat protection, the impacts of subdivisions depend heavily upon the degree of cooperation between the conservation commission and the planning board during the review process and upon the breadth and specificity of the subdivision regulations. If the two agencies support the notion of protecting these resources through the subdivision review process, then consideration may be given to the design in order to minimize impacts.

On the other hand, if the planning board fails to involve the conservation commission in the plan review, the conservation commission and the board of health may be forced to review and attempt to mitigate impacts on a lot by lot basis. This lot-by-lot "remediation" is not only difficult and rarely effective, but also places the town in a vulnerable position with regard to Wetland Protection Act exemptions. For example, if a developer submits a plan that ignores wetland boundaries to a weak planning board operating under a conventional set of

subdivision regulations, the planning board may merely review a developer's basic compliance with road and drainage requirements, severely limiting opportunities to protect the integrity of a wetland system. Effective subdivision regulations provide that the entire layout conform to town policy.

A planning board's authority to deny or require changes to subdivision plans on issues relating to environmental impacts is likewise complicated and subject to interpretation. Although the Supreme Judicial Court has held that planning boards can require extensive information in an application for review of a proposed subdivision, including information not directly related to its review of ways and utilities. Planning boards must approve plans if the explicit regulations and standards of the planning board on the narrow reviewable issues are met. For this reason, respondents indicated that in some Bays towns, subdivision approval is fairly automatic.

In the same vein, respondents indicated that in some cases, towns are forced to approve subdivisions over the objections of the conservation commission, because of limitations in scientific or other data that would have supported a broader interpretation of subdivision review authority. This issue may be exacerbated at present by tight local fiscal conditions (although, as noted previously, planning boards and zoning boards of appeal do have authority to assess a review consultant's fee from applicants.)

As with other subdivision review issues, a planning board can only place conditions on a submission which are clearly within its realm of authority, as defined by its rules and regulations or state law, and where it can show that a particular regulation will not otherwise be complied with. For example, unless the planning board has adopted specific regulations for the purpose of protecting groundwater (using its authority to require adequate water supply in subdivisions), it must rely on the board of health to address the issue (requiring

changes based on existing groundwater conditions, potential impacts of stormwater discharges, and waste disposal issues).

Therefore, unless a town has broadly interpreted the scope of planning board review, the board has little leeway to regulate cumulative impacts, particularly in view of the fact that it can only review issues that an applicant has the power to remedy. Again, the disjointed nature of review by several boards with single purpose authority often leads to inadequate measures to control nonpoint sources of contamination. In this regulatory environment, it is not surprising that cumulative impacts are frequently not addressed at all.

The vesting of final (definitive) subdivision plans for a period of eight years under the existing grandfathering provisions of the Commonwealth's zoning enabling act have proven a hindrance to towns in their management of nonpoint source impacts. The effect of this protective clause is to close the door on any further review of a subdivision for eight years following its approval, regardless of whether any physical action has commenced to construct the subdivision. This obviously prevents a community from mitigating impacts which may be identified subsequent to approval, and as such, has caused many areas to be subdivided "on paper" long before real estate market demands would otherwise encourage their development, in order to protect a property owner's "rights."

Barnstable and other communities have attempted to blunt the effect of the grandfathering provision adopting general bylaws for resource protection that are not bound by this constraint of the zoning act. Since disparate town bylaws must be administered simultaneously, subdivisions are included in the general bylaw jurisdiction. Grandfathering may also be superceded by District of Critical Planning Concern designation on Cape Cod, as provided for by the Cape Cod Commission Act Sections 10 and 11.

Impact fees and mandatory donations of open space are not provided for by the Subdivision Control Act. In fact, provisions for mandatory donation of open space are expressly forbidden by S. 81 Q, although a three year set-aside of open space is allowed. Similarly, the ability of a planning board to consider adequacy of roads and other services available to a subdivision has been uncertain. On Cape Cod, the adequacy of infrastructure and the means to approach it through the use of impact fees are both addressed through the Cape Cod Commission Act.

"Approval Not Required" Land Divisions. An important and troublesome subset of the problem of managing subdivision impacts on Bay resources has been the provision for "subdivision approval not required" (ANR) endorsements under S. 81 P of the Subdivision Control Act. The section provides that divisions of land, however large, need not be reviewed as subdivisions as long as all of the resulting lots meet the minimum frontage requirements of the zoning district in which the land is situated. While the intent of this law is to allow divisions of land to occur without extensive review if adequate access already exists for all newly created lots, it has been used in extraordinary ways to circumvent full subdivision review.

In an effort to avoid the expense of subdivision review and the requirements of local regulations, developers have frequently laid out areas in "flag" or "pork chop" lots providing long access strips to get the required frontage on a public way, albeit an ancient way or other path not actually available for access. Often the "strips" are not even used or physically improved for access themselves. Instead, a common driveway is often provided to service two or more lots. In practice the only consideration of the planning board in the review of ANR plans is the review of the adequacy of the intended access to meet the needs of the proposed lots. As a statutory matter, ANR "non-subdivisions" (and all single lots fronting

public ways) are exempt from the review of interior ways, drainage, flooding, sanitary conditions, and utilities provided by the subdivision review process. Lots which are created in this fashion often result in the establishment of private driveways which can present a problem with respect to wetland protection and drainage issues.

Respondents pointed to several difficulties with ANR plans, from the standpoint of water quality protection. An important concern is a planning board's inability to initially evaluate and ensure consistent maintenance of wastewater and drainage facilities. Since ANR plans are frequently submitted simply to replot (realign) new lot lines for existing structures, even the most fundamental information about proposed septic systems may be difficult to verify. (In one south shore town, failed septic systems in ANR divisions have proven to be located on lots owned by neighbors.) Tracts divisible as ANR lots can also introduce considerable uncertainty into nutrient loading analysis.

The ability of a town to require installation of proper stormwater management BMPs in these areas is often highly dependent upon the applicability of other bylaws. This concern is particularly important because stormwater facilities in private subdivisions are frequently subject to lesser standards than subdivisions in which roads and drainage facilities will be dedicated to the town. DPW inspection of these facilities is generally performed only once, during construction.

The lack of clear review authority also makes for a contentious decision-making arena that is not well coordinated with town planning needs and objectives. ANR disputes are very common in the Superior Court, and have generated a patchwork of caselaw (Dawson, 1988). Further, since grandfathered ANR plans are protected for three years from new zoning and health regulations, plans can be submitted to freeze regulations, as illustrated by the example cited earlier concerning a Mansfield Aquifer protection zoning initiative.

Potential for Local Management of Bays Resources. In spite of the fact that they were not designed to address land use (and despite the limitations outlined in previous sections) subdivision regulations can be used to help protect critical Bays resources from the impacts of stormwater and sedimentation, and have been adapted toward this purpose in several Bays towns.

Communities can expand subdivision control authorities directly in several ways. Options are to establish a low threshold for review (fewer than the standard 8 to 10 lots, or "regardless of frontage"), and to include broad purposes in the bylaw. Towns can also extend the Planning Board's authority to expand preliminary plan submission requirements or definitive plan requirements. These expanded submission requirements can include prior delineation of soils and wetlands, evaluation of site hydrology to demonstrate how natural site drainage patterns will change (in addition to the standard volume increase calculation), and others. In addition, towns can require that site density calculations be based on buildable area only, and can establish policy on lay-out to require enhanced protection of wetlands and other important habitat areas.

Subdivision regulations can be used effectively to improve management of stormwater for water quality protection and aquifer recharge as well as for flood hazard control. Provisions should be consistent with site plan review provisions that address these issues on a town-wide basis. (A comprehensive stormwater management bylaw is highly recommended to apply to all development activities including those of town government. None were found to be in place during the course of this study).

In general, subdivision regulations in many Massachusetts Bays municipalities need to be updated to place increased emphasis on management of stormwater quality and to enhance review of site suitability. Subdivision regulations of all of the four focus communities were

examined; of these Gloucester's, Scituate's, and Nahant's would benefit from significant updating, as would Brewster's in certain respects. Stormwater management standards should include both detailed design and construction specifications and performance standards. These should be consistently applied to accomplish the dual goals of control of runoff quality and management of quantity, while providing for groundwater recharge in a safe manner.

To accomplish these objectives, subdivision regulations may require installation of various types of detention basins, grease and oil traps, gravel driveways and road shoulders, roof drainage dissipators, etc. Regulations may also require terracing of slopes, retention of natural vegetation, reduction of road dimensions, and other means of retarding and treating runoff.

Environmental impact assessment requirements can also be included in subdivision regulations for improved protection of receiving waters, and as a means of mitigating other environmental impacts of grandfathered developments. If an assessment requirement of this type is to be successful, it should be designed so as to form a consistent baseline for monitoring, support inspection and enforcement efforts, and otherwise enhance a community's ability to evaluate its resources as assessments accumulate. Many communities will require technical assistance in matching their environmental impact review requirements to monitoring and staffing constraints. Pooling technical staff among communities sharing Bays resources may offer significant potential in this regard.

A considerable level of technical detail may be required to ensure that: a) all sensitive receiving waters on the site and affected by it are identified as to location and pre-development condition; b) post-development impacts (including nutrient load) are identified, quantified, and compared to performance standards established by the town; and c)

appropriate mitigation strategies are specified for situations where town performance standards cannot be met.

Brewster's environmental impact assessment requirement provides an example of a rigorous approach. Brewster requires that a comparative environmental analysis be submitted for any subdivision creating frontage potentially allowing for more than eight lots, for non-residential subdivisions, and for other cases where the planning board determines it appropriate in light of special circumstances. Broad authority is given to the planning board to establish the scope of the required analysis, to outline alternatives to be compared, and to determine how consequences must be compared among the alternatives.

For Brewster's assessment, differences among alternatives must be evaluated in terms of their impact on groundwater and surface water quality (including nutrient loading analysis), with additional stormwater-related contaminant analysis required for developments within the Town's Water Resource District. Impacts on wildlife habitats, important botanical resources, and historical and scenic environs must be assessed and compared, along with the relationship of impacts to the requirements of the Wetland Protection Act. The capability of soils, vegetative cover, and proposed erosion control efforts to prevent erosion, silting or other instability must be documented and compared, as must the effectiveness of measures to be taken in order to comply with the town's Development Plan Review Bylaw. Impacts on town roads and water supply services must also be compared for alternative sites and configurations.

As do many town subdivision regulations, Brewster requires that "due regard" be shown for all natural features, such as large trees, watercourses, scenic points, historic spots, and other community assets.

A Note on Environmental Impact Review Bylaws.

To extend environmental impact review authority, towns have passed general bylaws. Some have applicability town-wide (as in Brewster), while others require that environmental impact reviews be submitted for development proposals within areas defined as having critical resource values or critical value for provision of town services such as water supply. Appropriate elements are similar to those of environmental impact assessments for subdivisions, which were outlined previously. In addition, a general environmental impact review bylaw can apply to grandfathered subdivisions.

Towns can establish a low threshold for required submission of an environmental impact review in critical resource areas to enhance the authority of local boards in placing conditions on ANR development. The report can be required for all proposed commercial and industrial developments, municipal development projects, and projects requiring special permits.

Authority of the Board of Health.

This research effort gives consideration to the role of local health boards in implementing Title V of the State Environmental code (310 CMR 15.00), as supplemented by local regulation of onsite waste disposal. This focus is due to the broad distribution of onsite sewage disposal systems (OSDS) in coastal areas influencing the Massachusetts Bays. Although the current research effort has focused on regulation and management of these systems, regulation of hazardous materials and underground storage tanks may be a notable source of concern in some coastal areas contributing to the Massachusetts Bays, and the important role of health boards in addressing these problems should be emphasized.

Onsite sewage disposal systems (OSDS) are very widely used in the Massachusetts Bays watershed, although widely varying conditions affect the appropriateness of their use.

Buzzards Bay Project research results indicate that, particularly in enclosed embayments, the deleterious influence of septic tanks on coastal water quality exceeds that of POTWs.

Proper treatment of wastewater effluent from septic tanks and other types of onsite disposal systems is an essential component of coastal water quality protection. When properly sited, designed, installed and maintained, OSDS can be used to treat household waste simply and effectively.

However, discharge of improperly treated effluent to groundwater and surface waters can create significant hazards to human health, can degrade potable water supplies, and can promote eutrophication leading to loss of valuable fisheries habitat and closure of recreational areas. In many Massachusetts Bays basin communities, both groundwaters and surface waters are vulnerable to contamination from OSDS. This is due to several factors, including the susceptibility of coastal areas to flooding, sea level rise, and coastal storm flowage; the prevalence of high water tables; and the prominent role of groundwater flow in recharging coastal embayments.

In Massachusetts Bays, as in other regions, the danger to human health and the coastal environment from OSDS effluent must be considered in two ways: local effects caused by the identifiable plume of treated effluent from a single disposal area or a concentration of densely spaced systems; and the regional groundwater concentration resulting once the local concentrations of all permitted, local sources have dispersed. These local and regional impacts must be considered in evaluating the adequacy of OSDS management on the part of local governments.

Many communities in the Massachusetts Bays basin are dependent upon groundwater sources for water supplies, and are vulnerable to loss of supplies to OSDS-related contamination. EPA has established a drinking water standard of 10 mg/l nitrate nitrogen to

reduce risk of infant cyanosis, which is caused by elevated nitrate levels in drinking water. High nitrate-nitrogen levels have also been linked to the formation of carcinogenic nitrosamines (Porter, 1978).

In Gloucester and Scituate, among the focus communities, closures of shellfishing areas and swimming areas, and restriction of other beneficial uses, have been at least partially attributed to pathogens derived from septic leachate. OSDS effluent contains several types of pollutants of concern in coastal areas in addition to nutrients and pathogens; conventional pollutants such as suspended solids, oil, and grease; and toxic chemicals such as synthetic organics and metals. Other leachate components include chloride, sodium, and sulfate.

Of these contaminants, nutrient and pathogen loadings present the greatest concern as pollutants of coastal receiving waters in most areas, followed by organics. Suspended solids and metals should be removed by a properly functioning system, although metals may potentially break out at the groundwater-estuary interface. Oil and grease may clog leach fields, limiting treatment capacity.

Although scientific understanding concerning the biochemical fate of these pollutants, and their interactions in coastal waterbodies, is continually being refined, sufficient data exists to justify a high degree of concern where dense development has led to groundwater contamination, and where effluent is transported into poorly flushed waterbodies or coastal embayments.

Septic systems are regulated under Title V of the State Environmental Code, which is administered by local boards of health. This law was never intended to deal with land use and environmental management issues, and has numerous limitations in terms of its ability to effectively address land use-water quality relationships. Statutory and regulatory revisions

are currently under consideration to address several of the most important shortcomings of Title V, including its inadequate provisions for assessment of site suitability.

With guidance from the Barnstable County Health and Environmental Department, several Cape Cod communities have passed local supplements to Title V to address local circumstances, as provided for in the state law. Local governments are using a variety of approaches, based on a diverse set of scientific findings. Inconsistencies across jurisdictions within Bays watersheds have inevitably resulted and will increase in frequency as new scientific information and monitoring results are variously interpreted. Although local supplements may effectively address problems on a local scale, effective Bays resource management demands improved wastewater management planning capability.

Emerging Issues of Concern. In many coastal resort communities around the Massachusetts Bays, dense concentrations of substandard OSDS are located in old neighborhoods on substandard lots where space for upgrading is severely constrained. These systems were installed prior to revision of Title V regulations in 1978, when requirements were upgraded. A majority of these systems may have been designed to support seasonal use only, are outdated in design, are poorly maintained, or may have disintegrated entirely. Frequently, the most dense concentrations of these old systems are on soils least suited to the use of conventional OSDS as a waste disposal strategy.

As land use intensifies, the health and environmental risks imposed by OSDS effluent may increase in a non-linear fashion. The cumulative total of wastewater flows may raise regional average values of contaminants to levels exceeding EPA drinking water standards. In addition, groundwater recharging sensitive coastal systems may carry nitrate loads and other contaminants which have been carried by groundwater from distant locations in the watershed over several years as well as loadings from adjacent areas. Since Title V allows

use of leaching pits, which may be placed more densely than leaching fields, cumulative impacts may be seriously exacerbated, particularly in sandy soils.

Septic systems accommodate development on lands that are not served by public sewer service, inducing increased demand for community services, loss of buffering capacity, enhanced risk of water quality degradation, and the potential for loss of land previously devoted to other traditional coastal area uses, including shellfishing, farming, and cranberry culture. Especially where variances are issued to allow development of these lands, and where systems subsequently fail, the choices available to restore degraded water quality and protect public health may be limited and costly. Because the demand for coastal property continues to escalate, increased growth pressure on marginal lands can be expected, especially if regulations accommodate the use of alternative systems for new development.

The wide diversity of soil drainage conditions along the Massachusetts Bays shorelines and tributaries contributes to the complexity of managing OSDS impacts. Shallow bedrock, shallow depth to groundwater, clay substrates and other impediments to OSDS use have frequently been overcome by homeowners and developers in unfortunate ways that ignore short term consequences.

Contamination of coastal waters due to septic systems can occur in several ways. In overt system failure, soils can no longer accept effluent and sewage may break out onto the ground surface where it is transported by drainage systems or overland runoff. Overflow pipes and subsurface drainage pipes, designed to prevent system flooding, may intercept contaminated groundwater and discharge contaminants directly to surface waters. (Installation of overflow pipes is no longer permitted in Massachusetts, but many old ones remain in use.) Conversely, hydraulic overloading can cause pathogenic viruses, nutrients, and heavy metals from other sources that have been illegally discharged to these drainage

systems, to enter coastal waters via groundwater. Considerations of flooding potential in Massachusetts Bays communities relate not only to coastal storms and storm surge, but also to sea level rise. On Cape Cod, analyses of the effect of sea level on OSDS suitability concluded that up to 40 percent of the land area of several Cape towns would be unable to meet existing OSDS siting requirements by early next century, given a defensible sea level rise scenario. In resort communities around the Bays, a large percentage of OSDS are subject to seasonal use only and are thus vulnerable to two important problems. First, the concentration of organic material in wastewater is necessary to support the formation and continued viability of the "biological mat," which has been found to have an important role in filtering viruses and other pathogens. Since a mat frequently requires several months to form under conditions of normal use, the filtering capacity of the mat may only be reaching its design potential as a resort season ends. Conversely, overloading a system intermittently, by using it to support a household or guest population well beyond its design capacity, can cause hydraulic overloading and system failure.

Of key importance are conversions of seasonal homes to year-round use, and enlargement of buildings served by substandard systems. These concerns have been particularly severe on Cape Cod, as conversions of seasonal homes to retirement homes have escalated. Many residences which have been converted for year-round occupancy are located in old, dense summer colonies having soils unsuited to effective wastewater treatment. Again, a large proportion of the OSDS in these areas pre-date state siting and construction standards, are in extremely poor condition, or have deteriorated completely.

Role of Boards of Health in Implementing Title V. Boards of health have a great deal of authority to adopt regulations protecting the health and safety of a community, and to protect water resources for current and future use. Under specific mandates of state law, health

boards have authority to review and approve preliminary and definitive subdivision plans. They also review and licence septic systems and septage facilities, regulate sanitary landfills and waste disposal facilities, and may investigate and remove any nuisance potentially injurious to public health. In addition, boards may choose to exercise a broad range of other powers through "reasonable" local regulation and emergency action, and may enforce several laws and regulations of the state related to public health.

Deficiencies in Title V. Enacted in 1977, Title V establishes minimum standards for the design and installation of OSDS. Systems of up to 15000 GPD are regulated by local boards of health, while DEP approval is required for larger systems. As an environmental law protecting coastal areas, Title V is limited, in terms of its site evaluation procedures, its ability to prevent and deal effectively with failures and to encourage appropriate upgrades, and as a wastewater management planning tool.

Respondents pointed to a number of specific deficiencies in Title V. These include its lack of consideration of nutrients and viral transport; inadequate siting provisions; testing requirements unsuited for many Massachusetts Bays jurisdictions (especially where sandy soils, clays, bedrock, or high water table conditions exist); poor coverage of drainage issues; lack of consideration of innovative and alternative systems; insufficiently low threshold for state review of large systems; insufficient prohibitions regarding use of fill; and many other issues related to management and maintenance.

In addition, Title V is poorly coordinated with the requirements of the Wetland Protection Act in terms of its ability to protect buffers, hydric soils, and seasonally flooded areas and to restrict OSDS construction in hazard zones. Of particular importance to Massachusetts Bays protection, Title V is insufficiently able to deal with cumulative effects, from the standpoints of either prevention or resource restoration. Although many of these

issues are being addressed as amendments to Title V are considered, and as DEP prepares proposed regulatory revisions, contamination attributable to existing systems will inevitably increase.

In general, Title V is similar to many older subsurface waste disposal laws in New England in that it was designed to address public health needs and is insufficiently able to address groundwater protection or control of environmental impacts. Traditionally, public health officials were forced to adopt minimum standards for OSDS in order to meet operational goals. Thus, standards were designed to: prevent the spread of disease caused by pathogens contained in inadequately treated sewage, abate nuisance conditions, and to provide assurance to a system owner that the OSDS would function over a reasonable design period (e.g., the useful life of the dwelling).

Applying Title V to Bays Resource Protection. Effective control of nonpoint source pollution from OSDS in the Bays basin is much more complicated. It must involve comprehensive attention to a range of management needs, including careful consideration of siting and design issues, development and implementation of wastewater management planning strategies, upgrading of failed or substandard systems in critical areas, and training and public education.

To address these needs, performance goals are needed which go well beyond the operational goals for system installation which have historically formed the foundation for OSDS regulation. Two other types of goals recommended by EPA's new Design Manual on Subsurface Disposal (currently in review draft) should serve as foundations for the management framework that is needed. These include functional goals:

For surface water systems, prevent or eliminate impacts of pathogens, nutrients, and toxics which prevent attainment of beneficial coastal uses, protection of viable habitats, and maintenance of water quality classifications.

For groundwater systems prevent loss of current and future supplies as resources for consumption and as base recharge for surface water.s

They also include community goals:

Establishing orderly relationships for the long term between sewage disposal/management options and development opportunities.

Making available a choice of systems which are effective, moderate in cost, and can be effectively operated with a reasonable level of training.

With regard to local government implementation, Title V regulations need to be adjusted to enhance the ability of communities to meet these goals in coastal areas, within and among their jurisdictions. To ensure that wastewater management objectives can be met consistently, a process needs to be established (via Title V or local bylaws) that will allow the OSDS designer and reviewer to evaluate how any individual system proposal, keyed to a specific site, will meet the required goals. Elements of board of health regulations examined during the course of this study were compared to those recommended by the draft EPA Design Manual for Subsurface Wastewater Disposal, as well as by other wastewater management literature. In order to be effective in sensitive coastal areas, these sources suggest that OSDS management programs incorporate the following elements, some of which may be delegated to district entities if performance objectives can be met:

A site evaluation procedure which considers site-wide hydrogeologic capability and is capable of considering cumulative impacts of septic system density on coastal resources.

Regulations and management programs governing site selection, design, construction, installation, operation and maintenance of OSDS, use of cleaning solvents, and disposal of septage.

Regulations and management programs which consider the special characteristics and requirements of commercial, industrial, and large residential systems.

Regulations and management programs which provide for the orderly upgrading and/or replacement of failed OSDS contributing or potentially contributing to degradation of coastal water quality.

Technical guidance for system designers, installers, and operators.

Legislation and a review process that accommodates effective innovative and alternate technologies capable of enhancing coastal water quality.

Enabling legislation which accommodates and sets standards for the functioning of regional wastewater management entities.

Programs for training and education which are supported by a dedicated source of funds.

Title V as a Planning Tool. In spite of a wealth of available documentation regarding the water quality impacts of sprawling development and the need to channel growth into areas where waste disposal can be made effective and safe, development in many Massachusetts Bays towns continues to proceed in a manner which insufficiently considers the pervasive impacts which improperly treated sewage effluent can create across property lines and jurisdictional boundaries.

This is not to say that efforts have not been made. The Cape Cod Aquifer Management Project (CCAMP), for example, involved the evaluation of many important disposal issues, as did Yarmouth's water resources protection study and a number of other noteworthy programs designed to control nutrient discharge to groundwater and coastal embayments. In the course of this research, a few instances were documented in which

towns have moved to confront shared wastewater management problems. These include the South Shore Septage Management Study, which included Scituate, and the development of the Cape's tri-town septage management facility (although the facility has encountered problems due to siting and management).

Nevertheless, very few Bays towns were identified during the study as having instituted long term wastewater management planning efforts to ensure that regional siting and retrofitting needs would continue to be met in a cost-effective manner consistent with growth management and coastal resource protection needs. To a large degree, jurisdictional, institutional and political issues appear to have affected the flexibility that Bays communities have in moving toward inter-jurisdictional wastewater management planning.

There are many instances in which Title V has been used as a planning tool to stop or stall growth in areas which are unsuitable for subsurface waste disposal. Using OSDS regulation as a de facto approach to zoning leaves a community vulnerable to technological solutions which may overcome the constraints that prevent placement of conventional OSDS. If land use policy is pieced together in this fashion, it is subject to rapid unraveling by technological advances and may invite legal challenge. Without the support of a comprehensive plan which sets forth broad land use objectives and policies to guide growth in sensitive coastal areas, new technology may open the door for alternative waste disposal and find many communities unprepared for the onslaught of development in areas previously considered undevelopable.

An example of this problem is now facing many bay communities as they evaluate the appropriateness of nitrogen removal systems for coastal watersheds. If approved for widespread use, denitrification OSDS will significantly reduce the nitrogen loading affecting many of our shallow coastal embayments. However, they will also eliminate one of the major

constraints that communities have relied upon to control development in sensitive coastal watersheds. As mentioned above, the comprehensive plan is the appropriate forum for establishing land use policy, rather than individual regulatory programs. Title V provisions need to be complemented by effective comprehensive plans and resource protection overlays that address zoning deficiencies. In and of itself, Title V is not a land use tool, in that it is administered site-by-site in a manner that may have no relationship to overall land use goals.

The ability of towns to use Title V as a planning tool depends heavily on the consistent efforts of a strong local Board of Health, and the willingness of the Town to broaden the provisions of Title V through local supplemental bylaws. In cases where the process has been initiated incorrectly, so that neither a comprehensive plan nor zoning districts articulate the actual development capacity of the land, effects of disjointed permitting processes and ineffective plans can be severely exacerbated by Title V administration. In such cases, Title V decision-making can result in the "de-facto" zoning described previously -- that is difficult to support from the standpoint of meeting planning or wastewater management objectives.

A number of Bays towns appear to be avoiding the political difficulties of controlling development in sensitive areas and relying on Title V provisions (and its lack of provisions regarding alternative technologies) to take responsibility for land use decisions. As technology advances and research on the impacts of a range of new technologies improves, town decisions based solely on out-dated design standards (as opposed to sound wastewater management planning) will be increasingly difficult to support. As a result, Title V can be expected to become less and less effective as a land use management tool.

From an inter-jurisdictional standpoint, Title V may provide satisfactory guidance to ensure proper functioning of onsite systems, but it has been of limited use to communities attempting to anticipate and manage wastewater-related impacts of developments in adjacent

towns. Outside the jurisdiction of the Cape Cod Commission, these potential resource impacts are handled through litigation, or through negotiation (as has occurred, for example, between the towns of Duxbury and Marshfield).

As of now, Title V regulatory authority appears to be used more often as a reactive instrument to control development to some degree in sensitive areas (where public health impacts may result) than as a complement to wastewater management planning. As a result, flaws in the Title V program, incomplete use of watershed protection authority, and issuance of variances demonstrate its deficiencies as a planning tool, as Title V may still be allowing growth to occur in marginal areas. These "ad hoc" development decisions are more likely to compromise coastal water quality than those which would be achieved through sound wastewater management planning. As pressure on coastal areas increases and as sea level rises, impacts of haphazard OSDS siting can be expected to escalate.

Use of Authority. Another concern voiced by respondents with regard to the use of Board of Health regulations for coastal resource protection has to do with the definition of what constitutes a health issue, versus an environmental or ecological issue. Ch 111 S. 31 provides boards of health with significant authority to implement reasonable regulations that protect public health. However, questions remain as to how far a health board could or should extend its authority to deal with an environmental impact such as eutrophication. Eutrophication can be linked to water clarity, hydrogen sulfide gas production, and certain health nuisances associated with anoxic conditions, but these conditions are difficult to predict with certainty, and thus difficult to link with necessary remedies on a site-by-site basis. Regulations of other boards are thus an important complement to use of board of health authority in resource protection.

Related to this concern is the recognition that boards of health face obstacles in prohibiting activities that may become nuisances, or may collectively be harmful. Lacking explicit authority to remedy incremental damages, boards of health face difficulties in defining the point at which enforcement is appropriate and defensible, particularly where cumulative impacts may be involved.

Site assessment measures and testing required by Title V do not successfully support boards of health in this regard. In addition, limitations are posed by the structure of the decision process. Boards of Health can make general recommendations regarding the suitability of a proposed subdivision for use of septic tanks, but cannot comment firmly on suitability until lots are laid out. Since leaching pits can be used in Massachusetts (and can be installed at high density), a subdivision review process based on conventional subdivision regulations can easily be manipulated by an applicant.

A response to these concerns among several Mass Bays towns has been to pass general bylaws based on protection of public welfare, which are implemented with input from the board of health. In these cases, resource areas are defined and evidence is presented to make a reasonable connection between specific activities and their expected outcome. Absolute certainty regarding specific effects is not required, provided that a management goal is clearly defined and furtherance of that goal is provided for via reasonable means.

Local Supplements to Title V. Many Bays towns have codified supplements to Title V standards for subsurface sewage disposal, as provided for in the statute where particular local conditions warrant additional stringency. Sandy soils, high water table, and shallow bedrock have been the basis for these supplements.

The Barnstable County Department of Health has been extremely active in researching and promoting defensible Title V supplements, in an effort to address some of the deficiencies

of Title V as they are manifested on the Cape. In its publication "Material Concerning Proposed Board of Health Regulations" (1991), the Department has provided specific derivations and a detailed rationale for each of its recommended supplements. Additional sources of scientific data and support are also included. The supplements address site evaluation and construction requirements, criteria for determining the basis for requiring a septic system repair or replacement, specifications for OSDS inspection at real estate transfer, and support for banning cleaners. Guidance on the issuance of variances is also provided.

The Department has recommended use of an areal application rate to evaluate soil suitability for system sizing. The Town of Brewster is among the very few towns in the state that requires hydrogeological studies for all systems exceeding 2000 gpd. Wellfleet requires hydrogeological evaluation for developments of four units or more. Several Cape towns, including Barnstable, Yarmouth, Dennis, Harwich, and Orleans require the use of the U.S.G.S. adjusted high groundwater assessment method in system design. Nearly all of the Cape towns bordering Cape Cod Bay prohibit the use of at least certain septic system additives.

Brewster requires a 100 foot setback to wells and watercourses, and defines watercourses quite broadly to include streams, ponds, open and subsurface drains, fresh and saltwater marsh, and inland and coastal banks. Orleans requires a 150 foot setback to wells producing potable supplies. Norwell, an inland watershed town, has adopted a five foot groundwater separation distance. The Barnstable County Department of Health recommends a five foot separation to groundwater, and suggests that boards of health require that the effluent application rate be reduced if a variance is issued to allowed the four feet separation required by Title V.

For several years, Brewster has had a bylaw in place requiring septic system inspection at title transfer, although inspection is now triggered through the tri-town septage

management framework. Upgrades are also required upon title transfer for commercial properties. In addition, Brewster requires upgrades at change of use and when properties are enlarged, and strictly defines "bedroom" as "any enclosed area" for the purposes of the Town's regulations.

In general, board of health regulations can take a number of approaches in managing the impact of OSDS on coastal waters. These include imposing more stringent standards on siting and design of systems proposed for areas that would affect sensitive receiving waters; requiring greater scrutiny of large system siting and design, upgrading substandard systems, and imposing nitrogen loading limitations. As noted previously, several Bays towns have used board of health regulations to specify how the condition of OSDS will be defined, how site evaluation data will be collected and used, and how systems will be managed and maintained. Detailed regulations have also been developed specifically for the purpose of controlling nitrogen loading, and assembled assessment results have been applied in land use management decision-making.

Despite progress in these areas, challenges attend administration of local board of health regulations. Conflicts with wetland regulations have been discussed in other sections. In addition, partially in response to concerns regarding inverse condemnation, variances from Title V and supplements are routinely issued by some boards of health. Where boards of health are weak, variances may lead to OSDS construction in numerous coastal watershed areas incapable of providing proper effluent treatment through time. At the same time, "strong" boards may place conditions on permits that become meaningless in their effects, or are impossible to enforce with available staff.

Volunteer health boards that are presently issuing variances on the basis of public interest or hardship may not be capable of evaluating long-term and cumulative impacts on

receiving water quality. In some Massachusetts Bays jurisdictions, no clear standards or written review procedures govern approval or disapproval of variances. (Barnstable has responded to shortcomings in this regard by putting regulations in place that eliminate consideration of whole classes of variances).

Potential for Local Management of Bays Resources. Effective Bays management may require addressing OSDS contamination issues on several levels. In the various watersheds of the Massachusetts Bays, a range of approaches to OSDS management will be appropriate, depending upon local conditions. The choice of regulatory strategies and management organizations depends upon numerous issues, including the structure of existing local authorities and their flexibility, the management needs at issue in specific coastal towns (and associated resource areas), and other technical issues and constraints outlined above, in addition to local needs and preferences. The effectiveness of the regulatory regime, the reliability of the management entity established, and the availability of a dedicated source of program funds (provided, for example, through an OSDS utility or wastewater management district fees) may ultimately determine the range of wastewater treatment and disposal options that can be used successfully in an area that affects Bays resources.

On the state level, Title V should be revised to eliminate as many of its shortcomings as possible. Revisions should recognize impacts of nitrogen loading and viral transport, should promote appropriate use of innovative technologies, and address many other siting, design and management issues as well as wastewater management planning.

Many states have made effective use of critical area management authority to impose a heightened level of scrutiny on OSDS siting in critical areas. Efforts have been made to strengthen OSDS management in several ACECs around the Massachusetts Bays, yet

management measures could be strengthened. The Cape Cod Commission Act's provisions for Districts of Critical Planning Concern offer opportunities in this area.

Consideration should be given to basin-wide or regional management options. Bays basin communities could consider developing regional water quality control and restoration plans or basin water quality control plans that address OSDS siting and management needs as an aspect of a comprehensive water resource management program. Basin-wide regulation should specify criteria for the discharge of wastewater, and should consider all beneficial uses of the creeks and rivers within a basin as they are affected by cumulative wastewater discharges.

Basin-wide standards can serve to ensure a consistent level of protection across identified areas of concern with respect to concentrations of nitrate or other contaminants. This approach has been recommended for the Towns of Plymouth, Wareham, and Bourne, all of which include portions of the Buttermilk Bay recharge area and is under investigation in Waquoit Bay. Using overlay zones and nutrient loading bylaws, specific restrictions can also be imposed within subwatersheds, recharge areas, or areas having specific hydrogeologic conditions.

In California, the basin planning process has been used to adopt nitrate action plans for specific regions, based on concentrations in public and private supply wells. The planning process has been used to prohibit discharge from OSDS, thereby requiring appropriate connections to sewers in heavily developed areas, and forcing system upgrades in lesser developed areas.

State authority can also be implemented on a district basis. For example, county health departments, or a regional group of local boards of health, organized as an independent entity (such as the Nashoba Regional Health Board) could be given enhanced jurisdiction in

wastewater management planning, design review, monitoring, inspection, and enforcement. This approach could not only help ensure consistency of approach across an affected resource area, but could also capitalize on economies of scale.

The Commonwealth could also consider establishing regulatory requirements keyed specifically to regional limiting conditions, or to regional retrofitting needs. Factors affecting OSDS discharge to coastal waters should be specifically addressed within these region-specific regulations. Currently the California Water Quality Control Boards impose district-level requirements tied to a range of water quality management and supply needs.

Bays management would also benefit from an enhanced emphasis on creation of local wastewater management districts. On the basis of evidence from other coastal states such as Rhode Island, North Carolina and Maryland, effective implementation of wastewater management plans and regulatory programs may best be accomplished through the formation of these specific wastewater management entities, which can coordinate implementation of currently existing regulatory programs, among many other functions.

Effective wastewater management decision-making in coastal towns should involve: 1) developing tailored wastewater management strategies; 2) preparing comprehensive wastewater management policies and plans; 3) refining regulatory strategies; and 4) implementing those regulations and plans. Local governments have many opportunities to supplement Title V, as outlined in previous sections. In summary, local governments might consider the following wastewater management strategy for coastal areas:

1. Undertake a comprehensive review of cumulative nutrient impacts in enclosed coastal embayments, and implement zoning and nonzoning land use controls on the basis of resource system function (e.g. basin-wide, watershed-wide, within delineated primary or secondary recharge area, etc.).

2. Establish coastal resource protection policies, and siting criteria as needed for specific areas, while ensuring that region-wide guidelines and criteria are adequate to protect water quality and preclude health hazards on a cumulative basis.
3. Consider site specific and regional factors in granting OSDS approvals (site suitability, system design, availability of sewer infrastructure, etc.).
4. Establish moratoria and phasing requirements where necessary to prevent and/or reverse coastal water quality degradation that prohibit installation of OSDS systems after a given date, and/or discharges from systems installed after given date.
5. Regulate system density.
6. Require system upgrades and repairs at change of use or change of ownership.
7. Require use of water-conserving fixtures and conservation practices.
8. Stipulate conditions under which variances, waivers, exemptions, etc. will be considered, and under which they may be rescinded if coastal water quality or beneficial uses are threatened
9. Strictly enforce bylaws and regulations to achieve standards at least as high as those of the district
10. Work to implement district regulations, policies, and management measures so as to ensure consistency among local jurisdictions which share coastal resources or which contribute flow to a downgradient resource area

Regulations for Management of Stormwater and for Sediment and Erosion Control.

Stormwater runoff is an important contributor of contaminants to the Massachusetts Bays

ecosystem (Menzies, et. al, 1991). Two classes of stormwater discharge to estuaries must be considered: upland runoff entering the system via freshwater rivers and streams, and overland runoff entering the bays, or the tidal portion of tributaries, via direct overland flow or through artificial drainage systems. The general evaluation presented here relates primarily to the latter category, although stormwater management principles and techniques may frequently be applicable throughout the basin.

Development inevitably increases the amount of impervious surface in a watershed. In turn, alterations in watershed hydrology caused by increased impervious surface area unavoidably magnify the concentration and velocity of stormwater flows, further altering stormwater hydrology. These changes increase peak discharge and runoff volume, while decreasing time of concentration, such that the abilities of tributaries to absorb and mitigate flood flows, and to sustain flow during dry periods, is markedly decreased. Greater runoff velocities also result in dramatically increased rates of sedimentation.

Depending upon the flushing rates of estuaries and other factors, sediment loading can significantly effect estuarine hydrology, leading to loss of water depth, increased turbidity, and alterations in temperature and salinity regimes. Sediment loads from uncontrolled construction sites have been reported to be as high as 35 to 50 tons per acre (Novotny and Chesters, 1981).

Effects on ecosystems are complex, involving physical and chemical alterations. Stormwater-borne contaminants occur as dissolved and particulate forms. The chemical constituents of stormwater have been analyzed and enumerated in numerous publications. Although the type of land use in a drainage area affects constituent fractions, a number of contaminants of concern have been found to be almost universally associated with stormwater discharge from urban and suburban areas (U.S. EPA, 1987). In addition to

sediment these include nutrients, pathogens, oxygen-demanding substances, oil and grease, trace metals, toxic chemicals, and chlorides. Thermal impacts are an additional concern.

All of these contaminants probably effect portions of the Massachusetts Bays system, to varying degrees. Constituents of primary concern with regard to uses of Bays resources include pathogens, nutrients, sediment, heavy metals and toxic chemicals. Stormwater runoff has been associated with high bacterial concentrations in coastal waters, and with shellfish bed closures in several Bays embayments. The Towns of Scituate and Brewster have specifically attributed closures of shellfishing areas to stormwater impacts, at least in part. In the Buttermilk Bay watershed in Buzzards Bay, stormwater-borne bacterial loadings were found to be sufficiently high to result in temporary shellfish closures absent other sources of bacterial input.

The existing management framework for stormwater runoff and control of sediment among local communities is complex and uneven. Local bylaws contain standards for stormwater collection systems that in many cases are still focused solely upon flood control objectives, rather than water quality concerns. These are gradually being updated, but largely deal with stormwater management opportunities on a site-by-site basis, rather than comprehensively. Only the Cape Cod Marine Water Quality Task Force has made an attempt to address stormwater runoff on an inter-jurisdictional basis.

Although erosion and sediment control mechanisms are in place in a few Bays towns, these are not articulated as special purpose bylaws, but are generally connected with resource protection bylaws, and unevenly administered and enforced.

In general, institutional arrangements which are in place are unable to anticipate and manage cumulative effects of watershed development on water quality. A consistent set of

guidelines for watershed level management of stormwater and for effective erosion and sediment control on the local and regional level is badly needed.

State and Regional Management Framework. Although several Bays communities have begun to move individually to address stormwater quality management needs, from a Bays-wide standpoint, management efforts have tended to be ad hoc, poorly coordinated among communities sharing watershed resources, and incompletely codified in local rules and regulations.

The requirements of S. 6217 of the revised Coastal Zone Management Act and EPA's new Stormwater Rule provide an opportunity for Massachusetts to place renewed emphasis on the need for management of stormwater for water quality protection and recharge as well as for flood hazard control. At the same time, new federal highways legislation requires that the Federal Highway Administration adjust planning, design and construction requirements to achieve consistency with state nonpoint source control programs. Because reliance on traditional drainage methods has contributed significantly to the degradation of Bays water quality, these opportunities to strengthen and rationalize state, regional and local efforts should be capitalized upon to the maximum extent possible.

At the state level, comprehensive nonpoint source management legislation is not yet available, although a bill strengthening state sediment and erosion control authority is under consideration in the current Assembly. Watershed assessments required by Section 319 of the Clean Water Act need to be refined and updated. The utility of the Commonwealth's Nonpoint Source Assessment document as a management tool has been further limited by the fact that the Massachusetts Nonpoint Source Management Plan does not deal specifically with critical area management or local land use.

Stormwater treatment needs have been addressed to some extent by EOEA through reviews of WPA Orders of Conditions and via the MEPA review process, although stormwater treatment standards and criteria have not yet been developed on a statewide basis. Unfortunately, DEP lacks staff to do much of any follow-through on BMP installation or performance, as indicated in previous sections. The Department is preparing a "mega manual" designed to enhance stormwater management capability on the local level generally and has recently initiated three regional stormwater management studies in the Massachusetts Bays watersheds, to be completed by two regional planning councils.

The Massachusetts Office of Coastal Zone Management (MCZM) has been active in providing technical assistance to communities seeking to protect ACECs through enactment of local regulations. The MBP-sponsored mini-bays program offers an opportunity to address stormwater management needs, and to evaluate regional planning and retrofitting needs. The extent to which stormwater management will emerge as an issue of focus for this program will likely vary among the individual embayments involved.

As in other Bays management issues, the lack of strong local and regional comprehensive planning legislation has also hindered effective stormwater management, in that effective watershed approaches to joint land and water management issues do not receive needed emphasis as a component of the planning process. On Cape Cod, general standards contained in the Regional Policy Plan are used in promoting an interjurisdictional approach to stormwater management. The Commission supports requirements of many Cape communities in limiting new discharges to surface waters and wetlands, and stipulating that stormwater be recharged on site to the maximum extent possible consistent with groundwater protection. In cases where DRI reviews involve application of more than one set of local standards, the Commission seeks to adhere to the standards which are strictest in terms of

resource protection. Measures for dealing with resource impacts are also required on a project-by project basis, although detailed design and performance standards have not been prepared.

In general, this research has revealed several areas in which stormwater management capability could be improved. Respondents questioned the ability of existing state authorities to effectively consider effects of stormwater and eroded sediment on interconnected components of water resource systems and floodplains, and to consistently ensure that impacts are mitigated, particularly where cumulative effects are concerned. The lack of consistent state performance standards and applicability criteria makes the state agencies involved particularly vulnerable to fluctuations in staffing and enforcement budgets. To ensure consistency, predictability and accountability, specific state standards and criteria need to be established, keyed to regional or watershed-specific management needs.

Secondly, relationships between flood hazard management and stormwater quality management needs and practice have been poorly coordinated in state and local law and policy, and in terms of decisions made concerning funding of infrastructure extension and repair. A watershed approach that both recognizes critical resource protection needs and preserves natural storage and treatment capacity is needed if a goal of effective stormwater management and treatment is to be met. In particular, state road and facility planning and construction practice should be updated to consistently meet stormwater quality management needs of the Bays systems.

As a result of poorly planned development and use of traditional drainage practice, many existing storm drainage systems require retrofitting to provide adequate stormwater treatment. Retrofits are often complicated and costly, and can rarely be undertaken at reasonable cost unless they can be planned to coincide with infrastructure repairs. At

present, needed upgrades of stormwater treatment systems are not accomplished routinely when state and local roads and utilities are repaired. Some responsible efforts are being made to capitalize upon upgrade opportunities. The Cape Cod Water Quality Task Force, for example, has vigorously promoted upgrading whenever roads are repaired, and the Buzzards Bay Project has placed significant emphasis upon stormwater facility retrofitting, developing a priority setting formula for projects in coastal areas. These initiatives and strategies should be considered for broad implementation throughout the Bays contributing watersheds, among all levels of government.

Stormwater Management at the Local Level. Progress toward management of stormwater quality at the local level has been uneven and somewhat haphazard. As a general finding, few Bays towns specifically mention water quality in their drainage-related bylaws and regulations. Previous sections described selected provisions of local bylaws and regulations that do provide for enhancement of runoff quality and outlined ways in which local wetland regulations, environmental impact review requirements, zoning overlay provisions, subdivision regulations, and site plan review requirements should be updated to improve stormwater management practice.

Among the several organizations which have been active in encouraging towns to incorporate stormwater treatment provisions into their bylaws and rules, the Massachusetts Audubon North Shore Office and the Cape Cod Water Quality Task force have been notable in attempting to rationalize approaches among towns sharing watershed lands that discharge runoff to Bays resources.

For example, the Massachusetts Audubon North Shore Office worked with all of the Parker River ACEC watershed towns to pass a set of model local bylaws designed to protect

the estuary. Several of these models included provisions for stormwater management and sediment and erosion control:

1. Critical Resource Protection District (in zoning bylaw)
2. Coastal Freshwater Overlay
3. Conservation Commission Rules and Regulations (including wetlands regulations, rules for buffer zones, plan requirements, buffer protection requirements, and stormwater management requirements)
4. Conservation Commission /Planning Board Rules and Regulations (governing soil erosion and sediment control)
5. Conservation Commission /Planning Board Rules and Regulations (governing stormwater management)
6. Planning Board rules and regulations under subdivision control; Conservation Commission rules and regulations under wetland bylaw (governing environmental impact statements and environmental impact analysis)
7. Model Wetland Protection Bylaw

Among the Bays communities examined, Gloucester has adopted several elements of these models, including an expanded buffer zone applicable to wetlands associated with the Parker River ACEC. As discussed in previous sections, Brewster has used local wetland regulations, environmental impact review procedures, subdivision rules, and overlay district requirements to regulate the quality of stormwater discharged to wetlands and receiving waters.

In a number of Bays communities, stormwater quality is addressed on a project-by-project basis, through interagency implementation of town policy. For example, Scituate's subdivision regulations are quite conventional in terms of their drainage requirements, and yet

Although the SCS District offices and the RPAs review plans for certain communities under cooperative agreements and other arrangements with individual towns, the lack of a regional stormwater management planning framework, combined with the regional planning agencies' staffing limitations has lead to difficulties in developing and implementing watershed-based stormwater management programs. The intimate relationship among land use management, provision of infrastructure, water resources management, habitat protection, and financial resources management suggests that a multi-disciplinary and coordinated management program is needed to ensure adequate coordination among state, regional and local entities concerned with stormwater and other watershed management issues.

While the MBP and the Buzzards Bay Project are working directly with SCS on stormwater management and retrofitting needs, few communities were identified as working closely with Conservation Districts. Districts can provide badly needed assistance to communities, and offer the ability to consider a range of watershed protection and land use management needs. An innovative method for involving Conservation Districts in erosion and sediment control design and inspection has been implemented in Rhode Island. An experimental regional site-inspection program has been put in place there to enable employees of the three Conservation Districts to perform design review and inspection. Funding is shared by the state and participating towns. Plans are underway to expand the site inspection program to address stormwater management facilities as well a erosion and sediment control practices.

In Bays communities, the need for proper installation and maintenance of stormwater and erosion and sediment control practices is being revealed as maintenance problems emerge. Key concerns identified include loss of infiltration capacity due to sedimentation and

clogging, problems with oil-grit separators, and pond inlet or outlet problems. Maintenance issues are being addressed in a variety of ways. Detention facilities in Scituate, for example, have essentially evolved into extended detention ponds. The Town has responded to maintenance concerns by retaining an access easement, and a narrow maintenance easement between the inlet and outlet of all stormwater ponds.

Although lack of funding for planning, inspection, and maintenance has contributed to the poor management of stormwater in the Bays system, no communities have thus far put stormwater utilities in place to create a dedicated source of funds to meet these needs. There are many reasons for turning to a utility approach, particularly where regional facility development or retrofits are envisioned. A source of funding outside the general fund is ensured for planning, capital construction, operation and maintenance, and retrofitting. Utilities, unlike fees that apply to new development only, can be applied to stormwater management needs of existing as well as future development.

In addition, maintenance problems and system failures can be addressed in a timely fashion that avoids contamination and liability hazards. Utility funds can be made available to maintain flood control as well as water quality enhancement facilities (a role generally inappropriate for homeowners' associations). Only a dedicated source of funds can ensure that there is staff available to provide a consistently high level of attention to planning, review, design, maintenance, and other needs at the site, neighborhood and regional level. Where utilities are established prior to the development of a comprehensive regulatory program, they can support good management capability and ensure that an adequate management structure is in place before BMPs are constructed -- an issue that has proven to be significant in Rhode Island in towns which have established stormwater treatment requirements.

A Note on Erosion and Sediment Control Practice. For several reasons, erosion and sediment control practice is ineffective in many Bays towns, despite the technical assistance efforts of local conservation districts and the SCS. First, as is the case with stormwater, bylaws specifically designed to address erosion and sediment control have not been put in place. Where erosion and sedimentation controls exist, they are found in local wetland bylaws, or are implemented through local implementation of the WPA. In this study, no local regulations were identified that require developers to prepare and implement erosion and sediment control plans. In towns where regulatory authority exists, boards rarely have the technical knowledge necessary to ensure that practices are appropriately selected and indicated on site plans, to stipulate appropriate project phasing, or to inspect installed controls and take appropriate enforcement action. Consultants are not usually involved in prescribing needed erosion and sedimentation controls.

Potential for Local Management of Bays Resources. Massachusetts local governments have access to regional planning and data management capability, and to actively-involved SCS and Conservation Districts, all of which give Bays communities the opportunity to prepare "regional stormwater master plans," an approach which has been found to provide numerous planning and financing advantages in states where the regional approach is used. Regional stormwater management offers coherence with respect to flood control and water quality management and the ability to comprehensively address flood hazard and water quality management needs for both existing and new development (including retrofit opportunities). The regional approach is cost-effective and reduces the land area which must be devoted to stormwater management. In addition, research in the Saugatucket watershed in Rhode Island and elsewhere has shown that several randomly sited onsite stormwater detention ponds

within a watershed can not only fail to reduce peak flow in a watershed, but can actually aggravate the magnitude and frequency of localized flooding in lower watershed areas.

A commitment to watershed-based stormwater management planning is needed in order to encourage communities to prepare effective strategies for shared watersheds, to address multiple stormwater management needs effectively, and to take a long view. In developed areas, regional stormwater management planning can require or facilitate retrofits to capitalize on re-development proposals, road reconstruction, and repair of storm damage. In rural areas, communities can establish a view of the full range of stormwater management facilities as necessary infrastructure -- the capacity of which should be considered in planning growth. Likewise, in developing areas, acreage necessary for future treatment can be purchased and preserved in the optimal part of a watershed to meet flood hazard management and treatment needs, allowing communities to examine the best potential mix between onsite and regional facilities for flood hazard mitigation and water quality management.

In the Massachusetts Bays watersheds, improved coordination is also needed between stormwater management and comprehensive planning. Many land use planning decisions play a fundamental role in effective stormwater management. Of critical importance is the need for watershed-based management of land use for stormwater source reduction, which must involve cross-jurisdictional land use "consistency." The data-gathering effort which towns undertake in the course of preparing and updating comprehensive plans should reinforce sound stormwater management planning by considering watershed character at build-out, the rate of development within sub-watersheds, needs for preserving buffering capacity, and the nature and timing of necessary BMP construction, all in relation to the condition of receiving waters. On a sub-watershed or recharge-area basis, build-out information can be calibrated

to plot-level spreadsheet data to estimate current and future impervious areas, so that zoning changes can be better coordinated with stormwater master plans.

A rationalized approach to watershed management should involve enhanced protection of critical areas, broadened protection of the natural buffering capacity of watersheds (particularly in upper tributaries), and improved linkage among riparian corridor areas for habitat and water quality protection. For effective rehabilitation of Bays water quality, buffer and corridor restoration needs should be strongly considered, because development of coastal sub-watersheds has proceeded more rapidly than in inland areas -- to the point where structural treatment options may be limited and a suite of structural and nonstructural approaches must be used. Of particular importance is "repair" of tributaries key to effective protection of critical areas.

Performance standards need to be established to encourage the use of the more advanced stormwater management systems in use in other states. Although an advanced system is in place at Emerald Square Mall in North Attleboro to protect receiving waters used for potable supply, few advanced systems are in use in Bays communities. Even on Cape Cod, where soils are well-suited to the use of dual treatment and infiltration systems, these have not been installed. Similarly, the effectiveness of forested buffers in treating stormwater quality could be boosted with the use of bordering grassed buffers vegetated to take up specific pollutants. Regional coordination is also needed to arrive at the best means of approaching constraints that are imposed by groundwater and wetland protection needs, and to effectively consider other potential conflicts between stormwater treatment and stream corridor management (e.g. water temperature tolerance limits of key fish species in coldwater streams receiving heated discharges from wet detention ponds).

The Bays program should encourage collection of data needed to support development of effective regional stormwater master plans. Data that is needed to do an effective screening evaluation of future needs can support coordinated local planning efforts. SWMM, EXTRAN, HEC II and other models are suggested for development of regional master plans, especially where dual flood hazard and water quality management needs must be considered.

Based upon resource protection studies conducted by individual Massachusetts Bays communities (e.g., Yarmouth, Brewster, Scituate, Plymouth, Parker River ACEC watershed towns) as well as evidence from similar systems in the Buzzards Bay watershed, many ponds and coastal embayments in the Bays watersheds appear to be subject to nutrient enrichment. A number of freshwater systems are already mesotrophic, while several estuarine systems are groundwater-fed and have already shown signs of nitrogen enrichment. Watershed loading evaluations should be completed and used to match BMP design and performance standards to existing and predicted receiving water conditions.

At the same time, towns need guidance in inventorying and evaluating existing facilities and management problems and anticipating the types of facilities appropriate for site-level treatment (singly and in series), given the character of receiving waters and development trends. Attractive regional facilities should be built to anticipate future watershed characteristics. Efforts should be made to ensure that the capacity of facilities or BMPs in series can be adjusted over time as a drainage area develops. "Problem" stormwater facilities showing a poor match to receiving water characteristics should be inventoried and upgraded. Data should also be gathered to do a thorough evaluation of financial and administrative constraints to improved management of stormwater at the local level, so that a foundation can be laid for establishment of stormwater utilities or financing districts that might offer

potential solutions. The Cape Cod Water Quality Task Force has begun investigating these problems.

Finally, communities need guidance in updating existing regulations to improve runoff management, and beginning to take the steps required to prepare and implement watershed management plans and stormwater master plans. Guidance is needed in several areas, including:

1. Siting issues: the importance of preserving good watershed location (detention in subwatershed mid-section and retention at mouth); taking advantage of redevelopment to retrofit existing drainage systems; use of stormwater easements as alternative to fee-simple acquisition
2. Design criteria and performance standards: how best to target to receiving water needs, how to view flood control and water quality protection problems simultaneously; how to build in the flexibility to upgrade with increasing development density
3. Methods of evaluating water quality benefits of alternatives: elements and pitfalls in forming a long range plan (projecting growth, planning new facilities, inventorying existing facilities and repairs needed)
4. Strategies for making effective use of BMPs in series; planning an appropriate mix among regional and local facilities to achieve water quality enhancement and flood control
5. Useful ways of "scaling up" a program, or sharing burden among administrative bodies, and/or developers; factors that should be addressed in a feasibility study

6. Best means of ensuring that regional plans work across jurisdictional lines; key areas in which regional master-planning is vulnerable to administrative and political trends
7. Basic steps in setting up a stormwater utility, and costs involved

KEY ISSUES AND CONCERNS IN LOCAL-STATE MANAGEMENT OF BAYS RESOURCES.

Analysis of local regulatory and management authorities affecting the Massachusetts Bays has revealed a number of inter-related issues that present concerns for Bays management. The ability to meet the challenges of Bays management may largely depend on the manner in which local Bays communities approach these fundamental issues. The most important of these are the needs to:

1. Control consumptive development patterns that affect Bays ecosystem function
2. Improve management of the cumulative impacts of development
3. Develop a consistent approach for proactive management of resources shared among jurisdictions
4. Enhance local administration and management effectiveness
5. Aggressively advance local planning and growth management agendas
6. Forge improved linkages among planning and regulatory authorities
7. Adjust technical resource management capacity to capitalize on local and regional resource management opportunities, especially where opportunities for retrofitting and restoration are concerned.

The following discuss key issues and concerns, summarize central findings, and propose recommendations:

Consumptive Development Patterns in Fringe and Ex-urban areas.

Summary of Issues. Although the Massachusetts Bays basin includes heavily urbanized inland and coastal areas, the majority of recent growth has occurred in suburbs and ex-urban areas at low densities, resulting in a land conversion rate that is unrelated to population growth and that contributes to the development pattern known as "urban sprawl." Urban sprawl is characterized by scattered, unplanned, low density development that is not functionally related to adjacent land uses.

Sprawl is a nationwide trend. The President's 1988 Nationwide Urban Policy Report found that through the 1980's suburbs continued to gain population share relative to nearby cities, leading to a dramatic expansion of metropolitan areas. In much of the Northeast, the role of central cities and smaller manufacturing centers has become one of striving for an adequate share of metropolitan success rather than serving as the economic engine that serves the entire local market. Examples of this phenomenon are familiar in the Bays basin.

Sprawl is especially costly in New England. Not only does it preempt traditional farmland uses, but it also compromises the village-rural landscape that lies at the foundation of New England's aesthetic appeal for visitors. Landscapes become homogenized and ensnared by traffic, due to the trip-generating effects of diffused commercial areas.

Sprawl increases fiscal pressures on state and local governments to provide efficient, affordable services. Studies undertaken by the Massachusetts Growth Commission, the Cape Cod Commission (1991), the Chesapeake Critical Area Commission (1990), and the Florida Governor's Task Force on Urban Growth Patterns (1989) all showed that both capital facility and service cost to revenue ratios are more favorable in compact growth centers than in outlying suburban areas. Publicly owned wastewater treatment facilities, for example, cost

typical ex-urban landowners more than 200 times the cost to urban landowners (Small Flows Clearinghouse, 1990).

With respect to Bays resource management, poorly planned development causes progressive stress on natural systems through the physical degradation of potentially productive habitat and the conversion of land from uses which are beneficial or benign to uses that change the character of the land itself, affecting ecosystem function.

Urban and suburban lands, unless properly planned and managed, can contribute as much as 200 times the amount of phosphorus and five times the amount of nitrogen to a watershed as does forested land (Chesapeake Bay Commission, 1986). Sprawl increases nutrient, sediment and toxic loads to the Bays and their tributaries, due to increases in traffic-related air pollution, large-scale disturbance of land cover, and proliferation of impervious area. Percent impervious area was identified by the Nationwide Urban Runoff Study (1983) as the variable of principal importance in determining surface water quality in developing areas.

Unfortunately, poor coordination among government agency objectives, rules and practices at the state and local level can contribute to consumptive growth patterns. Protection of Bays resources depends upon promoting concentrated urban development patterns and reducing low density sprawl.

Conclusions.

1. In several Bays jurisdictions, average land consumption per dwelling unit has escalated, because towns have taken steps to increase minimum lot sizes for water quality protection without making adequate complementary provision for clustered development and open space protection.

2. Speculative commercial development in the 1980s focused along collectors and urban bypasses, increasing development pressure on small towns poorly equipped to consider development constraints at a watershed scale.

3. Outdated zoning and subdivision regulations contribute to strip development and sprawl by facilitating development of frontage lots, and requiring wide easements, setbacks and excessive parking, while prohibiting mixed-use development that integrates residential and commercial uses.

4. Local road construction standards are frequently land-consumptive and inconsistent with water quality protection needs and restoration objectives.

Recommendations.

1. The Massachusetts Bays basin jurisdictions need to develop a strategic urban policy which articulates the nature of the future urban form of relevant sections of the basin, and sets clear priorities as to how public investments will be made to achieve that form.

2. For rural watershed contributing areas, involved agencies should work to identify the scale of effort that would be most appropriate in addressing various aspects of the Bays management problem, and should work to set priorities for institutional change that reflect the potential of specific regulatory and non-regulatory initiatives to match local circumstances and capabilities.

3. Massachusetts planning laws should be amended to remove impediments to the use of new growth management techniques, and to require local governments to designate urban service areas, village center areas, and where appropriate, urban expansion areas in comprehensive plans and resource area protection designations.

4. Effective economic and regulatory incentives need to be put in place to promote concentrated, mixed-use development where impacts on Bays resources can be minimized,

and where public services can be efficiently provided. At the same time, rural land uses should be separated and protected.

5. The Massachusetts Zoning Act should be amended to allow communities greater flexibility in providing incentives for growth area infill development and redevelopment, and to remove obstacles to land assembly.

6. Local zoning, building and construction codes and subdivision regulations should be amended to encourage flexibility of design, reinforce traditional village development patterns, and emphasize development of compact, mixed-use urban fringe communities.

7. Bays communities should encourage compact development by requiring that clustered development plans be submitted for all residential developments above a low threshold, by establishing minimum density zones in growth areas, by encouraging mixed-use development, and by establishing rigorous open space protection requirements for large commercial and residential developments.

8. The Cape Cod Commission is providing communities with a model for fiscal impact analysis that weighs the cost of open space acquisition against the costs of development. The Massachusetts Bays Program should consider providing an expanded model to the full range of Bays communities.

9. Where public services and infrastructure extension and maintenance are anticipated, full marginal cost pricing policies and impact fees should be employed to promote efficient growth patterns. Prices should accurately reflect the cost of providing facilities and services through time.

Management of Cumulative Impacts on Bays Resources.

A number of overlapping definitions have been used by scientists, managers, and policy-makers to describe "cumulative impacts" or "cumulative effects." Hemond and Benoit (1988) refer to cumulative impacts as those "multiple impacts whose effects...cannot be predicted by simply adding the effects of all the individual impacts. In a cumulative impact situation, assessment methodology must consider each impact in relation to others." The CEQ definition (1978; 40 CFR 1508.7) focuses attention on the importance of environmental impacts on the environment, as distinct from the way that objectively evaluated effects accumulate. Nevertheless, CEQ regulations state that "effects" are by definition cumulative, but can accumulate by additive, synergistic, or interactive means, each of which can be mediated by space or time (Bedford and Preston, 1988).

Several problems have contributed to the difficulty that the Commonwealth has experienced in effectively managing cumulative or secondary impacts to the Massachusetts Bays ecosystem. First, common law has traditionally required that a direct causal relationship be established between a source of pollution and identified damages in order to establish legal authority to change the behavior of a discharger. Small changes induced by an activity are difficult to attribute, particularly where impacts of diffuse nonpoint source discharges are concerned.

Secondly, impacts of gradual alterations in land use intensities, and their associated nonpoint source loadings, may be felt as an incremental deterioration in resource quality, or as a slowly exceeded threshold that is extremely difficult to link to specific activities over time. These large-scale threshold effects, which may actually be more detrimental than a short-term exceedence of state water quality standards, are primarily related to land use control, traditionally within the regulatory purview of numerous local jurisdictions.

The complexity and range of definitions in use reflects the range of approaches that have been taken to understand and address incremental alterations to the many distinct, individual and dissimilar mechanisms that support watershed functions, and the functions of receiving water systems. Sound knowledge of various component processes is important in making guided judgments concerning the probable effects of a given suite of impacts. These component processes are often incompletely understood. In addition, regulatory procedures have been ineffective in preventing incremental damage, because of their focus on permit-scale site evaluation rather than on landscape-scale function.

In the Massachusetts Bays, as in other complex systems, it has also proven difficult to establish linkages between observed system stresses and the numerous causes of those stresses, and to forge a strategy that facilitates the evaluation of cumulative impacts in a regulatory context. This has been due to several factors, including: 1) limitations to the understanding of coastal and watershed ecosystem processes; 2) a general failure to reach consensus on regional landscape management objectives; and 3) a reluctance or inability among local governments to work together to set goals for management of resource systems, and to establish permit evaluation criteria that effectively consider the existing conditions of a resource system and its landscape context.

The notion of cumulative impact assessment and management is not new, and has been recognized by local governments that have sought to establish critical loading limits for protection of aquifer recharge areas and enclosed embayments. Similarly, the Massachusetts Wetland Protection Act emphasis on protection of wetland functions recognizes recent advances in wetland science that have refined our understanding of those functions to a point where improved assessment of change in function is now possible.

Nevertheless, local boards charged with important resource protection responsibilities, including administration of the Wetland Protection Act, have not developed anticipatory approaches, and are largely forced to react to incremental pressures brought by individual permit requests. Applicants are rarely denied outright, but are generally issued permits subject to conditions, so much responsibility falls to boards and commissions to consider the consequences of numerous changes in the character of the land. Since a framework for anticipating the cumulative effects of individual project approvals on existing conditions in a watershed or stressed embayment is rarely available, consensus is difficult to achieve among communities, or among individual boards within a community, regarding the landscape and resource conditions that need to be maintained or the method of ensuring and monitoring their long-term viability.

Complicating the inability to anticipate cumulative effects are important weaknesses in the local decision-making process, and deficiencies in local regulatory and planning programs, which are discussed in other sections. The lack of clear mandates at the state level for control of cumulative impacts, and associated programmatic shortcomings, are also outlined elsewhere in the document. An absence of consistent monitoring data, poor institutional memory in local and state permitting programs, and near absence of regional review authorities also contribute to the Commonwealth's poor record in managing cumulative impacts.

Emerging Opportunities. At present, the convergence of several important factors suggests that an improved approach to these impacts is not only critically important, but could prove especially fruitful. First, the requirements of S. 6217 of the amended Coastal Zone Management Act require that states develop enforceable policies to address cumulative effects of nonpoint source impacts to coastal resources -- impacts that can be closely

associated with, and can complement, wetland resource protection. Secondly, recent interpretations of the public trust doctrine, discussed in other sections of this document, may offer considerable support for regulation in this area. Where the property interests of the public are clearly invoked in local laws and policies, the public trust doctrine can support implementation of sound local resource management plans, and can bolster a community's ability to limit projects that would generate cumulative impacts.

In addition, the development of MAGIS data layers will support the development of watershed-based management strategies, and will facilitate regional assessment efforts. The Cape Cod Commission has not only begun using GIS for this purpose, but has also established a regional habitat assessment program intended to map and manage wildlife corridors and associated resource areas.

Newly developed approaches to the assessment of cumulative effects offer the potential to make responsible judgments as inventory data is being collected, in advance of the availability of an optimum level of information concerning affected resource systems. Finally, recent efforts to integrate landscape conservation goals into existing regulatory frameworks elsewhere offer models that suggest potential strategies to capitalize upon current Bays management efforts.

The landscape approach offers numerous advantages in wetland resource protection, in that cumulative impacts are usually landscape-level phenomena involving alterations to attributes that are not manageable at a finer scale. This scale of management also conserves the valued functions and biota of smaller subsystems, while recognizing their inter-relationships. A landscape approach to management of cumulative effects reinforces sound watershed management, in recognizing that the pattern of resource attributes (and damages) within a system is of equal importance to the resources themselves (Lee and Gosselink,

1988). The integrity of forest or wetland pattern and area may be best preserved, for example, when large blocks of resource area are appropriately interspersed with smaller tracts, when continuity is preserved, and when contiguous riparian zones are protected.

Scientists appear to agree that environmental effects accumulate in ways that can be grouped according to five basic categories, including time- and space-crowded perturbations, synergisms, indirect effects, and nibbling (Beanlands and Duinker, 1983 in Lee and Gosselink, 1988). Several authors have identified ways to simplify, or to organize, assessment of cumulative impacts. For example, Lee and Gosselink (1988) have established a hierarchy of effects for specific wetland types based on experience that synergistic and nibbling effects contribute to the expression of other impacts. Incremental losses (nibbling) were identified as having the most importance, and had a direct effect on water quality.

Other authors have attempted to rank cumulative impacts on the basis of their intensity, the area affected, and the permanence of effects, and to use projected time requirements for recovery of function as an indicator of the magnitude of cumulative losses. Preston and Bedford (1988) suggest a method of qualitatively anticipating cumulative effects on wetlands based upon a knowledge of what impacts are likely to occur, and where. A refined assessment model is proposed that focuses on landscape variables controlling hydrology. The same authors also assert that a scientifically sound basis exists for setting assessment boundaries in terms of the distribution of wetland resources; that landscape-level measures of function can be identified; and that qualitative relationships to landscape variables can be described for hydrologic and water quality functions.

In terms of cumulative effects of alteration on the water quality functions of wetlands, Hemond and Benoit (1988) proposed a set of criteria to use in assessing impacts, based upon the condition of a wetland relative to expected norms or baselines, and the related prediction

of future impacts. These criteria concern measurement of ambient water quality, physical parameters and pollutants loadings, use of biological indicators, and sediment and tissue analysis. The authors emphasized the importance of understanding the interaction of water quality processes occurring in a wetland as an indicator of cumulative effects.

Summary of Management Needs. Improved management of cumulative effects on Bays resources is extremely important, and will require action on several fronts. At the state level, regulations need to be updated to incorporate results of recent research on cumulative impacts in watershed systems. At the same time, research is needed to establish defensible limits for the future (post build-out) pollutant assimilation capacity of ACECs, preserves, parks, seashores, and resource systems shared among jurisdictions, and to define how those limits should be used in adjusting management strategies. With respect to the cumulative effects of stormwater on enclosed embayments, for example, a "watershed loading" approach could be used to link these critical limits with land management and restoration strategies. The State of Florida has used watershed loading to set priorities among protection and restoration activities mandated by the state's Surface Water Improvement and Management Act.

In summary, a consistently-applied framework for improved assessment of the cumulative impacts of a range of pollutant inputs is needed, for use as a near-term management tool and as a guide for further data development. Particular attention should be given to effects attributable to construction of docks and piers, to loss of wetland buffering capacity, and to impacts of stormwater and wastewater discharge.

Provisions should also be established to ensure that individual state permit approvals and funding decisions will not be issued in a manner inconsistent with efforts to address cumulative impacts through local comprehensive plans or resource management plans, and that local permits may not be issued which would require subsequent review under MEPA.

To support this level of analysis, MAGIS should be developed for sub-watershed level management applications. Subwatershed delineation should be encouraged, on the basin level, as should plot-level resource delineation at the local level. Towns should be encouraged to develop computer-based GIS capability that is compatible with systems of neighboring communities, as well as with MAGIS. Coordinated inventories of nonpoint sources and resource condition are also needed to form the basis for planning and remediation, and could be coordinated with the development of data layers.

At the level of resource functional areas or subwatersheds, management plans are needed to rationalize critical area protection, to inform and refine monitoring strategies, and to coordinate overall water quality enhancement and habitat protection efforts. Protection of natural watershed buffering capacity is of particular concern, and requires that a set of guidelines be prepared to assist communities in establishing buffer design and management requirements that meet multiple needs.

Improved principles and standards need to be established guiding development away from sensitive resource areas, and reinforcing local and regional planning and growth management capability. State funding for infrastructure extension and housing should consider the potential for cumulative impacts, and should be better coordinated with landscape-level resource management needs.

At the same time, local comprehensive plans, bylaws and regulations need to be amended to enhance the effectiveness of existing tools for management of cumulative effects, including anticipated DCPC designations on Cape Cod and existing ACEC designations. Towns can greatly strengthen the MEPA fail-safe provision as a tool for preventive mitigation of cumulative impacts by stipulating that no board can act on a local permit independently for a project subject to MEPA review.

Strong consideration should be given to the establishment of a binding DRI review mechanism within contributing zones to delineated resource functional areas that would consider secondary and indirect impacts of large developments. An area-wide DRI review process in use in Florida has proven to be highly effective in ensuring that the cumulative impacts of stormwater and wastewater discharges from several nearby developments are estimated in advance, and that commitments are made for efficient, effective treatment and mitigation. Inter-local agreements and other binding mechanisms should be developed within resource functional areas to ensure that all contributing jurisdictions address cumulative effects in a consistent manner protective of landscape-level system function.

Watershed management plans, embayment plans, and stormwater master plans should specifically address resource viability in terms of capacity limitations, and should invoke the public trust doctrine to reinforce its usefulness as a viable tool for managing cumulative effects.

Current Initiatives. On a regional level, the Cape Cod Commission and the Buzzards Bay Project have begun to address cumulative impacts of sediment transport, habitat loss, and nutrient loading on an interjurisdictional basis. The Cape Cod Commission has authority to require that developments subject to Development of Regional Impact (DRI) review submit cumulative impact assessments, and has established specifications for the methodology to be used in their preparation (Cape Cod Commission, 1991). More broadly, the use of nutrient loading analysis represents a recent attempt by local governments to approach the management of cumulative impacts in a rigorous manner.

According to Cape Cod Commission members and staff, the Commission's DRI review process has significantly enhanced the effectiveness of MEPA as a tool for planned prevention of cumulative impacts. Nevertheless, according to the results of our interviews, none of the

Commonwealth's jurisdictions has yet developed a consistent strategy for assessing the cumulative effects of wetland loss and water quality degradation on landscape functions, and for refining regulatory alternatives accordingly.

It is extremely important that local abilities to manage cumulative impacts through comprehensive planning, watershed management and growth management be fostered, although control of cumulative impacts is probably most effectively exercised at the landscape scale, via implementation of regional policy plans and resource management measures by regional and state agencies. Still, opportunities clearly exist for enhanced management of ACECs by local governments, and for rationalized use of local resource protection authorities generally.

Conclusions.

1. Few local jurisdictions have approached management of cumulative impacts on Bays resources in an integrated fashion. A comparison of management techniques and strategies currently in use in leading jurisdictions for a range of impact types is needed. The comparison should review data requirements, legal and administrative regimes, cost-effectiveness, and applicability to single and multiple jurisdictions.

2. Values of Bays resources such as wetlands need to be considered in terms of existing and future functions within a watershed, since the value of many functions depends on the relative scarcity of a particular resource type. Yet limitations in local regulatory authorities tend to lead decision-makers to view resources in a static sense that further restricts their ability to manage cumulative impacts using a permit-by-permit approach to review.

3. Most Bays towns lack a framework for jointly anticipating the additive impacts of individual new projects on Bays resources, limiting their abilities to work together to manage land uses that affect shared resources.

4. Watershed characterization methods currently in use for water supply management in the Commonwealth are not being used to facilitate local evaluation of cumulative impacts on Bays receiving waters.

5. Permit review and enforcement mechanisms largely fail to monitor impacts of existing development in a manner which would support assessment and control of cumulative impacts. Local governments need improved methods of setting priorities among pollutant sources for short and long term management of cumulative impacts.

6. Few bays communities have the resources to establish monitoring programs that would enable them to form a basis for adjusting programs to take advantage of new scientific evidence regarding cumulative effects on ecosystem function.

7. Criteria are needed to enable local governments to establish appropriate stipulations for the calibration and use of available models in cumulative impact assessments required in environmental impact reviews.

Recommendations.

1. The requirements of S. 6217 of the amended Coastal Zone Act Reauthorization should be capitalized upon to the maximum extent in adjusting the state statutes which form the basis of the networked Massachusetts coastal zone management program to support enforceable policies for management of cumulative effects.

2. State and regional government entities should delineate zones of contribution to public wells, surface water recharge areas, potential water supply source recharge areas,

estuarine resource areas and wildlife habitat corridors to support local communities in approaching cumulative impact assessment and management.

3. The Mass Bays program should consider working with state agencies to identifying keystone indicators or sensitive species whose condition, when monitored, can serve to show trends in the condition of larger systems, signaling vulnerability to specific types of incremental alteration.

4. State and federal data concerning Bays water quality and habitat indicators (e.g., shellfish contamination levels, the extent and condition of habitat areas, fishery data, etc.) would be made more easily available and accessible to regional agencies and communities.

5. Research on the cumulative effects of specific types of development on sensitive Bays resources is needed. Particular attention should be given to the effects attributable to construction of docks, piers, and marinas, and to impacts of stormwater, sediment and wastewater discharge on wetlands. Results should be used in setting clear siting and design criteria and restricting uses as necessary in sensitive areas.

6. On a sub-watershed or recharge area basis, a methodology should be developed to enable communities to use soils data in estimating the effects of accumulative loss of water quality buffering capacity.

7. The Massachusetts Bays Program should consider working with other government agencies to develop model regional methodologies which towns could use in requiring developers to develop mass balance evaluations of a range of pollutants of concern in recharge zones of sensitive Bays resources. If prepared according to a consistent regional model, the evaluations could support management of cumulative impacts.

8. A focused technical assistance effort should be initiated to help local communities adjust bylaws to explicitly invoke the public trust doctrine for protection of public property interests.

9. Local governments should be assisted in preparing preliminary buildout and impervious area cover analyses so that timely assessments can be made as to allowable contaminant load and nutrient flux in areas affecting Bays resources.

10. Use of area-wide DRI reviews and "specific plans" should be considered as a means of ensuring that the cumulative impacts identified in consecutive environmental impact assessments and/or anticipated from several nearby development projects are mitigated in advance, using shared facilities where appropriate.

11. State and regional agencies should assist communities in developing inter-local agreements and other binding mechanisms to coordinate review processes within resource functional areas identified as being susceptible to cumulative impacts.

12. Recent research advances in landscape conservation should be capitalized upon in developing a comprehensive strategy to coordinate land acquisition, protection, and regulation.

Management of Resources Shared Among Jurisdictions and Control of Trans-boundary Impacts.

Protection of critical resource areas of importance to the functioning of the Massachusetts Bay system will involve a coordinated effort among federal, state, and local agencies to enhance the capabilities of local and regional entities in managing land use within a watershed context. The need to manage watersheds comprehensively has long been recognized in the Commonwealth, as evidenced by the Charles River floodplain restoration effort and the activities of river basin commissions in the 1960s and 1970s, and currently

through the watershed protection efforts of the Massachusetts Coastal Zone program, the Massachusetts Riverways program, and numerous other efforts. Nevertheless, the success of local and regional efforts is vitally important in Bays management as the direct exercise of state authority has thus far proven inadequate to protect Bays resources from impacts of many land-based pollutants.

Much responsibility for implementation of state law currently lies with local government. In Massachusetts, the Wetlands Protection Act, Title V of the State Environmental Code, and other key resource protection laws related to land use depend upon local participation and administration, or upon the enactment of complementary local bylaws enforced by local agencies. This level of responsibility may be inappropriate for many resource protection needs. Protection of water resources shared across jurisdictional lines has frequently proven difficult, as has the comprehensive protection of inter-dependent water resources generally. Although modelling efforts sponsored by the Massachusetts Bays Program (Menzie & Cura, 1991) have pointed to the central role that tributary systems play in contributing pollutant loads to the Massachusetts Bays, mechanisms to address transboundary issues and impacts to shared resources have tended to be based upon individual communities' short term interests in responding to a current crisis or perceived threat, rather than upon ongoing intergovernmental planning efforts.

Outside the jurisdiction of the Cape Cod Commission, comprehensive regional planning remains a largely unfulfilled, and even undefined goal, despite the strenuous efforts of regional planning agencies and the regional offices of state agencies. Strong mechanisms for mandatory coordinated review, and for consistently applied joint enforcement are also generally lacking, despite the forum provided by the ACEC program. At the same, transboundary management needs can be expected to escalate with increasing growth, and

to grow in complexity as local jurisdictions take further home rule initiative in growth management and resource protection.

Current Initiatives. In 1988, Barnstable County adopted a home rule charter that broadens the county's powers in implementing the Cape Cod Commission Act, in addition to conferring other governing authorities. Unlike the other regional planning agencies, the Cape Cod Commission has specific regulatory capabilities established by statute.

Among its many powers, the Commission has authority to initiate a Development of Regional Impact (DRI) review process automatically at an early point in the MEPA notification process. Since all local permits are stayed until the DRI process is complete, regional issues and concerns can be evaluated effectively before the local permitting process has eliminated flexibility. As a result, the DRI process has served as an integral element of the planning process, and has not become a reactive review mechanism. Through its Regional Policy Plan, a document which thoroughly integrates planning objectives with regulatory policies and procedures, the Commission has also established minimum performance standards and review processes that set up a definable regional approach to management of shared resources.

A regional planning capability and focus is important in determining the effectiveness of state-level or cooperative resource protection initiatives. As discussed in other sections, the Area of Critical Environmental Concern designation relies upon watershed-wide support from local bylaws that are consistent across town lines in terms of their objectives, applicability criteria, performance standards, and enforcement. The Massachusetts Audubon Society North Shore Office developed a strategy to promote protection of the Parker River ACEC by working with area towns to put protective bylaws in place and to articulate consistent principles in comprehensive plans.

The effectiveness of MEPA, too, is enhanced where communities have developed a regional view. An inter-local growth management committee formed among MetroWest towns has hired staff and has used MEPA to address traffic and other concerns. Because the need for multiple state permits can be anticipated by the regional organization, it has been able to help member towns capitalize on MEPA thresholds as triggers to confront regional planning needs. Metro West, a section of the Metropolitan Area Planning Council (MAPC), has been endorsed by member towns as an agent, and plays an important role in resolving conflicts concerning regional issues.

MetroWest has also developed a formal DRI review process, supported by a memorandum of understanding among member communities that guides regional decision-making policies. A water resources sub-committee has been formed by the growth management committee, and has taken on additional projects augmenting its original aquifer protection initiatives. Other groups of communities in the Bays watershed could form similar arrangements, using memoranda of agreements to define a consistent approach to Bays resource protection, or to address a broader range of planning needs.

Several additional regional planning opportunities are available. Chapter 40 S. 4 gives broad authority to towns to establish regional water supply protection districts that support an ecosystem view of a water resource. These districts are empowered to develop watershed plans, form commissions, issue bonds, accept state and federal grants, address regional land use management, and perform intermunicipal project reviews. Although state funding for the formation of districts has not been forthcoming, this authority could be used effectively and aggressively in Bays watershed communities that have an interest in protecting groundwater resources that are used or slated for future use as water supply and that subsequently discharge to Bays tributaries and estuarine systems.

Scituate, along with nine other towns, used this authority to form the South Shore Regional Water Supply Protection Committee in 1986. Selectmen from each of the towns served as advisory representatives on the committee, which worked with MAPC to diagnose regional groundwater protection needs. The committee provided feedback for MAPC technical recommendations and helped to tailor the model bylaws that were developed for individual town use. Thus far, the towns have moved only unevenly to implement the recommendations.

Chapter 40 Section 4 (a) does provide that bonds may be issued for aquifer protection on a regional basis, subject to town meeting approval among district towns. This provision has been used by the Pioneer Valley Planning Commission. Chapter 400, which establishes authority for formation of regional development policy committees, does not require town meeting vote, a factor which enhances flexibility but may limit the strength of committee actions.

River corridor protection programs have also attempted to perform needed regional planning functions. The North River Commission, for example, was formed in 1978, pursuant to the Scenic Rivers Act, and was given special permit granting authority to address impacts to the river's scenic values, which were interpreted to include water quality-related concerns. After a year-long study, the towns agreed to specific actions to reverse widespread water quality problems. Implementation has proceeded only haltingly, due in part to the limited ability of the scenic river designation to accomplish the towns' objectives. A less formal mechanisms have proven successful in the Mattapoissett River, a Buzzards Bay tributary.

Emerging Opportunities. Results of this research effort indicate that there are there are several options for improved management of shared resources, in addition to the area-specific strategies now being developed through the mini-Bays grant program. These fall into three

categories: implementation of a Development of Regional Impact review framework in areas where the specific character or intensity of given uses affects shared Bays resources; passage of comprehensive watershed protection legislation; and creation of an enhanced role for regional agencies in Bays management.

Development of Regional Impact Review. DRI review processes currently in use are discussed in subsequent sections. DRI reviews have proven to be a useful mechanism for determining the consistency of specific uses with regional policy plans and strategic plans and for analyzing extra-local impacts not accounted for in local plans. In Florida, where DRI review forms the backbone of the state's adequate public facilities ("concurrency") review process, local environmental reviews consistent with the detailed DRI review requirements are waived, limiting applicants' data-gathering burden. However, regional planning agencies may appeal DRIs approved by local governments which are inconsistent with regional planning goals.

An enhanced regional role in project review has also proven to be valuable on Cape Cod, where the Cape Cod Commission uses its Regional Policy Plan as the basis for evaluation of impacts deemed to be of regional concern, using its DRI review process has been in a manner that has created a strong mutually-reinforcing linkage with local environmental impact reviews and with state MEPA review.

Thresholds for review of impact categories can be adjusted to create incentives for growth and redevelopment in suitable areas, and to encourage use of "innovative" or "high quality" development techniques adhering to established design standards. Similarly, "Area-wide" and "Downtown" DRI reviews are used in Florida to analyze development opportunities and constraints within a limited area, and to establish specific conditions for site development, mitigation and treatment. Subsequent projects proposed for the area are exempted from individual DRI review if they conform to the established development guidelines.

A process of issue certification or use of a "rebuttable presumption" concerning applicable standards can also be used to winnow the list of review issues, or to incorporate elements of existing review mechanisms and plans (such as articulated stormwater retrofitting priorities).

In Florida, DRI reviews have served to reduce speculative development, according to the Southwest Florida Regional Planning Council, because lenders make maximum use of the market analyses required for DRIs (SWFRPC, 1992). The mechanism has also proven to be the only avenue available in many cases for review of "pervasive regional issues" such as air pollution, and for implementation of statewide policy regarding specific uses such as marina development.

DRI review categories have been established to reflect various special characteristics of projects. "Character" DRIs could be triggered for resort areas, roads, LULUs or privately owned sewage treatment facilities (PSTFs), for example, in the Bays communities. "Locational" DRIs are suitable for review of grandfathered uses, while "magnitude" DRI's may be applicable to large-scale residential, commercial and office developments. As outlined in the previous section, a cumulative impact review can be required as a DRI review component. Further, applicants can be required to analyze the applicability of alternative treatment strategies or retrofitting options. These analyses can be of crucial importance in the context of existing and future development if proposed stormwater or wastewater management technologies require establishment of a management entity.

DRI review processes have not been immune to criticism. In Florida, where the review requirement has been in place for several years, critics point to the cost and administrative burden of the review, the difficulty of making needed adjustments to approved DRI plans, the deferred return on investment necessitated by phasing requirements, and a frequent lack of

consistency with state review procedures. Sound pre-application review procedures and use of development agreements can help address these needs. In addition, specific DRI review requirements might be scheduled to "wither away" in towns where local comprehensive plans have consistently been implemented in conformance with agreed regional objectives.

Watershed Management. In addition to the statutory adjustments which would be needed to support broader use of DRI reviews, legislation is needed to provide a specific framework for watershed management and restoration outside water supply watersheds. A management framework is needed that goes beyond the controls stipulated via the designation of Areas of Critical Environmental Concern, to comprehensively address specific categories of water quality protection and restoration needs, to establish financing mechanisms, and to establish conditions under which local regulations and grandfathering provisions must be superceded. As mentioned previously, both Florida's Surface Water Improvement and Management Act and Delaware's new state-local cooperative watershed management program have attempted to confront these needs.

While limited in its scope, the Massachusetts River Protection Act (legislation again considered by the Legislature in the last session), would contribute to important management goals. The act would provide a statewide approach to protection of riparian areas and limit encroachment of any new development on sensitive floodplain areas which would contribute pollutants to groundwaters or leach pollutants into adjacent river waters.

The District of Critical Planning Concern designation, provided for by the Cape Cod Commission Act, can be used to address these needs in Cape towns for a range of "special needs" areas. However, legislation specifically devoted to coordinated watershed planning and restoration is needed.

Whether or not a critical area protection, towns should work toward establishment of defensible buffers and riparian setbacks based upon physical conditions (slope, soils, adjacent land use, etc.) Use of a uniform buffer or setback distance, while pragmatic, may be less appropriate. For upper tributary streams, for example, the practice of using floodplain regulations to restrict development in floodplains significantly underprotects these sensitive areas, which are crucial to the processing of nutrients and trapping of sediment.

Enhanced Regional Role. In many instances, the existing regional planning agencies (RPAs) have provided valuable assistance to communities in managing water resources, although the RPA boundaries are not consistent with those of watersheds. RPAs develop and update databases and maps and prepare forecasts which can provide towns with a consistent source of information about shared resources. The RPAs have also conducted a wide range of technical analyses related to land use, growth and development, transportation, waste management, water quality and supply problems, and other issues germane to Bays management. Unfortunately, the RPAs operate in an advisory capacity, and initiate programs only at the request of member towns. In addition, due to funding constraints, RPAs can rarely provide the degree of sustained technical support and advocacy needed to ensure that recommendations are implemented. In terms of water resource management needs, much depends upon the willingness of local governments to sustain and expand the functions of technical advisory committees, and to follow through independently in putting local bylaws and regulations in place that provide consistent protection across a resource area. Towns may or may not "buy into" the "top-down" point of view of the RPAs, as illustrated by the limited implementation of the South Shore Water Management Study, conducted by the Metropolitan Area Planning Council at the behest of the town of Norwell.

By statute, RPAs have been given considerable responsibility to address regional management issues and to assist local governments in interpreting state policies. However, limited authority for needed oversight is provided, unless communities act to confer oversight responsibilities on an RPA through inter-local agreement. The diversity of responsibilities assigned to RPAs, and the shortages of staff available also restricts the degree to which these agencies can focus on water quality issues related to Bays management.

Several models have been suggested for enhancing the effectiveness of regional planning and environmental protection efforts in the Commonwealth. To capitalize on the planning emphasis of the new federal Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, state planning statutes need to be strengthened to preserve future mass transit corridors, and to improve integration of land use planning, growth management and transportation planning generally. The statutory basis is also needed for development of criteria governing comprehensive regional policy plans and regional strategic plans, as discussed in previous sections.

Alternatives to existing uniform regulatory standards have also been suggested. In addition to the tailored watershed management initiatives described above, the Draft Generic Environmental Impact Report on Privately Owned Sewage Treatment Facilities (PSTFs) (1990) suggested that alternatives to a single uniform water quality standard, including resource area-specific criteria and area-wide analysis, be considered for specific waterbodies. Watershed-specific targeting for stormwater management planning and upgrading efforts should also be considered. These alternatives would require a strong regional presence in assessment, coordination, and monitoring.

To enhance consistency among local comprehensive plans that affect resource functional areas, regional entities could be given authority to review selected local plan

elements and amendments. Local authority to charge impact fees could be conditioned on the consistency of local with regional plans. In critical areas, the regional entity could be given authority to specify when local requirements should be adjusted to limit mass loadings of pollutants to sustainable levels. The Cape Cod Commission currently has clear authority to review local plans for consistency with the regional policy plan, and to impose more stringent conditions than both state and local governments for DRI projects if necessary to comply with the Regional Policy Plan. Further, the Commission may recommend that towns waive existing standards to support the overall objectives of the Cape Cod Commission Act.

Conclusions.

1. A number of institutional and practical obstacles currently limit the use of effective new regional land management methods and best management practice (BMP) technologies. At the same time, few incentives exist for consistent sharing of routine management tasks that are fundamental to effective watershed protection.

2. Transboundary management needs can be expected to escalate with increasing growth, and to increase in complexity as local jurisdictions take further home rule initiative in growth management and resource protection. An effective regional coordinating presence will be essential for effective interjurisdictional decision-making.

3. Except in limited instances, communities have not developed consistent frameworks for addressing landscape alterations that affect shared resources. Improved methods are needed for matching resource characterization methods and management tools. The use of resource-based performance standards and design standards should be expanded. Pollutant load targets are needed for Bays tributaries and enclosed embayment to support coordinated action among towns.

4. Regional planning agencies, state agency regional offices, watershed associations, associations of health boards and nonprofit organizations have provided a valuable role in assisting communities with management of shared resources. Nevertheless, a stronger mandate for proactive planning and review of transboundary resource impacts is needed. In particular, circumstances should be clearly identified which require a consistent regulatory and planning approach within and among jurisdictions.

5. Through the implementation of the Cape Cod Commission Act, DRI review has proven to be a highly effective mechanism for addressing transboundary issues in a timely manner, and, with appropriate statutory support, could be expanded for broader application.

Recommendations.

1. The MBP should evaluate how responsibilities are shared among regional agencies, particularly with respect to interpretation of state policy, long range planning, ensuring consistency among local permitting and inspection procedures, and community outreach.

2. Involved agencies should develop criteria to assist local governments in matching resource characterization methods and management tools.

3. Regional agencies and the SCS should assist communities in using existing watershed data and targeting new cooperatively funded data gathering efforts. Watershed data should be gathered with a view toward establishing watershed-specific performance standards and design standards as necessary.

4. The MBP should work with regional entities to capitalize on opportunities for improved local access to management expertise and rationalized management of transboundary impacts. Methods for coordinating effort among regional planning agencies, regional offices of state agencies, Soil Conservation Service district offices, Conservation Districts,

Extension offices, Resource Conservation and Development Areas, and regional associations of health boards should be examined.

5. Various cost-sharing strategies would allow regional entities to assume or perform additional functions where proposed development involves extra-local impacts on Bays resources. These might include merging functions, hiring personnel cooperatively, re-allocating the mix of shared responsibilities on a seasonal basis, forming a regional ombudsman service for certain technical reviews, etc.

6. An expanded role should be provided for regional entities in reinforcing management of trans-boundary impacts. The state should consider requiring that technical analyses for projects having impacts on resources of regional value be reviewed (and certified) by a regional technical entity prior to review by local boards. State statutes should be amended as necessary to give regional entities authority to issue (or to condition issuance of) state or local permits for activities having significant transboundary impacts.

7. As an alternative to prior review, an appeal mechanism could be considered, in which regional entities could appeal issuance of local permits found inconsistent with an accepted regional policy plan.

8. State statutes should be amended to support development and implementation of regional policy plans and regional strategic plans for enhanced management of shared watershed resources. Criteria should be established for development of regional policy plans that support expanded use of DRI review procedures.

Local Administration and Management.

Due to the breadth of the Home Rule Amendment, as well as other enabling authorities, Massachusetts cities and towns have primary authority over land use and many public health issues as well as broad capability to protect receiving waters from the inevitable effects of

development. Zoning and land and water management controls are critically important in preventing groundwater pollution, protecting estuarine water quality, targeting growth toward resource areas capable of sustaining development, managing critical areas and preserving the unique amenity qualities of the Bays watershed system.

Several factors, however, complicate the process of local decision-making and may restrict the ability of local governments to meet Bays resource protection needs on a consistent, long-term basis. Many of these are reviewed in detail in other sections, particularly those involving deficiencies in the use of specific management tools. However, certain local administration and management issues deserve special emphasis, as they serve to illustrate fundamental problems that determine a local government's ability to make effective use of existing and emerging management tools. To illustrate how typical management "styles" tend to influence local resource management capability, a set of "management scenarios" is provided in Appendix A.

Local Permit Review. Among the most consistent limitations to effective local decision-making is the poorly planned sequence of most local permit reviews. A fundamental concern is the lack of a logical point of entry to the process, which has been remedied to some extent by communities that have established an effective site plan review procedure. Permit review and evaluation procedures are not only complicated, but frequently cannot make the best use of scientific information and state technical assistance in an effective and timely manner. Because permits are obtained from a range of local boards operating under disparate enabling statutes, conditions for approval may be poorly coordinated or conflicting, requiring repetitive revision of development plans. Cumulative and secondary impacts become extraordinarily difficult to evaluate and control.

State requirements may be insufficiently understood, or inadequately considered at an early point in the review process where designs are in the formative stage. MEPA reviews have sometimes led to conclusions that recommend substantive changes in development plans which have already received approval as a result of a lengthy local review process. Once local board approvals have been obtained, the ability of both state and local authorities to work with a developer to mitigate anticipated impacts is severely constrained. At a minimum, when several boards must issue permits for a single project, boards should require a joint or coordinated review process. Likewise, local permits should be stayed until any applicable MEPA or DRI review results have been evaluated.

Special permit and variance granting processes are particularly vulnerable to the lack of standards and guidelines. Most town zoning bylaws allow for certain uses by special permit or provide for an appeal process through which land use activities may be reviewed by boards of appeals or other designated authorities. Very often, the special permit granting authority or appeal board is an appointed body which does not formally adopt written criteria, review standards or policy guidelines for the issuance of special permits and variances. A lack of accepted standards not only inhibits accountability, but increases the likelihood of conflicting interpretations among boards, enhances contentiousness, and may allow for unjustified inconsistency in review procedure.

Staffing and Coordination. Of key importance is the lack of full-time professional planning staff in many Mass Bays basin communities. Of the four focus communities examined, only the City of Gloucester has a full-time planning staff. In other communities, planning responsibilities are divided among town board members or fall to the town building inspector.

Unfortunately, town budget constraints frequently limit staffing options. In Nahant, for example, where existing stormwater management and wastewater disposal issues have

created a critical need for consideration of long term objectives, and a need for full-time professional assistance in evaluating and implementing alternative retrofitting approaches, funds for planning staff have not been available.

Towns lacking sufficient professional planning capability and staff assistance (such as Nahant) have been hesitant to implement local resource protection initiatives important to Bays management. Volunteer conservation commissions, for example, are frequently strained in meeting basic wetland permit review workloads and are reluctant to adopt additional requirements. These communities have particular difficulty addressing retrofitting and restoration needs, which are especially vulnerable to a lack of continuity in both policy and financing. A rapid turnover among board and commission members tends to exacerbate the problems created by an absence of staffing continuity.

At the same time communities such as Brewster have developed highly effective resource protection authorities and programs with very limited staff. The extent of variation among town initiatives is quite broad with regard to approach and effectiveness, complicating management of shared resources.

Communication and coordination among local officials and board members within towns is frequently insufficient. The formality of inter-board communication structures also tends to fluctuate through time with changes in administration, as has recently been the case in Scituate. Boards may be unaware of other town bodies' regulations, or may adopt contradictory policies and procedures. The failure of town administrations to reinforce communication among and between boards and managers serves to further complicate the permit review process.

Regulations promulgated by boards having distinct mandates may conflict, as may unwritten operating policies. For example, regulations applying to a town engineering

department may require developers to direct storm runoff into stream channels, or to the lowest available drainage point, although planning board policy supports installation of detention/retention basins.

Similarly, public works policies may be established to ensure that roads are interconnected to facilitate movement of service and emergency vehicles and allow for efficient maintenance of infrastructure. In these communities, development of cul-de-sacs and narrow streets may be discouraged or prohibited (outside ANR subdivisions). Roads or drainage facilities may be forced into areas where construction is in conflict with town wetland and aquifer protection needs or with sound wastewater management policy. Vague comprehensive plans and poorly articulated policies concerning road construction and subdivision development have left Bays communities vulnerable to Wetland Protection Act exemptions and to inconsistent state agency siting decisions.

This is a particularly significant problem where town engineering departments or building inspectors have a limited understanding of resource protection needs. Similarly, respondents indicated that in some Bays towns, public works departments and municipal boards and commissions are insufficiently informed and/or unsympathetic regarding the objectives and regulatory requirements of state or regional water quality protection authorities, and are thus unable to serve as an effective force to encourage local internal consistency, as well as consistency with state regulatory language.

Bylaws may be severely diminished in effectiveness if specific regulatory language providing implementation responsibility and setting performance standards is not incorporated into applicable board operating procedures and into the regulatory language of related departments and authorities.

In such situations, board members may have little power to ensure that town policies be internally consistent, particularly where a variance granted by one board may be appealed to a review body having a conflicting interpretation of town priorities, or an inconsistent view of policies articulated in the local comprehensive plan.

Conservation Commissions generally have no coordinating responsibilities, and may consider themselves to be quite independent from other town agencies. Absent the availability of a fully articulated site plan review process, boards may have little opportunity to ensure that a consistent approach is applied to the substance of permit review and may apply review criteria that are limited by their specific enabling legislation. Local inconsistency is perpetuated by the high turnover among board members, and the fluctuating interests and priorities of town administrations.

State review authorities and laws which have been made available may be incompletely utilized for protection of Bays resources, as outlined in other sections. For example, attachment of permit conditions as deed encumbrances can be an extremely useful enforcement mechanism if supported at the local level, but was found to be infrequently used among focus towns.

Inspection and Enforcement. Enforcement of local and state permit conditions and mitigation requirements is a serious concern. No overall statutory mechanism exists to ensure that building inspectors, as zoning enforcement officers, obtain all applicable permits and verify compliance with all local or state permit conditions and stipulations before issuing building or occupancy permits. Further, many building inspectors operate part-time or have a variety of inspection responsibilities (such as plumbing or electrical inspection) that may not coincide with inspection needs for nonpoint source control practices. Because severe nonpoint

pollutant impacts are often associated with infrastructure extension and project construction, this statutory weakness needs to be rectified.

Generally, with regard to both state and local regulations, effectiveness is heavily dependent upon a local building inspector's interpretation of the breadth of his/her responsibilities as zoning enforcement officer, his/her level of technical training and commitment to ensuring that requirements are met, and the resources and time which are available to undertake inspections. Although some local building inspectors have strong technical qualifications, many have taken their positions based on familiarity with the building trade, and have limited qualifications where review of natural resource or environmental permitting factors are concerned.

Nevertheless, building inspectors may exercise considerable influence with regard to the scope and character of local initiatives. Although building inspectors are enforcement officials, and not policy makers, they nevertheless frequently act in an advisory capacity to the zoning boards of appeal and planning boards, and may in some cases function in multiple capacities. Boards may rely heavily on a building inspector's opinion regarding constraints to implementation in determining the appropriate scope of a permit condition, or in setting performance standards. In certain Bays towns, these concerns have contributed to a limited perception of retrofitting needs and applicable requirements following the "Halloween Northeaster," of October 1991.

The importance of enforcement and inspection activities suggests that staff positions are needed which are dedicated solely to resource and public health protection needs. Recommended professional staff positions include health agents, conservation agents, and professional planners. Towns having an engineer and/or water quality specialist on staff are also significantly supported in their ability to fulfill basic resource protection responsibilities

and to respond to restoration and retrofitting opportunities. Shellfish wardens and harbor masters play very important resource protection roles in several Bays communities.

In certain Bays communities, such as Gloucester, strong public pressure has led local governments to undertake needed resource protection initiatives, but has not succeeded in ensuring timely passage of some necessary implementing regulations or the development of adequate enforcement capability. The financing constraints posed by Proposition 2 1/2 have contributed to enforcement limitations. Similarly, town bylaws may describe the purpose of the local law and the extent of its jurisdiction, but may fail to outline clear performance standards. Unless provisions for citizen enforcement have been made, a great deal of discretionary authority regarding inspection and enforcement responsibilities thus passes to local officials.

New methods to ensure consistent financing for needed staffing, management and maintenance functions should be strongly promoted, but many opportunities short of hiring full time staff are available. In Maine and North Carolina, for example, specially trained agents supplement local staff in meeting various septic tank siting and inspection needs.

The Cape Cod Commission Act stipulates that towns fulfilling certain planning requirements will be eligible to impose impact fees on new developments which can help to support local review efforts. More broadly, state statutes need to be revised to encourage, and provide incentives for, the establishment of stormwater utilities, OSDS utilities and/or wastewater management districts to ensure sustained funding for staffing and management needs. In the short term, fee structures similar to those established by the towns of Dartmouth and Rehoboth can be used to significantly enhance inspection and enforcement capability.

Conclusions.

1. Although many Bays communities have demonstrated a willingness to create resource protection authorities and responsibilities, the same towns have not consistently moved to ensure that appropriate "support capacity" is in place at the local level, with regard to staffing, legal and administrative coordination, inspection and enforcement capability, and training.

2. A primary limitation to the effectiveness of local decision-making is the poorly planned sequence of local permit review. Individual local board decisions may be defensible in legal terms, yet the optimum use of available authority to meet management needs is clearly inhibited by inadequate coordination.

3. A coordinated local review process is needed which provides one point of contact for developers seeking local permits, and a defined point of entry to the permit process, from which individual permit review duration periods can be measured.

4. Inadequate methods exist for tracking the effectiveness of the body of management tools in terms of their overall record in protecting resources, and for adjusting them accordingly.

5. All local permits should be stayed until any applicable MEPA or DRI review process is complete.

6. Better methods of sharing technical review and inspection responsibilities between local and regional entities, and among local entities, are needed.

7. Additional authority is needed to allow local governments to improve enforcement capabilities and to initiate enforcement actions against violators of state resource protection statutes.

Recommendations.

1. State enabling should be adjusted to broaden the scope of site plan review authority to expand its use as a tool for coordinating the local permit review process.

2. For specific sensitive resource areas, towns should be encouraged to form joint review committees of members from various boards, each of which would be responsible for reviewing variances, exceptions, and public agency actions that would impact that resource area.

3. Towns should be assisted and supported in forming action committees among boards that establish specific tasks and deadlines for action on specific resource management and restoration needs (e.g. passage of Title V supplements, stormwater retrofits, etc.)

4. An inventory of the procedures and standards used by local boards in granting variances is needed. Local bylaws should establish clear specifications and conditions for the granting and recording of variances, should identify methods to ensure that one board does not issue variances in conflict with another board's policies, and should ensure that the local permitting procedure is able to assess and manage the resource impacts attributable to issuance of variances.

5. The Massachusetts Bays Program and state agencies should encourage attachment of permit conditions as deed encumbrances to facilitate management of resource impacts among boards. Where periodic inspections are involved, facilities and associated permit conditions should be linked to MAGIS or coded to assessors' maps.

6. The state building code should be revised to require that neither building permits nor occupancy permits can be issued until compliance with all applicable state and local permits has been verified.

7. A training curriculum and annually updated short course program should be prepared for local board members and officials to familiarize them with the activities and responsibilities of other boards.

8. A certification process should be considered for officials involved in permit review, inspection, and enforcement. At minimum, local boards should join forces to the extent possible in performing inspections. Periodic shared reconnaissance trips to projects under construction can be valuable in revealing complementary issues of concern.

Planning and Growth Management; Linkage Among Planning and Regulatory Capabilities Limitations in Enabling Authority. Local comprehensive planning authority rests in MGL Chapter 41. A local comprehensive plan or master plan, adopted by a town planning board, is intended to guide the community's physical development and land use, setting a framework for decision-making on municipal functions as well as private land use. Plan development provides an important forum to establish community consensus on future development patterns and municipal investment.

Nevertheless, no regulatory or enforcement powers are invested in the master plan, which inevitably articulates a compromise among varying interests. Despite the availability of planning authority, for example, 61 percent of Cape Cod residents polled in a Commission survey indicated that their town was doing "a poor job" of land use regulation (Cape Cod Commission, 1991). As outlined in previous sections, many local plans have been unable to make adequate provision for the control of consumptive residential development, or to ensure that development decisions fully consider the future availability of services.

At the same time, Chapter 41 does not specifically direct local governments to address existing and future land use-water quality relationships as a part of the planning process within and among their jurisdictions. Nor does the Act emphasize the importance of proactive

planning and critical area management in the protection of vital resource areas. Little incentive is provided in either of these areas. Yet perhaps the most significant limitation of this legislation is the lack of a provision requiring that zoning bylaws and regulations be adjusted to ensure consistency with a community's master plan. Since conventional zoning itself was never intended to address many of the evolving resource management and planning needs of modern communities, poorly conceived past zoning decisions can severely limit a town's ability to respond in a timely way to new findings concerning complex Bays management needs.

Resource Management Considerations. In addition to the limitations of the planning enabling legislation, Bays communities have been hampered to varying degrees in their ability to use comprehensive plans effectively for control of nonpoint source pollutants by a lack of understanding of the relationship between sources and cumulative impacts. Especially with regard to estuarine resources (for which assimilation capacity is often poorly documented), it has been difficult for towns to assess the potential magnitude of nonpoint source problems, determine their sources, evaluate both current and future abatement needs, and then define how management needs should be articulated and supported at a parcel, sub-watershed, and basin level.

Strategies developed and articulated through the comprehensive planning process determining target responses appropriately for given levels of flexibility. For example, undeveloped, lands present a wide variety of options to protect resources through responsible zoning, use of resource protection overlays, and density transfer techniques.

Plotted lands are more challenging to protect, because options are restricted. Existing local zoning is difficult to supercede, due to a variety of factors outlined in subsequent sections. Density shifting mechanisms may still be used. The District of Critical Planning

Concern designation may be used on Cape Cod. Too, innovative planning mechanisms such as developer agreements and "specific plans" may enhance flexibility in a variety of areas. However, in most of the Bays communities, opportunities to protect resources impacted by the development of platted lands lie chiefly with the effective use of performance standards. These include requirements for stormwater management and waste disposal that govern the development that is allowed to take place "as of right." Where unfortunate zoning decisions have been made, plots have been established, and sound performance standards are not in place, the comprehensive plan is put into a role for which it is not well suited -- mitigating the shortcomings of existing zoning. Nevertheless, on previously developed or grandfathered properties, where still fewer options are available, a comprehensive plan and related resource protection plans can still be effective in guiding the use of site plan review authority and the implementation of retrofitting and restoration objectives.

The specificity of comprehensive plans plays an enormously important role in resource management. Plans are generally built on consensus and may not be aggressive in setting standards that clarify how goals and objectives will be implemented on site -- for example by designating specific growth areas and defining areas to be left in agricultural or low-density use. (There may in fact be few areas in a community that can support concentrated growth from the standpoint of environmental protection or provision of community services.) In many instances a comprehensive plan may result which is vague in terms of its language and hortatory in content. Implementing boards are guided by instructions to "balance" interests in affordable housing, environmental protection, growth, and preservation of traditional agricultural and fisheries uses and historic values. Hence, consensus-built plans are rarely specific enough in spatial terms to guide site-by-site decision making, although town boards are responsible for implementing comprehensive plans through the permitting process.

These shortcomings pose significant concerns for management of cumulative impacts to Bays resources, which must consider management constraints and opportunities on scales of watersheds or recharge areas. Balancing for adequate protection of wetland areas, or for management of cumulative nonpoint source impacts generally involves looking across the breadth of a coastal area. Yet if a comprehensive plan has failed to ground its broad, long-term view in specific spatial terms suited to the needs of site level permit evaluation, boards often attempt to achieve the "balancing" mandate of plan policies on each individual project site, in reaction to specific permit applications. The Town of Barnstable's deliberations concerning Independence Park in the mid-1980's serve as a prime example of this concern. (DeConti, pers. com., January 18, 1992) Where case law introduces uncertainty, the tendency toward onsite policy balancing may be particularly magnified.

Linkage Between Planning and Regulatory Authority. Land use practice promises to continue to be a fundamental factor in the state's ability to achieve several important goals: improved control of nonpoint source pollutant inputs to the Bays, protection and restoration of habitat and fishery resource areas, and preservation of recreational uses and amenities. As has been emphasized previously, a more cohesive watershed approach is needed which would involve managing and regulating activities in coastal areas (from the standpoint of prevention and restoration), and which would effectively target initiatives necessary to manage impacts on those areas which are attributable to upstream land uses. A real challenge is presented for Massachusetts Bays management in that a disparity exists between the manner in which land use management authority is used at the local level and the extent and complexity of problems attributable to land use decisions.

Although different "degrees" of protection may be appropriate to meet specific Bays resource management needs, land use patterns articulated in a town's zoning bylaw and maps

reveal the fate that is "programmed" for Bays resources at buildout, and establish how much flexibility may be available to take cost-effective actions toward water quality protection. Zoned "capacities" are frequently incompatible with the actual development capacity of the underlying soils and substrate. In this case boards are forced into a posture of remediation, in which, for example, compliance with health regulations may require development of costly sewers in an area where development should not be encouraged. In this way, decisions about water resource management become forced, contentious decisions that limit long term flexibility, rather than planned, orderly decisions based on thorough evaluation of alternatives.

Conventional zoning rarely fills the "decision gap" created by vague comprehensive plans. As discussed in related sections on the use of regulatory tools, zoning is often inflexible and rigid over time and space, and zoning (or rezoning) decisions may be reached in isolation from other resource protection and development initiatives. Conventional zoning is not well suited to planning development within a small area to include a variety of buildings, densities, and uses (all of which are necessary in development and protection of existing compact, traditional village centers), or conversely, determining the precise locations for specific uses within an area where diverse uses are allowed. Nor can conventional zoning easily provide for phasing development according to a plan, addressing "pervasive needs" such as aesthetics or historic preservation, or monitoring impacts of growth in ways that allow for timely adjustments in related zones.

Unfortunately, though, a characteristic response to complex and conflicting issues is a reliance on the simplest or strictest interpretation of board responsibilities as articulated in bylaws and regulations. This response places enormous emphasis upon a town's previous zoning decisions (whatever their basis), and reinforces the need for zoning that reflects actual land development capacity and environmental concerns.

Recognizing the severe obstacles to responsive management that have been created by their past zoning regulations, Bays towns have searched for alternatives. A desire to fit evolving management needs into the euclidean zoning framework has lead some Bays communities, such as Scituate, to resort to a proliferation of increasingly smaller overlay districts focused on unique situations. These overlays may be difficult for local boards to administer with respect to overall resource management needs, and may invite recourse to discretionary appeal remedies or to court challenge.

Though well intentioned, efforts to link planning and regulatory authority have produced other questionable techniques: use permit procedures formulated with criteria tailor-made for each district, cumbersome special permit requirements that discourage contemporary development alternatives such as cluster; planned unit development provisions that purport to promote flexibility and mixed use alternatives, but adhere almost entirely to the standards of the underlying zone; floating zones that grant quite broad discretion to town boards.

Where comprehensive plans are not sufficiently detailed, the permitting processes themselves can encourage reliance on less-than-optimal solutions. The Massachusetts Wetlands Protection Act, for example, offers an individual project proponent the opportunity to "demonstrate" that resource damages have been minimized. Effective non-structural or watershed-oriented approaches to nonpoint source management planning (e.g.the use of buffers or other non-structural runoff and sediment control techniques) may be underemphasized, since the mitigating influence of structural site-level engineering approaches may appear more clear-cut, and thereby more attractive to a project applicant, although they may be less supportive of actual plan objectives.

Need for Enhanced Capabilities. These problems indicate that not only should local planning mandates and incentives be strengthened, but also that broader use should be made of flexible

regulatory instruments and procedures that can complement the existing process, and respond to the highly complex and sophisticated development proposals that are increasingly common in coastal areas. Emerging instruments in use in other states can go well beyond zoning in encouraging innovation and could help address the existing "decision gap." Among these are "developer agreements," mutual private/public commitments to development over time. These negotiated agreements are increasingly used to complement states' growth management laws. Developer agreements are in use on Cape Cod, under provisions set out in the Cape Cod Commission Regional Policy Plan.

Another alternative instrument which could benefit the Bays communities in linking planning and regulatory authority is the "specific plan," a hybrid combination of the plan and the zone. Specific plans articulate mutual public private commitments to development of a particular space. These plans are similar to the Florida areawide and downtown DRIs discussed previously in that they provide for project-specific administrative review based on explicit policies and standards consistent with the underlying comprehensive plan. Once private and public entities have agreed to a specific plan, the plan has the force of regulation. Future capital facility improvements and land divisions must conform to its provisions.

The state of California authorizes use of specific plans in its zoning and planning laws and requires that specific plans be used to regulate subdivisions located in remote rural areas with limited populations. As is the case with area-wide DRIs, environmental impact reports prepared for specific plans in California can substitute for reports on individual projects within the purview of the specific plan (Sedway, 1988).

Linkage with Supra-Local Authority. A lack of progress in meeting local planning and growth management needs can exacerbate the effects of limitations in state authorities. For example, absent a complementary DRI review process, MEPA has not been effectively used to support

specificity in comprehensive plans, despite the fact that {Similarly, with regard to control of cumulative effects, }towns can petition the Secretary of EOEA to invoke the MEPA review process for a comprehensive review. The MEPA staff have been reluctant to initiate reviews based on cumulative impacts. In addition, the structure of the local decision-making process and the availability of a sound comprehensive plan are rarely considered in MEPA review, although the function of the review process is to identify and refine in advance the least damaging alternative in planning a development.

In several well-known instances on Cape Cod, and elsewhere, projects have proceeded through the local permit process to a point where designs are fully completed and approved before a state permit is sought. Since local approvals are in place, and since local land use decisions are accorded deference by the courts, the conservation commission's power is reduced to placing conditions on individual lots, and MEPA loses its fundamental benefit as a planning tool for identifying the least environmentally-damaging alternative and making the best decision among broader site planning alternatives. In these cases the process can degenerate into an unproductive "build-no build" negotiation.

To enhance the effectiveness of both MEPA and local reviews elsewhere in the Massachusetts Bays communities, legislative authority is needed to enable local boards to refuse to consider a local permit application which will subsequently require MEPA review. Using authority provided in the Cape Cod Commission Act, The Cape Cod Commission has been able to manage the timing and influence the substance of the local review process where MEPA, or DRI review, is applicable. The Commission also encourages the coordination of local Environmental Impact Review requirements with MEPA and DRI review processes. Local review is stayed, pending completion of these reviews.

In summary, unless plan goals, objectives and policies are thoroughly referenced and supported through the local permitting process, and unless review criteria and standards consistent with the plan are adopted, boards are unlikely to develop a consistent structure for using disparate permitting authorities in plan implementation.

Where no comprehensive plan is available to provide guidance, bylaws unsuited to planning are frequently "stretched" in an effort to meet planning needs, with results that are highly vulnerable to the strengths and weaknesses of the local decision-making structure.

Use of Other Local Resource Planning Options. Natural resource protection plans and open space plans are used in many Massachusetts Bays communities to complement master plans. These plans may be critical complements to the comprehensive plan in helping towns to avoid pressure to issue inappropriate variances or to make arbitrary zoning changes. Where they are reinforced by applicable local bylaws, natural resource protection plans present a significant opportunity for comprehensive management of nonpoint source impacts on interrelated watershed systems. These plans are particularly important where joint or conflicting responsibilities of local, state, and federal agencies must be considered.

To be eligible for state funding from the Division of Conservation Services, open space plans must conform with DCS guidelines and must be updated and approved every five years. With a historical emphasis on recreation planning and public access, open space plans have been underutilized in some communities as a tool for integrating watershed management and nonpoint source control needs.

Policy plans have also been underutilized by municipalities as a means of establishing criteria to guide decision-making among boards or departments or to achieve consistency in decision-making among neighboring towns. In its regional policy plan, the Cape Cod Commission articulates its program for exercising specific regional authorities which exceed

the scope of local government authorities as well as those provided by Massachusetts CZM Program policies. On a local level, policy plans can cover any government operation, and can establish guidelines that directly prescribe how review criteria are to be translated into administrative actions. Policy plans can be made binding through formal internal agreements. In environmental planning, policy plans could be used to a greater extent to integrate review criteria and to define a consistent approach to decision-making for implementation of plans and allocation of budgets.

In many coastal communities, harbor management plans appear to offer a flexible and effective means of examining and managing conflicts among diverse shoreline uses, though limited in applicability to developed "harbor" areas where opportunities to prevent resource damages may be constrained. Many waterfront or water area uses falling under the jurisdiction of Ch. 91 and the MCZM harbor planning regulations contribute significantly to nonpoint source loadings, particularly on a cumulative basis. Others are themselves significantly affected by impacts from upland uses, as well as from uses within and seaward of the intertidal zone. MCZM harbor planning regulations strongly encourage towns to use harbor management plans as a means of dealing comprehensively with pollution sources.

Conclusions.

1. Inadequate incentives exist in relevant enabling legislation to encourage local governments to ensure that zoning and other regulatory authorities are implemented in a manner consistent with community goals as reflected in comprehensive plans.

2. Considerable uncertainty exists among Bays Communities as to the extent of legal authority to limit and guide development density. Many Bays communities have limited density for the protection of water quality in ways that subvert their future ability to provide efficient, affordable services.

3. The inflexibility imposed by existing zoning, the vague language of comprehensive plans, and the conflicting procedural requirements of local regulations have encouraged a reliance on Title V as a primary tool for "de-facto" regulation of development density and land use. This "strategy" places inappropriate pressure on local Boards of Health and will be less and less defensible as wastewater management technology increases in sophistication.

4. Deferred action on zoning and master planning continues to shift decision-making processes of importance to Bays management into a future in which not only are options more constrained, but recourse to complementary resource protection authorities (such as federal wetlands regulatory authority) may be uncertain.

5. In attempting to broaden local authority to encompass resource management needs, most Bays communities have tended to rely more on single-purpose zoning overlays than on broader resource planning mechanisms and comprehensive plans.

6. Local governments need assistance in choosing the appropriate mix of land and water management techniques to apply on a sub-watershed and recharge area basis.

7. Performance standards put in place to control the effects of development are often poorly matched to the levels of flexibility available for undeveloped, plotted, and built lands.

8. A suite of complementary tools currently available to local governments and districts for district-based and/or cooperative management of both onsite wastewater facilities and stormwater facilities is underutilized, due to statutory and administrative limitations as well as local unfamiliarity with opportunities. Obstacles to the use of these tools should be identified and removed.

Recommendations.

1. Towns should be supported in integrating growth management bylaws, resource protection bylaws and associated performance standards for improved control of the rate,

timing, and specific location of development impacting sensitive areas. Comprehensive plans and applicable resource protection regulations should be thoroughly cross-referenced.

2. The MBP should push for setting and implementation of nutrient load and other pollutant load goals for tributaries and recharge areas and should involve towns in setting loading limits and reduction targets for Bays contributing areas. These targets should form the basis of local performance standards.

3. To enhance the responsiveness of local bylaws, Bays communities should be encouraged to pass bylaws which take effect when specific growth indicators or environmental quality indicators exceed established thresholds. However, these indicator-triggered bylaws should only be applied where a management entity (such as a wastewater management district) or appropriate town staff are available to manage implementation.

4. Developing communities should be supported in considering appropriate use of innovative planning techniques that support growth management, including joint transit-land use development, floor area ratio bonuses for transit-oriented uses, value capture agreements, minimum (rather than maximum) density standards, and equitable distribution of infrastructure costs according to parcel densities.

5. Planning instruments that can serve both planning and regulatory needs, and can govern infrastructure expenditures, are currently underutilized and should be encouraged. Statutory limitations to their appropriate use should be reviewed and eliminated. These instruments include local and regional policy plans, stormwater master plans, wastewater facilities plans and resource management plans.

6. The use of area-wide DRI reviews, development agreements and "specific plans," consistent with comprehensive plans, should be considered as a means of integrating

planning, zoning, and regulatory mandates. When agreed to, these instruments constitute regulations and supercede or guide the implementation of other regulations.

7. State planning and zoning enabling should be revised as needed to accommodate broader use of these instruments. The legislative revisions should reference applicable resource protection criteria, outline project-specific administrative requirements for categories of projects, and provide requirements for consistency with approved local comprehensive plans based on explicit locational policies and standards.

Technical Resource Management.

The Nationwide Urban Runoff Study (1983) and many more other recent research efforts have attempted to characterize the relationships between various land use characteristics and the water quality impacts caused by development. Although the cumulative effects of these changes, and the rate at which they occur, remain poorly understood, sufficient information has been generated during the past decade to show that certain environmental control strategies result in reductions of specific contaminant loads.

The Massachusetts Bays Program has the opportunity to define an approach to land use practice for Bays ecosystem water quality protection and enhancement that incorporates data concerning risks to resource uses and focuses attention to a set of specific management needs that limit resource users' exposure to those risks. As outlined in Part I, a first step is to specify the nature of a series of critical relationships that articulate the influence of various environmental controls on risk factors that limit the sustainable use of the Bays. For land-use water quality relationships in which these risk factors (and their inter-relationships) are poorly understood, steps need to be taken to ensure that those available management techniques which are of proven effectiveness are capitalized upon, and that options for the effective use

of new strategies are not precluded by fundamental flaws in the way land use decision-making is carried out.

As of now, the Massachusetts Coastal Zone Management office (MCZM), a management and policy entity, strives to ensure that a balance among legitimate coastal resource uses is achieved, and that future uses are not compromised due to loss of habitat and water quality degradation. The theory of coastal zone management is that resources can be identified, evaluated in terms of their quantity, quality, use value, and suitability for potential use. The networked coastal zone management program in place in Massachusetts then works with communities and state agencies to formulate plans for the current and potential use of these resources. In so doing, MCZM relies on, and works to adjust, the permitting program in place to ensure that the character and magnitude of uses, and the sum of conditions placed upon those uses, constitute an effective strategy for coastal resource protection and restoration. In coordination with regulatory and planning bodies, existing standards are reformulated, and new ones developed, to achieve these goals. Many of these efforts are discussed in the second section of Part II, which presents an analysis of state and federal programs of importance to Bays management.

Summary of Management Needs.

Unfortunately, several factors have converged to leave some resource areas that are functionally related to the Bays system under-protected and under-managed. As emphasized in Part I and elsewhere in this section, community boards and commissions have often had insufficient access to interpreted data, evaluation methods and models that would support them in matching the sum of critical local land use variables with the Bays water quality impacts that are a function of local or watershed-scale land use.

Examples of data categories which are of benefit in using new models and evaluation methods include land use and land cover, slope, location of primary and secondary recharge areas to surface waters, location of stormwater and wastewater infrastructure and subsurface drains, percent impervious area by sub-watershed, soil buffering capacities, percent open space, connectivity among habitat types, and others.

Although data has been collected via implementation of nutrient loading bylaws and environmental impact review requirements, and MAGIS data layers are under development, few towns have the resources and staff available to evaluate existing resource conditions, or to ensure that the permitting process contributes consistently to local understanding of resource management needs. Not only are local (or regional) mapping and monitoring efforts needed to support resource management, but a vigorous state effort is needed to update the Commonwealth's nonpoint source assessments that identify water bodies impaired or threatened by nonpoint source loadings.

As outlined previously, many boards lack the technical expertise or support to assess the strengths and weaknesses of different resource management tools and to apply appropriately coordinated performance standards. Towns may take preliminary steps toward water resource protection, such as reducing allowable density for aquifer protection, but may underestimate the need for an internally consistent body of local regulations. For example, few towns either formally restrict development on steep slopes or consistently require placement of erosion and sediment controls -- management deficiencies that mutually exacerbate one another.

Title V has been inappropriately relied upon as a "technical tool" to serve unrelated management needs in several respects. Partly because health board regulations may be adopted without a city council or town meeting vote in Massachusetts, many communities

have come to rely on health board regulations as an alternative to more difficult and controversial zoning or planning amendments that require broad agreement on technical issues.

Title V and local board of health regulations have thus been used as a defacto restriction on steep slope development. Recharge areas to surface waterbodies are also inadequately protected in state law, as are certain wetland areas. Here as well, attempts have been made to protect these valuable resources by restricting siting of septic tanks on unsuitable soils, and in proximity to wetlands and water bodies. Local reliance on Title V standards has not served to encourage communities to develop needed technical resource management capability. In addition, as previously stressed, towns that have relied on these controls will be vulnerable to a broadened assessment of suitable wastewater management options.

Limitations in local boards' understanding of technical management issues can not only lead to ineffective land use regulation, but also consume the attention of town bodies to the exclusion of broader watershed management needs. The delineation and management of buffers, for example, serves as a prime example of an issue that continues to increase in its scientific complexity and to consume a significant percentage of local board review time. A lack of coordinated technical support -- or conflicting interpretations of technical needs, can prove especially crippling to retrofitting and restoration efforts. Currently no mechanism exists to encourage development of either the institutional framework or the financing mechanism that will be required for aggressive management of failed septic systems, or for orderly retrofitting of out-dated stormwater drainage systems. Both of these restoration issues are closely linked with comprehensive watershed planning and capital facilities planning and could benefit from consideration of utility financing options and establishment of

management entities such as wastewater management districts, strategies implemented successfully in other states. Clear designation of impaired areas is needed, along with establishment of priorities and performance standards for development and restoration.

The Cape Cod Commission has designated areas that exhibit impaired water quality and discharge to critical resource areas. These designations are used to set impact limits, to focus growth appropriately, to guide public water supply and other infrastructure extensions, and to establish conditions under which alternative wastewater management technologies will be allowed or encouraged.

The debate surrounding use of private-owned sewage treatment facilities (PSTFs) serves to illustrate a complex technical issue which local governments have been ill-equipped or unable to confront in terms of development ramifications. Yet few local governments have taken the necessary steps to address water quality impairment due to widespread septic tank deterioration in an orderly way by implementing an appropriate strategy for upgrading failed systems. A lack of resolve to regulate land use based on resource assimilation capacity, and to develop an appropriate management framework, coupled with fears regarding the land use consequences of PSTF proliferation, may reduce future wastewater management options available by precluding timely use of a viable technique whose use could be restricted and managed through effective planning.

Nevertheless, despite the need for enhanced access to technical expertise at the local level, results of interviews conducted for this research effort indicate that mandatory training and certification for board members would not gain wide acceptance. Hence local boards should not be expected to bear sole responsibility for making the fundamental decisions that shape the course of management for resources of significant statewide or regional value.

In order to use available local resource protection tools and restoration strategies to best advantage, a better method of using and enhancing existing technical supporting mechanisms is needed. Technical support and evaluation is needed at three scales, each of which could be addressed more effectively if some existing assessment mechanisms were better supported and if opportunities for pooling resources were capitalized upon, as discussed in previous sections. On a watershed scale, guidance from state and regional entities is needed to achieve effective environmental planning, and to integrate comprehensive plans with stormwater and wastewater management needs.

To coordinate sub-watershed scale management strategies with site level decision-making, clear development criteria and performance standards should be prepared or reviewed by a technical agency familiar with both local and regional conditions and limitations. A regional agency or entity could also assume inspection responsibilities for stormwater facilities, wastewater facilities, and erosion and sediment control structures to capitalize on economies of scale and ensure consistent application of watershed-scale standards. Finally, at the site level, a vigorous effort is needed to ensure that local bylaws are interpreted in a manner that is consistent with watershed infrastructure development plans and open space plans, and that developers consider applicable criteria in advance.

Conclusions.

1. Technical data and support are needed to enhance management capability at three scales. At the watershed scale, data is needed to support regional nitrate management, protection of tributary streams and other critical habitat areas, regional stormwater and wastewater management planning and restoration, and estimation of expected sea level rise scenarios to be used in formulating management strategies.

2. Clear, defensible development criteria are needed to ensure that sensitive areas adjacent to Bays resource areas are protected in accordance with watershed level management needs.

3. Site-level development criteria are needed to ensure that local zoning and growth management bylaws and amendments are consistent with identified protection needs.

4. Several scientific and technical issues present problems for local communities in evaluating impacts and conditioning permits. These include, among others, buffer design and management for pollution control and habitat protection, appropriate use of various nutrient loading techniques in planning and impact evaluation, impact of stormwater discharges on wetlands, cost-effectiveness of various stormwater management technologies for joint flood hazard management and treatment of runoff, use of soil indicators for development siting, appropriateness of alternative wastewater treatment technologies for specific applications.

5. With regard to vegetated buffers in particular, a region-specific scientific review is needed that outlines the basis for use of buffers for control of various nonpoint pollutants and for habitat protection under representative categories of coastal watershed conditions. Benefits and limitations of natural and managed buffers should be evaluated, and delineation, design and maintenance issues clearly articulated for site-level and watershed level application.

6. An improved method is needed for applying data on background water column concentration and sediment characteristics in assessing magnitudes of loadings from multiple, diffuse sources and in relating land use classifications to expected loadings.

7. Technical assistance, training, and/or a pooling of technical review responsibilities is needed to achieve better coordination among local boards responsible for stormwater management and sediment control, site planning, and state/local permitting.

8. Improved use of utility options is needed to finance regional stormwater and wastewater management planning, facility siting, inspection, enforcement, and retrofitting efforts. State statutes should be amended as needed to allow guaranteed long-term ownership and maintenance of stormwater and wastewater management facilities, and to encourage the appropriate use of utilities.

9. Legislation is needed that comprehensively addresses categories of water quality impairment in Bays tributaries, ensures that planning and retrofitting initiatives are effectively coordinated, and provides clear criteria for setting financing priorities among planning and restoration needs. The Florida Surface Water Improvement and Management Act and the Delaware Erosion and Sedimentation Control and Stormwater Management Act have each formed the basis for a well-focused technical cooperation between local and state agencies in long term regional management initiatives.

10. An improved means of assessing and coordinating retrofitting and restoration opportunities is needed in (and among) Bays communities. In the short term, non-degradation standards can be applied to create incentives for retrofitting in appropriate areas where resource impairment has been documented.

11. Where an appropriate management framework is available, broader consideration should be given to the use of alternative onsite or community wastewater management facilities for management of failed septic systems in Bays recharge areas.

Recommendations.

1. The agencies of the Commonwealth should work to ensure that clear, usable, defensible, guidance documents are available to communities concerning technical issues of specific importance in Bays management, and outlined above, and should ensure that

information is consistently available to assist local board in the appropriate interpretation or modification of nationally circulated guidance.

2. Involved agencies should examine the utility of using specific development features (hydrologic alteration, impervious area coverage, presence and age of specific facilities, development density, infrastructure characteristics) or natural features to facilitate timely designation of critical areas and to design targeted, consistent management strategies.

3. The MBP should work with regional agencies to provide and clear, scientifically defensible, codified minimum standards for cluster, open space, and resource protection districts.

4. A technical review service should be provided to enable communities to implement consistent region-specific model development criteria. These should include criteria for protecting stream buffers, non-tidal wetlands and floodplains, upland habitats, steep slopes, open space, and onsite vegetation protection and restoration methods.

5. The MBP and state agencies should work with SCS to adopt existing buffer delineation methodologies for use by Mass Bays watershed communities and to guide local communities in establishing supplemental buffer regulations that address specific local resource protection needs.

6. The MBP should consider developing a classification system for Bays resource areas that would support communities in imposing resource-specific development criteria and performance standards.

7. To enhance site-level assessment capabilities, state and regional agencies should develop derivations of critical pollutant loading rates for enclosed embayments, and should provide regionally consistent review of loadings characterizations for proposed developments in contributing areas.

8. A soils-based site suitability assessment methodology should be developed for large flow and multiple flow septic systems and PSTFs.

9. Involved agencies should establish conditions under which specific models and methods should be considered suitable for preparing evaluations of land use-runoff relationships, soil erosion estimates, nutrient load calculations, and meeting other technical evaluation requirements increasingly called for in local environmental impact reviews and other local bylaws.

10. The Bays program should encourage collection of data needed to support development of effective regional stormwater master plans.

11. Involved agencies should prepare guidelines that help local boards and town staff interpret and appropriately use generic best management practice evaluation methods.

12. The state should consider working with conservation districts and regional SCS offices to establish a regional site inspection program for sediment and erosion control structures and stormwater management facilities, to be funded on a fee basis by participating towns.

13. DEP and other agencies should continue to work for passage of comprehensive stormwater management and sediment control legislation that includes enabling for formation of stormwater management utilities.

14. The MBP should consider encouraging regional designation of "impaired areas" as a basis for setting priorities among stormwater and wastewater retrofitting needs. Local governments should be assisted in developing joint retrofitting and upgrading approaches for shared resource areas.

15. Communities and regional committees should have in place a storm drain retrofitting strategy and policy to support a requirement that retrofitting opportunities must

be effectively capitalized upon whenever road, drainage and utility repairs are undertaken by local or state agencies.

16. The MBP should promote several related initiatives in onsite wastewater planning, management and retrofitting. Among these, a detailed evaluation of management needs and options across jurisdictions should be prepared. The applicability of innovative and alternative wastewater management technologies (omitting PSTFs) should be investigated for use in developing areas and for system upgrades, along with relevant institutional and financing issues.

MAJOR CONCLUSIONS AND RECOMMENDATIONS.

Projections for steady growth in coastal communities suggest that Bays resource degradation and habitat loss due to flawed land use planning and management practice and to nonpoint source pollution will increase steadily in the 1990's. At the present time, state and local statutes and regulatory capability are inadequate to prevent further deterioration of Bays resources in a consistent manner, or to ensure that resource viability is enhanced to a point where traditional uses of currently degraded Bays systems can be restored.

A landscape scale management approach for Bays critical areas is needed, based upon improved planning and restoration of watershed/recharge area units. This will require enhancement of local and regional comprehensive planning and growth management capability, a broadened regional focus on protection of functional resource areas shared among local jurisdictions, and development of a coordinated management structure capable of confronting technical problems as well as institutional needs.

Regional-scale assessments of the status of Bays resources and tributaries are needed in order to allow state and local managers to rely upon consistent management-oriented data

sets in setting action priorities and allocating scarce resources. A permanent, consistent monitoring program for water quality, fish and shellfish resources, sediments, near-shore habitats and wetland conditions is urgently needed, as is continued progress in development of land-based MAGIS data layers.

Institutional obstacles, program inconsistencies, and conflicting agendas have also hampered progress in addressing complex issues in which land use affects water quality. The cross-media character of nonpoint source impacts, and the pervasive nature of degradation across jurisdictional boundaries underscores the need to refine and clarify management objectives and strategies through the CZMA S. 6217 review process.

Although comprehensive state nonpoint source management legislation is badly needed, much progress can be made at the local level in protecting Bays resources. Technical guidance, performance standards and review criteria are needed to ensure that local governments require the use of up to date management practices and capitalize on regional treatment opportunities. Statutory grandfathering provisions relating to subdivisions and approval-not-required land divisions inhibit local efforts to enhance resource management capability, and should be revised by the Assembly.

Significant progress has been made by the MCZMP in encouraging local Bays management initiatives, yet inter-jurisdictional land use coordination and consistency remains a serious problem, as does staffing and enforcement. Significantly enhanced protection is needed for ACECs and for certain wetland resource categories generally.

Priority nonpoint sources affecting Bays resources, including stormwater and OSDS leachate, can be effectively addressed only if an improved planning structure for these sources can be developed and implemented. A long-term regional vision complementing shorter-term local retrofitting initiatives is required. Regional agencies may offer potential in improving

wastewater and stormwater management planning so that a rationalized approach to planning, management, retrofitting and financing can be achieved.

Technical planning, review, and enforcement capability in many Bays communities is inadequate to meet escalating requirements, and (given the rapid turnover among boards and staff) threatens to seriously undermine Bays protection efforts. Incentives should be created for towns to share technical staff, pool consulting and retainer expenditures for reviews and analyses of regional interest, and capitalize on economies of scale for site inspection to the maximum extent possible.

State and local development review procedures need to be revised to enhance consistency, predictability and accountability. Standards and policy guidelines should be established which clarify agency interpretations regarding infrastructure extension and codify procedures for granting variances and exceptions. Enabling statutes need to be updated to reflect current scientific understanding regarding resource function, to clarify policies regarding mitigation and enforcement, to enhance local inspection authority, and to support the local use of administrative penalties and other enforcement mechanisms in dealing with private and public violators.

Increased funding should be devoted to staffing state, regional and local agencies and working groups, providing enhanced technical assistance to local governments, and supporting shared inspection and enforcement efforts. Public education efforts should be vigorously supported and expanded. Incentives should be expanded to encourage local board members and town staff to pursue technical training opportunities on a sustained basis.

APPENDIX A

Local Management Scenarios.

Introduction.

Because successful control of land use-related impacts to the Massachusetts Bays system will involve a coordinated effort of local, regional, state and federal entities having distinct missions, it is important to examine the existing decision-making process in order to learn which elements are most successful and where management problems tend to occur, and to identify specific points in the process that present the greatest opportunity to insert corrective measures.

The flexibility of the local decision-making process is to an extent hampered by its history. Much of the structure of town government was set up to address specific concerns of public health, safety and welfare that were much narrower than the complex environmental problems which those same local boards must now face. The Home Rule Amendment has proven extremely valuable in helping many towns move toward more comprehensive control of environmental problems by strengthening legal authorities. Nevertheless, the structure available to implement those authorities has remained largely intact over many decades and is vulnerable to internal disruption as well as to exterior political forces and resource limitations.

The local decision-making process is of key importance in many respects. This process largely defines whether a community is able to maintain the long view and proactive posture so necessary in effectively implementing land use and resource planning strategies, or whether it is limited to a reactive posture based on piecemeal review of individual projects. The decision-making process also determines whether the community can effectively look beyond its specific interests to address watershed needs and management solutions.

The nature of interagency communication that supports the local decision-making process determines what technical evaluation tools can be appropriately used at key decision points, and whether the findings generated will be potent -- giving weight to recommendations for specific courses of action that are implemented in a coordinated fashion. Very few Massachusetts Bays communities have been able to establish monitoring programs that support evaluation of cumulative impacts, or effective mitigation of their effects. A flexible, responsive strategy based upon results of a consistent, area-wide, cooperatively-funded monitoring program is needed.

Of key importance is the manner in which the local decision-making framework supports regional and state resource assessment efforts. ACEC designations are meaningful in direct proportion to the degree to which management of the systems is supported by local decision-making. In addition, as noted previously, the effectiveness of the MEPA review process is highly vulnerable to the completely independent multi-track local review process, which may be poorly coordinated in itself in terms of the substance and timing of evaluations.

The local decision-making process determines how initiatives will be developed, organized, and carried forward, and whether important opportunities will be capitalized upon in a timely fashion. This is of key importance in the restoration of Bays uses and habitats, which will involve a heavy emphasis on controlling nonpoint sources via politically invisible or difficult upgrades and repairs of stormwater infrastructure and septic tanks.

In summary, the decision-making process is important in terms of its effectiveness in overcoming its own limitations by reaching out and forward proactively to broaden jurisdictional reach and aggressively interpreting its own powers and capabilities.

The premise of National Estuary Program management efforts has been that an effective system for environmental planning and watershed management is necessary to address the

complex protection and remediation problems facing the Massachusetts Bays. Unfortunately, the web of local, state and federal programs geared toward water quality concerns is neither consistent in terms of its objectives nor easily dissected in terms of its implementation. Each town in the Massachusetts Bays basin has its own unique "personality" and style of decision-making, and is distinct in terms of its approach to planning; its method of using scientific information; its administration and management structure; and the method by which it applies laws and regulations via the permitting process.

Purpose of Scenarios. A key indicator of whether a town's approach to management is cohesive or fragmented is the manner in which it organizes its departments and articulates the relationship of one to another. A set of local management scenarios is presented here to form a basis for discussion of local decision-making patterns. These three scenario types outline the manner in which many local boards and commissions coordinate (or fail to coordinate) their reviews of land development proposals. The management scenarios may then serve to suggest how a specific community may respond to strengths and weaknesses in the overall Bays management regime discussed in subsequent sections of the report. Clearly, potential adjustments in the existing regime must be carefully targeted so as to capitalize on particular opportunities in the local process. An important objective in presenting these hypothetical scenarios is to emphasize the distinction between technical problems and responses and the institutional ones that may be more difficult to resolve.

These scenarios are generic, and are not intended to represent the four Massachusetts Bays communities (Brewster, Gloucester, Nahant, and Scituate) which were examined in some detail during the course of this study. Rather, these types represent a synthesis of characteristics reported by local officials, interest group representatives, resource

management professionals and citizens interviewed -- all of which have been found to be common to different groups of Bay Basin communities.

Independent or Fragmented Process: No Coherent Management. In this case each town board or agency having permitting authority acts under its own guidelines and according to its own time schedules associated with its jurisdiction. Points of entry into the permitting process are poorly defined, and disjunct time periods of review are easily manipulated by applicants for project approvals. There is little meaningful (formal) coordination among boards. Decisions are typically made without regard to concerns which are known to be of importance, but which fall within another board's responsibilities. Individual proposals rarely receive a comprehensive review. Review standards and documentation requirements are not well defined, so little can be learned from the permitting process. Density bonuses and variances are granted on the basis of inadequate knowledge of land development capacity.

Coordinated management of inter-related water resource problems and assessment of cumulative effects is well beyond the capabilities of a community in this situation. If the breakdown in communication characteristic of this scenario has persisted for a sufficient length of time, boards may be involved in legal actions against one another.

A local decision-making process operating in this fashion is vulnerable at any point in the process. There is little or no certainty that a given project review will result in a predictable decision that incorporates the best available information about the site, the proposed activity, or its impacts on resources. Further, the composition of boards is often highly unstable, yielding further uncertainty about the outcome.

Partial Management: In this case, some staff coordination is available, and yet decision makers have not achieved a productive working relationship with the staff, or do not share and consistently invoke the same long term planning goals.

Here the process appears to be completely run by the staff, who receive little or no direct input from the selectmen or manager. The selectmen or manager, primary decision-makers, are out of touch with the daily operation of town government (at least where natural resource management is concerned), and enter the process only to resolve conflicts or forward a political agenda. This may not necessarily constitute an unworkable situation if skilled and interested planning and resource management staff are consistently available. However, if the top managers have not established a formal basis for the process, it tends to be in a constant state of flux. This is not a process designed to achieve and implement a defined set of objectives. Objectives and implementation methods vary with the makeup of the staff, and depend upon the reaction of top management to their own interests and input from the staff.

In this scenario, the comprehensive plan, if it is available, may be referenced by the planner in his or her review, but is rarely considered by other actors in the loop. If the plan is given little credence by the decision-makers themselves, or if the planner is not viewed as a strong participant in the review process (often a self-reinforcing situation), the long term vision articulated by the plan, and its ability to support the process, can be lost. The outcome of this situation is frequently a process that wavers in terms of its focus. The greatest weight is given to the comments of the reviewer who most strenuously articulates his point of view, albeit a narrow one.

With regard to the decision framework itself, the staff in this scenario has typically agreed to circulate some or all of the development applications in an informal process. Unless this process has been codified in a site plan review by-law, however, the consistency of review is uncertain. The process tends to be carried out by the same individuals who review subdivision plans -- the planner and the engineering department -- with limited input from the

board of health or conservation commission, and occasionally from utility or public safety personnel.

While this scenario represents an improvement over an unmanaged decision process, its effectiveness is inconsistent. It is particularly vulnerable to large scale projects which force their own review processes on the town. Examples are Ch. 40 B comprehensive permit applications, MEPA projects, or other initiatives in which political stakes are able to divert the attention of top management away from the poorly articulated objectives and resource management principles set out by the town. Here again, the lack of a clear, formally established process for the review of development proposals can undermine effective decision-making, even in those towns fortunate enough to have staff dedicated to planning and resource management.

Full Management: Planning Goals Fully Integrated into the Decision Process. In this case the town has made a serious and coordinated commitment to effective resource management, and has taken necessary steps to articulate its goals (via a well-documented, spatially-specific comprehensive plan and supporting by-laws). Responsibilities are clearly assigned to various boards and departments, and a clear path has been established for the sequence of the permitting process. A management and communication framework is in operation to ensure that all of the decision-makers are headed in the same direction. The Selectmen/Manager has a clear understanding of the town's land use goals and consistently directs each department to strive toward them.

Here the comprehensive plan is kept up to date and is well-referenced in the town by-laws and review procedures. The zoning bylaw is consistent with the plan in terms of district designations and recognition of critical environmental areas. Standards are in place to ensure the compatibility of uses within those areas, and variances are issued only in conformance

with those standards. There is a formal site plan review process in place that establishes design and/or performance standards and outlines a set of procedures for review. A clear point of entry to the process exists, and both the applicant and the public can identify in detail which department approvals are necessary, what is required to gain approval, and how decisions are made.

Evaluations have been performed and bylaws and/or procedures established that enable the town to expend its public funds on enhancement of Bays uses according to a clearly outlined priority plan that is based on cost-effectiveness (e.g. for wastewater and stormwater management facilities, retrofitting and repair). Monitoring, inspection and enforcement programs are in place that reenforce and ground-truth town decision-making and assist the community in enhancing its understanding of cumulative impacts on resources.

Needless to say, this scenario represents an ideal, and probably applies to few towns in the Massachusetts Bays basin, at least on a consistent basis. Nevertheless, elements of this scenario exist in many towns and can help reveal how regional, state and federal programs serve to enhance or frustrate effective decision-making at the local level and to suggest how the Bays management system might best be adjusted for greatest benefit.

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SECTION TWO. STATE-FEDERAL AUTHORITIES AND PROGRAMS IN MASSACHUSETTS BAYS MANAGEMENT.

Introduction.

This section of the report focuses upon State and federal laws and programs relevant to the management of Mass Bays space, uses, and resources. Section One examined local and State authorities and programs applicable to land use and watershed management, nonpoint sources of pollution including stormwater runoff, sediment control, septic tanks, wetlands protection, and cumulative impacts. Section Two concentrates upon related areas but from a different perspective: that provided by the interaction of State and federal authorities and programs. These areas include: wetlands protection under federal and State law; protection of areas of critical environmental concern under State law; water quality issues from the perspective of the programs authorized by the Clean Water Act, covering point sources of pollution, pretreatment, toxic reduction, CSOs, stormwater and erosion control, nonpoint source pollution, etc. In particular, the State and federal wetlands protection programs are the target of serious efforts to weaken them. Decisions denying permits to fill wetlands under the Section 404 program have been successfully challenged as unconstitutional takings of private property; federal legislation is pending that would radically revise the federal program; and proposed changes to wetlands regulations and manual would exclude significant wetland areas from protection under the Clean Water Act. Section Two examines these issues in some detail.

Section Two also considers recent efforts by the State to reduce the use of toxics (and toxic pollution to State Waters) (State Toxic Use Reduction Act). Attention is also given to the requirements of the 1990 Coastal Nonpoint Source Pollution Control (Section 6217)

Program, and amendments to the Coastal Zone Management Act obligating the State to adopt "enforceable policies" to implement this Program.

In addition, Section Two addresses the problems of coordinating the array of State and federal laws and programs toward the goal of effective management of Mass Bays space, uses, and resources. This coordination must occur primarily at the points of interaction between State and federal authority. In view of the difficult jurisdictional problems that exist whenever State and federal authorities must be linked together to produce a manageable whole, Section Two gives considerable attention to the mechanisms that have been created, mainly under the provisions of the Coastal Zone Management Act and the Clean Water Act, to encourage and sometimes to require intergovernmental coordination. The analysis of these mechanisms has led to a principal recommendation of the report that the current coordinative structure provided by the Massachusetts Coastal Zone Management Program for coastal use and resource management should serve as the framework for the management of Mass Bays lands and waters, uses, and resources.

Because Mass Bays is the site of the soon-to-be-designated Stellwagen Bank National Marine Sanctuary, which will adjoin or be near to State Ocean Sanctuaries in State waters, Section Two reviews the authority of these two extraordinary programs to protect and manage Mass Bays' waters and resources. The designation of the Stellwagen Bank Sanctuary has necessarily proceeded along a separate track from the development of the Mass Bays CCMP, but because of the overlap of Mass Bays and Sanctuary space and resources, and the complementary goals and objectives of the National Marine Sanctuary Program and the National Estuary Program, it is imperative that the CCMP and the management of the new Sanctuary be coordinated. The State Ocean Sanctuaries Program, although a relatively small program within DEM and with limited staff and resources, possesses unusually broad,

ecologically-grounded authority, which will be important to management of Mass Bays waters, uses, and resources.

Finally, Section Two examines two sets of legal issues that have serious implications for Mass Bays management: the current and changing status of regulatory takings law and the public trust doctrine. The analysis of claims of an unlawful taking of private property through too-strict governmental regulation has evolved through a hundred years' practice in the United States. For a number of reasons, federal courts have recently been less concerned with the necessity of governments acting to protect sensitive areas and resources than with the impacts of such actions upon the economic uses of private property. Because much of the environmental management of Mass Bays lands, waters, and resources requires restrictions upon economic development of private property, any change in takings law may significantly affect the ability of Mass Bays managers to manage these areas and resources effectively. These changes must be anticipated and addressed by Mass Bays managers.

Nationally there is renewed interest in the usefulness of the principles of the public trust doctrine for protecting and managing coastal and nearshore space, uses, and resources. One reason for this interest was the recent decision by the U.S. Supreme Court that the states own in trust for the public all lands washed by the tides, regardless whether such lands were "navigable" (Phillips Petroleum Co. v Mississippi, 1988). The common law public trust doctrine operates in each state; Massachusetts' public trust doctrine is most widely understood in the context of the surviving public trust rights in tidelands (navigation, fishing, and fowling) or in filled lands that were long ago conveyed into private ownership. But the public trust doctrine may provide a public property-based rationale for management of Mass Bays space, uses, and resources that remain in public ownership. Section Two examines the

public trust doctrine from this perspective, and suggests that, in appropriate cases, the public trust may offer protection from takings claims.

SPECIAL AND CRITICAL AREA MANAGEMENT.

This section of the report describes and analyzes the State and federal programs for protecting and managing special and critical areas: wetlands under both federal and State law; areas of critical environmental concern, under State law; and lands adjacent to State rivers, under proposed legislation. In view of pending changes to federal law protective of wetlands, the State Wetlands Protection Act and program may acquire greater importance to Mass Bays managers.

Wetlands.

Introduction.

As of the mid-1970s Massachusetts had nearly 590,000 acres (920 square miles) of wetlands (Tiner, 1989). This represents approximately 12% of the state's land area. Massachusetts' wetlands provide habitat for fish and wildlife, purify water through the uptake or control of sediment and pollutants, act as a storm buffer, and perform many other valuable functions.

In the mid-1970s, approximately 80% of the state's wetlands were palustrine (swampy) wetlands. Of that figure, roughly 71% or 330,000 acres were palustrine forested wetlands. Tidal wetlands accounted for approximately 20% of the state's wetlands. The term tidal wetlands in this instance encompasses marine and estuarine wetlands. The dominant tidal wetland type was estuarine emergent wetlands (i.e., salt and brackish marshes), constituting 40% of the tidal wetlands and accounting for 48,000 acres. Tidal flats totaled about 43,500 acres and represented about 37 percent of the state's tidal wetlands.

Plymouth County had (and has) the most wetland acreage in the state. Of its nearly 97,500 acres of wetlands, 76,000 acres were palustrine wetlands. Estuarine wetlands were also abundant in Plymouth County. Thirty-seven percent of the state's tidal wetlands were located in Barnstable County. It had 20,416 acres of marine wetlands and 23,113 acres of estuarine wetlands. Significant acreage of estuarine wetlands were also found in Essex County. Not surprisingly, Suffolk County had the least amount of wetlands of any county in the state according to the mid-1970s survey. Still, Suffolk County possessed 4,272 acres of wetlands, of which 1,156 acres were marine wetlands and 2,537 acres were estuarine wetlands. The balance was palustrine wetlands.

The number of acres of wetlands which have been lost since these figures were compiled can only be guessed at. A 1988 study of wetlands losses in southeastern Massachusetts performed for the U.S. Fish and Wildlife Service estimated that part of the state lost approximately 150 acres per year. This equals a rate of loss of approximately 0.2%. If that rate is applied statewide, Massachusetts could lose 1,000 acres of wetlands per year.

Fortunately, Massachusetts has one of the strongest wetlands protection programs in the country. In addition to the State Wetlands Protection Act, and the Wetlands Conservancy Program, Massachusetts wetlands are subject to federal protection and local regulation. Local regulation of wetlands has been addressed earlier in this report.

Federal Regulation.

Clean Water Act.

Chief among the federal legislation which affects wetlands is Section 404 of the Federal Clean Water Act, 33 U.S.C. 1344. A permit program has been established pursuant to this authority which is administered by the Secretary of the Army through the Chief of

Engineers of the Army Corps of Engineers (COE). The act prohibits the discharge of dredged or fill materials into the waters of the U.S., including wetlands, unless a permit has been issued by the COE.

The COE has the authority to identify disposal sites and to issue permits for the discharge of dredged and fill material into waters of the U.S., subject to guidelines developed by the EPA Administrator in conjunction with the COE. The Section 404(b)(1) guidelines prohibit the issuance of a permit for projects which would cause or contribute to significant adverse effects to the aquatic environment, and for projects which would violate any applicable state water quality standard. They also forbid permit issuance for projects where feasible, less environmentally damaging, practicable alternatives are available. Unavoidable impacts must be minimized and compensated for. Section 404(c) grants the EPA authority to veto permits or to prevent a discharge in advance of a permit application, and to prohibit specification of any defined area as a disposal site (or deny, restrict or withdraw any such specification) if, after notice and opportunity for a public hearing, the EPA determines that the discharge would cause unacceptable adverse impacts to certain environmental values at a site, such as municipal water supplies, shellfish beds, fishery areas, wildlife or recreational areas.

A public interest review is performed by the COE. This involves a consideration of economic, aesthetic and other impacts. A project which meets the Section 404(b)(1) guidelines may still be denied a permit if the COE determines that the project is contrary to the public interest.

Many of the activities for which approval is sought from the COE are covered by nationwide general permits. These permits provide blanket authorization for specified activities as long as they meet the stringent terms and conditions of the permits. An

individual permit will be required if the discharge will have more than minimal adverse impacts on the aquatic environment when viewed separately or cumulatively.

In 1990 the COE was asked to review 90,000 activities across the nation. Of those, 75,000 were authorized under general permits. Fifteen thousand individual permits were applied for, of which 10,000 were issued. An additional 4,500 of those applications were withdrawn, or were found to be covered by a general permit. Only 500, or 0.56% of the total number of activities for which permits were sought, were denied (Matthew Schweisberg, speaking at the meeting of the Massachusetts Association of Conservation Commissioners, February 29, 1992).

The Fish and Wildlife Service and the National Marine Fisheries Service acting under the authority of the Fish and Wildlife Coordination Act review applications for these federal permits and provide comments to the COE on the environmental impacts of the proposed work. The Fish and Wildlife Service is also conducting an inventory of the country's wetlands and is producing a series of National Inventory Wetlands maps. The Soil Conservation Service has been involved in wetlands delineation since 1956. It has recently become more deeply involved in wetlands determinations through the "Swampbuster" provision of the Food Security Act of 1985, and the 1990 amendments. The "Swampbuster" provision takes benefits away from producers when they plant an agricultural commodity on converted wetlands.

The Rivers and Harbors Act of 1899.

The Rivers and Harbors Act (RHA) also affects Mass Bays water and some wetlands. This act is administered by the COE. Section 10 of the Act forbids any work in navigable waters without the approval of the Secretary of the Army. Although regulation of wetlands under the Rivers and Harbors Act is not as extensive as under the Clean Water Act, the RHA

is important when Section 404 does not apply to a project because of an exemption or some other cause.

Section 10 requires that a permit be obtained from the COE before obstructing navigable waters or altering or modifying the course, location, condition or capacity of any navigable waters. Activities which are outside of navigable waters but which affect navigable waters may also be regulated. The COE conducts public interest reviews, balancing the benefits and detriments of a project in order to evaluate the probable impacts of the project and its intended use on the public interest.

If the COE determines that there will be "significant resource losses which are specifically identifiable, reasonably likely to occur, and of importance to the human or aquatic environment," mitigation may be required.

Proposed Revisions to Federal Law.

Recently the issue of what constitutes a wetland under the federal programs has become a topic of debate. Until 1989, EPA and the COE used their own methodologies for delineating wetlands. In 1989 a manual was promulgated which was to be used by the EPA and COE, as well as the Fish and Wildlife Service and the Soil Conservation Service. However, due to a provision placed in the budget of the Department of Defense by Congress, the Army Corps of Engineers is prohibited from performing any work under the 1989 manual. The Corps has had to revert to the 1987 manual, while the other federal agencies continue to use the 1989 manual. The major distinction between the two manuals is that the 1987 manual is thought to leave open more room for interpretation of its provisions.

In August 1991, a federal wetlands delineation manual was proposed which would have substantially revised the methodology for field delineation of wetlands used in authorizing work under Section 404. Wetlands are now defined as "those areas that are

inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." The 1989 Manual's methodology for implementing this definition in the field was objected to by certain sectors of the regulated community. While their concerns do not necessarily reflect a complete understanding of the 1989 Manual, problematic issues included areas that are dry at the surface (potentially all year round) which might be considered wetlands based on the presence of water as deep as 18 inches below the surface, and whether 7 days of wetness monthly was sufficient to create wetlands.

The proposed revision would require direct evidence of inundation for 15 or more consecutive days or saturation from surface water or from ground water to the surface for 21 or more consecutive days during the growing season or periodic flooding by tidal water in most years. Independent evidence of both hydrology and vegetation is also required. Under the 1991 regulations it could take substantially longer to perform a wetlands delineation.

The proposed methodology would also greatly reduce the acreage of wetlands protected under the federal act. It has been estimated that it would eliminate approximately 50% of those areas currently classified as wetlands nationwide, or fifty million acres. In the New England region, approximately 40% to 60% of those areas now considered wetlands would no longer be so classified.

The Environmental Protection Agency Region 1 Office in conjunction with the New England Division of the COE, the Maine Field Office of the U.S. Fish and Wildlife Service and the Soil Conservation Service has field tested 18 sites in New England applying the 1991 proposed revisions. Of the sites examined, 15 showed a reduction in wetland area ranging

from 5% to 100%, with a median of 60%. In most instances the loss was due to the change in hydrology criteria.

Five of the sites examined were in Massachusetts. The field study demonstrated that one site would lose 65% of its current acreage, two sites would lose 60%, one would lose 30% and one was inconclusive. In addition to the resulting loss of wetland acreage, the field investigators had other criticisms of the proposed revisions. The investigators concluded that although the 1991 revisions were intended to simplify wetland delineations and make them more consistent and accurate, applying the new standards will be more costly and time-consuming. Inconsistent jurisdictional determination will also result.

The proposed criteria were found by the investigators to be neither scientifically nor technically valid. The revisions effectively prohibit the use of hydric soils and hydrophytic plants to infer wetlands hydrology, which contradicts the interdependence of the soils, vegetation and hydrology which comprise wetlands. The manual itself was found to be confusing and disjointed. There is no set time schedule for the approval of the 1991 revisions. There is speculation that the proposed 1991 revisions could be abandoned and that the 1987 manual would be used with some modifications. While the 1987 manual may not be regarded as highly in some circles as the 1989 manual, it is considered preferable to the 1991 proposed revisions.

There are many bills presently pending before Congress which could have a substantial impact on the protection afforded wetlands. Two bills are described below as examples of the issues that currently confront this program. The Hayes Bill (HR 1330) would take away the veto power presently held by the EPA. A new wetlands classification system would be enacted. Wetlands would be classified according to their value: high (type A), medium (type B) and low (type C). Wetlands with high value would receive full protection only if purchased

by the government, those of medium value would receive minimal protection, and those deemed to be of low value would be unprotected. If a wetland is classified as type A the owner may elect to seek compensation for the fair market value of the land, without regard to any diminution of value which may result from the classification. This bill would also establish wetlands mitigation banking.

Another bill (HR 4255), filed by Representative Edwards of California, would have beneficial effects upon wetlands. This legislation would put a hold on the proposed revisions to the wetlands delineation manual until a report on wetlands has been issued by the National Academy of Sciences. The activities regulated by the federal government would be expanded to include flooding, draining and excavation of wetlands. Clarification of the federal agriculture exemption is also proposed.

Rep. Edwards' bill seeks to establish a wetlands restoration pilot program. This program would identify areas where the restoration of significant wetland acreage and functions could contribute substantially to preserving the quantity and quality of the nation's wetlands. It would also test methods for wetlands restoration and develop a means for evaluating the success of restoration efforts.

Obviously, if the 1991 proposed revisions to the delineation manual become binding on the federal agencies or the Hayes bill is passed, wetlands will lose much of the federal protection they have received in the past. Fortunately, state and local wetlands protection in Massachusetts is strong at the present time and the actual loss of wetlands as the result of these changes might be minimal, depending upon several variables.

One variable is the actual implementation of wetlands regulations by municipal conservation commissions at the local level. Also, there is a movement by Massachusetts developers to seek changes in the Massachusetts wetlands legislation to bring it in line with

the weakening federal standards. Massachusetts farmers are also seeking economic relief from current regulations. If such changes were allowed to occur, Massachusetts could lose significant acreage of wetlands.

Legal Issues.

For a number of years issues as to the extent of the federal government's jurisdiction to regulate wetlands under the Clean Water Act and the Rivers and Harbors Act were frequently brought before the courts. Now that most of the jurisdictional boundaries have been established, the main legal issue before the courts is whether wetlands permitting regulations constitute unconstitutional takings of private property without just compensation (for discussion of the takings and related issues, see the section of this report on the law of regulatory takings).

New England Wetlands Protection.

The New England Wetlands Workgroup was formed in 1985 by the six New England states and the federal agencies involved in wetlands protection. The group meets under the auspices of the New England Interstate Pollution Control Commission. The Workgroup has prepared a document setting forth recommendations for changes in the protection of wetlands. These recommendations focus on a regional approach to wetlands management, as well as heightened coordination of efforts between the states and federal agencies.

Among the recommendations the Workgroup has made is the development of a coordinated approach to permit review by state and federal agencies, thus reducing the costs and delays of the permit process. It notes that Massachusetts has already taken a step in this direction through the use of joint application forms. (The WPA authorizes local conservation commissions to coordinate their permitting activities with the COE. The timing of these joint applications can pose difficulties.) However, much more needs to be done, particularly with

respect to improving communication and information exchange between the state and federal levels.

The development of a comprehensive planning program to increase wetlands protection has also been recommended. The focus would be on viewing wetlands on a larger scale watershed basis, rather than on a wetland by wetland or case by case basis. The piecemeal approach currently being taken by New England states is not effective in stemming the cumulative effects of activities impacting on wetlands.

Massachusetts Wetlands Protection.

Massachusetts was the first state to enact a wetlands protection act. The Jones Act enacted in 1963 required permits for structures and fill in coastal wetlands. In 1965 the Hatch Act extended jurisdiction to inland wetlands. These laws were combined and enlarged in 1972 to include beaches, dunes, banks, land under surface waters, and areas subject to flooding. Implementing regulations were first adopted in 1974 and have been revised and supplemented periodically since that time.

The Wetlands Protection Act (WPA) identifies certain public interests which are to be protected by the Act and its regulations. Those interests include protection of public and private water supply, protection of ground water supply, flood control, storm drainage prevention, prevention of pollution, protection of land containing shellfish, protection of fisheries and protection of wildlife habitat.

The WPA requires that permit applications be filed for any activities which remove, fill, dredge or alter an area in or within 100 feet of wetlands or in the floodplain. The 100 foot buffer zone has been criticized by many in the field, particularly conservation commissions, as being inadequate to protect the statutory interests. Some communities, such as Gloucester, have undertaken to expand their buffer zone to 300 feet.

Coastal wetlands are defined in the Act as any bank, marsh, swamp, meadow, flat, or other lowland subject to tidal action or coastal storm flowage. Freshwater wetlands include "wet meadows, marshes, swamps, bogs, areas where groundwater, flowing or standing surface water or ice provide a significant part of the supporting substrate for a plant community for at least five months of the year; emergent and submergent plant communities in inland waters; that portion of any bank which touches any inland waters."

The local conservation commissions are responsible for determining whether the Act applies. A public hearing must be held, after which the conservation commission for the community in which the wetland is located determines if the activity will adversely affect the resource and issues an order of conditions approving or denying the application. All orders of conditions issued by the conservation commissions are to be reviewed by the Division of Wetlands and Waterways (DWW) within the Department of Environmental Protection (DEP) within ten days or they are approved by default. However, the Northeast Region of the DEP has a backlog of 94 appeals and an average processing time of 80 days. The Southeast region has a backlog of 135 appeals and a processing time of 110 days (Mass EOE, Final Assessment Document).

Appeals of the decisions of the conservation commissions are heard by four regional offices of the Wetlands Protection Program in the DWW. The appeal may result in the issuance of a Superseding Order of Conditions. The DEP Office of General Counsel conducts administrative hearings on appeals of Division of Wetlands and Waterways decisions.

Although the local conservation commissions are the primary permitting and enforcing agents under the Act, the Department of Environmental Protection also shares enforcement responsibility, sets overall regulations and policy, provides technical support and training for

the commissions, coordinates with other agencies, and considers requests for variances to the regulations.

The efficiency of enforcement of the WPA and the regulations varies considerable from community to community. There is a great inconsistency of knowledge among conservation commissions as to the provisions they are enforcing. The DEP has included training for conservation commissions among its priorities for the coming years. In some communities the conservation commission does not have the ability or the will to determine if the wetland edge has been properly determined. Trained conservation agents can result in less wetland loss and less effort on the part of the DEP. Approximately one third of 78 coastal communities do not have trained conservation agents (Mass EOE, Final Assessment Document).

Better access to technical assistance would also lead to enhanced protection of wetlands. Many towns lack the resources to retain the experts necessary to prepare to take an enforcement action to court. Technical support is becoming increasingly available through regional organizations such as the Cape Cod Commission. Unfortunately, at the present time certification of consultants performing wetland delineations is not required. The quality of technical assistance received by the commissions therefore varies widely.

Certain specified activities are exempt from the provisions of the WPA. Those activities include mosquito control, maintenance of drainage or flooding systems of cranberry bogs, normal maintenance or improvement of land in agricultural or aquacultural use, emergency projects necessary for public health and safety performed by the state and certified by the local government, and maintenance dredging licensed by the DEP. The application of herbicides in the course of maintaining structures of facilities is also exempt. Herbicide applied in the buffer zone is presumed not to alter a protected area if applied pursuant to the

Department of Food and Agriculture's rights of way management regulations. Electric generating facilities are specially permitted in coastal wetland areas as long as they meet specified performance standards.

Enforcement orders may be issued by the conservation commission, the DEP or the Department of Fisheries, Wildlife and Environmental Law Enforcement. An action to restrain a violation may be filed in Superior Court by the attorney general, the Commissioner, a city or town, an owner or occupier of property which may be affected, or ten citizens of the Commonwealth. Fines of not more than \$25,000 may be assessed for violations, and imprisonment is authorized. Civil penalties of not more than \$25,000 per violation may also be assessed. Any person who acquires or inherits property upon which work has been done in violation of the Act or orders may be sued in a criminal or civil proceeding commenced within 3 years of the acquisition.

As with federal wetlands provisions, the enforcement of Massachusetts wetlands laws occasionally causes a landowner to assert that the regulations have so restricted the use of his property as to constitute a taking without compensation. Massachusetts courts have consistently recognized the rights of the state and local communities to impose such regulations, and have been reluctant to find an unconstitutional taking. For example, in Lovequist v. Conservation Commission of Dennis, (1979) the Supreme Judicial Court found that a taking had not occurred, notwithstanding that the conservation commission's refusal to allow the landowners to construct an improved access road over a marsh would prevent them from subdividing their land into lots for single family homes. The court noted that even without the improved road the land could be used for a single family house, camp or commercial cranberry production. Additionally, the value of the land without the improved road was still more than the landowner had paid for it, allowing the owner to make a profit

upon its sale. Even with strict enforcement of the provisions of the WPA some loss of wetlands is inevitable. The WPA does not prohibit all activities within wetland areas. Exempted activities also result in a loss of acreage.

In 1990 the Massachusetts Water Resources Commission (WRC) adopted a Massachusetts policy of no net loss of wetlands in the short term, and a net gain in the long term. These goals are to be met through avoidance, minimization and mitigation. Responsibility for implementing this policy has been delegated to the DEP. Notwithstanding the DEP's expressed goal of "No Net Loss/Net Gain" Massachusetts wetlands will continue to experience some net loss until wetlands mitigation becomes more prevalent.

Proposed Amendments to the WPA Regulations.

Various revisions to the WPA regulations have been proposed. Among those receiving the most attention are those which would clarify the existing agricultural exemption. These proposed revisions have necessitated the filing of an Environmental Notification Form with the Secretary of Environmental Affairs. Public hearings are presently being held on the proposed revisions.

The Wetlands Protection Act exempts from its provisions "normal maintenance and improvement of land in agricultural and aquacultural use." The terms normal maintenance and improvement are defined in the regulations. The Legislature determined that clarification of the existing regulations was required and adopted legislation directing the Department of Environmental Protection to promulgate regulations upon the advice and consent of the Commissioner of the Department of Food and Agriculture to define these terms.

The legislation also established the Farmlands Advisory Committee (FAC) which is to assist the DEP in drafting the revisions. Pursuant to the statute the FAC is composed of five representatives appointed by the Commissioner of the DEP. One representative is to be from

the Cooperative Extension Service, one from the Soil Conservation Service, one a member of a conservation commission with expertise in agricultural issues and two commercial farmers with expertise in different agricultural commodities.

The revised regulations define land in agricultural use as "acreage within resource areas or buffer zones presently and primarily used in producing or raising" specified agricultural commodities. The term is expanded to include: land within resource areas or buffer zones that is presently and primarily used in a manner related to, and represents a customary and necessary use in, producing or raising such commodities, including: existing access roads and livestock crossings; windbreaks; hedgerows; field edges; bee yards; sand pits; fence lines; water management projects such as reservoirs, farm ponds, irrigation systems, field ditches, cross ditches, canals, grass waterways, dikes, sub-surface drainage systems, watering facilities, water transport systems, and water storage systems (within the limits of existing water rights); agricultural composting sites; agricultural storage and work areas; land under farm structures; and such land required to provide water or access which is necessary to maintain existing acreage in agricultural production. Land in agricultural use may lie inactive for five consecutive years without losing its status, unless the United States Department of Agriculture contract pursuant to the Conservation Reserves Program provides for a longer period of time.

The proposed regulations also define what is meant by "normal maintenance of land in agricultural use." Similar provisions exist for land in aquacultural use. The proposed regulations have met with criticism from environmentalists. Massachusetts Audubon expresses concern that activities which improve land in agricultural use, such a digging a ditch to drain a pond to expand an irrigation system, will now fall under the agricultural exemption, even though the number of acres in production is not expanded (Mass Audubon). Similarly,

attorney Alexandra Dawson has expressed concern that the expanded definition of land in agricultural use will result in "having farmers think they can do anything anytime anywhere on any land they call a 'farm'" (Dawson). It remains to be seen whether the objections that have been raised will result in changes to the proposed regulations.

Wetlands Conservancy Program.

The Wetlands Conservancy Program grew out of the inland and coastal restriction acts of the 1960s. The current legislative authority for this program is found in M.G.L.A. c. 130, Section 105 (coastal wetlands) and M.G.L.A. c. 131, Section 40A (inland wetlands). The Wetlands Conservancy Program is administered by the Department of Environmental Protection's Division of Wetlands and Waterways.

The coastal wetlands statute provides for the adoption, amendment, modification or repeal of orders regulating, restricting or prohibiting dredging, filling, removing or otherwise altering or polluting coastal wetlands. The Commissioner may take such steps for the purpose of promoting the public safety, health and welfare, as well as protecting public and private property.

A public hearing must be held before any such order may be issued. Once an order has been adopted it is recorded along with a plan of the land affected and a list of the assessed owners of the land. Any land owner, mortgagor or long term lessee whose interest in the land is affected by the order may petition the superior court to determine whether the order constitutes a taking without compensation.

If the court finds the order to be an unreasonable exercise of the police power the court may enter a finding stating that the order does not apply to the petitioner's property. The Department then has the option of taking the land by eminent domain. The landowner has no legal remedies other than the judicial taking proceedings.

Violators of the protection orders are subject to criminal fines and imprisonment as well as civil penalties. The orders do not apply to any area under the control of the Metropolitan District Commission or the MWRA. The orders may not prohibit, restrict or impair the performance of duties by the Department of Public Works, the MWRA, the State Reclamation Board or any mosquito control or other project under Chapter 252.

Most activities which are permitted under the Wetlands Protection Act are permitted under restriction orders. The restriction process is carried out on a town by town basis. Approximately sixty towns have had wetlands registered under the program. The DEP believes that the registration program will ease the burden on conservation commissions because landowners will know in advance what activities are permitted, and will accordingly file fewer permit applications.

The Department of Environmental Protection has suspended the imposition of the restriction orders. This decision was made in part because of a perceived conflict between the Wetlands Conservancy Program and the Wetlands Protection Act. While both statutes use the same definition of coastal wetlands, the definition used by the Conservancy Program expands the Commissioner's jurisdiction beyond the coastal wetland to "such contiguous land as the Commissioner deems necessary to affect by any such order in carrying out the purpose of this section." Similarly, the definition of inland wetlands used by the Conservancy Program includes the definition of freshwater wetlands used in the WPA, and also includes that portion of any bank which touches any inland waters of any freshwater wetland and any freshwater wetland subject to flooding. The interaction between the two acts is currently being rethought.

The main focus of the Conservancy Program now is on using aerial photography for the photointerpretation and mapping of Massachusetts wetland resources. Color infrared

photographs are taken in early spring which delineate wetlands areas to a minimum size of 1/4 acre. Hydrological connections are also delineated on the photograph.

Black and white orthophoto maps are also produced in the early spring. The information obtained from the infrared photography is superimposed on the orthophoto maps. While these maps depict the actual locations of wetland areas they do not display wetland boundaries as defined in the regulations of the Wetlands Protection Act.

At the present time over 17% of the State has been captured by aerial photography. The mapping will continue at least until 1993. Additional funding will be needed to continue the mapping past that date. The State is willing to making aerial photography of certain cities and towns a priority if the community is able to assume part of the cost of the procedure.

These maps are valuable as photographic wetlands inventories for local communities and the State. It is hoped that the program will be able to update the photography and mapping process periodically so as to generate a record of wetlands loss or gain.

Global Warming, Sea Level Rise and Coastal Wetlands Loss.

Many scientists fear that global warming will result in a gradual sea level rise which in turn could cause a loss of coastal wetlands. Rising sea level can disrupt coastal wetlands through inundation, erosion and saltwater intrusion. While some scientist argue that the rising sea level would actually create wetlands, the prevailing hypothesis is that the sea level rise would drown more wetlands than it would create.

The historic relative sea level trend in Boston has been for an increase of 2.3 mm/yr. The low end projections of sea level rise in Boston between 1980 and 2100 foresee an increase of 157.6 cm. The high end projections foresee a rise in sea level of 229.8 cm. New England could experience a loss of wetlands ranging from a low estimate of 3% to a high estimate of 63%.

Salt marshes will be among the most vulnerable wetlands. New England marshes normally occur in association with pocket beaches in small coves and behind small sand spits. These areas have little lowland to be inundated and colonized by marshes. Accordingly, it is feared that after 2075 when sea level rise exceeds the present spring high tide level, present salt marshes will be lost with no compensating gain in new marsh area.

The following recommendations for protecting coastal wetlands from the rising sea have been made by the Office of Wetland Protection of the U.S. Environmental Protection Agency:

1. Increase wetlands' ability to keep pace with sea level rise. This can be done by using natural and artificial methods to ensure adequate sedimentation rates.
2. Protect coastal barriers. Efforts should be made on a local level to protect barrier islands.
3. Create no-development buffers along the landward edge of wetlands. This would allow existing wetlands to migrate inland to reestablish in inundated areas that are now uplands.
4. Construct tide protection systems. Tidal gates and physical barriers could be used to both wetlands and developed areas that are vulnerable to sea level rise.

These measures in and of themselves will not solve the problem of sea level rise, but they will offer some protection to our coastal wetlands. However, it should be noted that such measures as creating "no-development buffers" on the landward edge of existing wetlands may run afoul of the constitutional prohibition against the taking of private property and require substantial funding to implement (see discussion elsewhere in this report of regulatory takings).

Massachusetts is among the few jurisdictions which prohibit the construction of bulkheads which prevent inland advances of marshes. This measure will theoretically allow marshes to advance inland as they are drowned by the rise in sea level. Some concern exists as to whether this law will in fact be enforced as the sea level rise advances, since these provisions were enacted before there was serious concern about sea level rise. Bulkheads already exist along much of the shore which are exempt from these provisions.

Areas of Critical Environmental Concern.

Introduction.

The Area of Critical Environmental Concern (ACEC) program was established in 1974 as part of a legislative reorganization of State agencies dealing with natural resources, environmental matters and conservation (MCZMP 1987). The coastal ACEC Program is located within the Massachusetts Office of Coastal Zone Management which administers the Massachusetts Coastal Zone Management Program (MCZMP). (DEM houses the inland ACEC program.) In the eighteen years since the program's inception nineteen areas of critical environmental concern have been designated, thirteen of which are located in the coastal zone. No coastal ACEC nominations are presently pending; several, including Neponset Marshes, are under consideration at DEM.

Procedure.

An area can be nominated for ACEC designation by any ten citizens, a Mayor, City Council or Board of Selectmen, Planning Board, Conservation Commission, state agency, the Governor, or any member of the General Court. A nominating letter must be sent to the Secretary of Environmental Affairs containing a summary of information regarding the area's resources and proposed boundaries, and a general description of the advantages of such a designation.

In order to be nominated an area must contain features from four or more of the following categories: Fishery Habitat; Coastal Features; Estuarine Wetlands; Inland Wetlands; Inland Surface Waters; Water Supply Areas; Natural Hazard Area; Agricultural Area; Historical/Archaeological Resources; Habitat Resources; and Special Use Areas. After a nomination has been accepted a public hearing is held to solicit further information about the area, its resources or the proposed boundary. The Secretary decides whether to make the designation based upon the information presented in the nomination and at the hearing. The Secretary need not accept the boundary suggested by the nominating parties, but may alter it if in the Secretary's judgment a different boundary would provide more effective protection.

The Secretary must consider certain specified criteria in making her determination. Those criteria are: threat to public health from inappropriate use; quality of the area's natural characteristics; productivity; uniqueness of the area; irreversibility of impact; imminence of threat to the resources; economic benefits; and other supporting factors.

Effect.

The main benefit arising out of ACEC designation is the higher scrutiny given to projects proposed within an ACEC. While no new regulatory authorities are set up by an ACEC designation, a project proposed to be built in an ACEC receives more public review and often is subject to higher performance standards. Massachusetts Environmental Policy Act (MEPA) regulations require that all projects within an ACEC that are proposed by the Commonwealth or that involve state funding or permits be described on an environmental notification form. As the ACEC program falls within the auspices of the Massachusetts Coastal Zone Management Program, federal consistency provisions apply (see the section of this report on intergovernmental coordination for a discussion of the State's federal consistency review authority).

The ACEC designation does not affect any existing local bylaws, regulations, zoning or subdivision procedures. Some local communities have enacted bylaws to afford additional protection to ACECs within their boundaries. The CZM Office works with local communities and provides technical assistance to enable them to develop management plans for ACECs within their jurisdiction.

Recent Developments.

The Secretary of Environmental Affairs has recently issued a Final Guidance Document regarding the development of resource management plans for coastal Areas of Critical Environmental Concern. This document was prompted by recently promulgated Chapter 91 regulations. 310 CMR 9.32(e)(4)(c) provides that any "privately-owned structure for water-dependent use below the high water mark" located in an ACEC does not meet the statutory tests for approval under MGL c. 91. Certain exceptions to the prohibition against such structures are provided, one of which is if such structures are consistent with a resource management plan for the ACEC which has been adopted by the municipality and approved by the Secretary (but see the section of this report on the effect of changes in the law of regulatory takings for possible impacts on management of private property located in ACECs).

The Secretary encourages communities to develop broad management plans for ACECs. Among the activities specifically identified for consideration in drafting the plan is the construction and use of new, private non-commercial piers. Particular attention is to be paid to secondary or indirect impacts, where the proposed activity may have significant adverse environmental impacts on the resources of the ACEC beyond the immediate vicinity (or time) of the construction of the pier, and cumulative impacts.

The Final Guidance Document provides outlines for natural resource inventories, human uses inventories, and regulation and management inventories which are recommended to be

performed as part of the planning process. Technical assistance is available for those communities that wish to go beyond the suggested scope of the plan.

Drawbacks.

The designation of an area as an Area of Critical Environmental Concern does not mean that the area will be free of all environmental harm. Often attention is not focused on an area and an area is not nominated for designation until a project is proposed for that area which will threaten its natural state. The project may be approved before the ACEC can be designated. The ACEC designation cannot undo what damage has been done by the project. The mere threat of harm to an area does not guarantee that ACEC status will be granted. ACEC designation is dependent on the areas's resources rather than on perceived threats.

Once a movement has begun to nominate an area for designation years can elapse before the designation is received. Of course, considerable time may be necessary to build a consensus for designation. The move to designate the Inner Cape Cod Bay ACEC began in February 1982. Informal public discussions and working meetings took place for three years with the boards and commissions of Brewster, Eastham and Orleans. Fifteen meetings were documented in the nomination letter (MCZMP 1987).

The nomination letter itself was not sent by the three communities until February 25, 1985. The letter was received by the Secretary on March 1 and the nomination was accepted by letter dated April 8, 1985. The public review process then began. The designation was ultimately granted on October 11, 1985, over three and a half years after the process began. An ACEC Program representative stated that this time period was not unduly long given that multiple communities and complex issues were involved. Local officials lament that the ACEC designation came too late to adequately protect the area from harm caused by a waste treatment plant.

The ACEC designation procedure established by the State does not appear to be unduly time consuming. For example, the Sandy Neck Barrier Beach System was nominated as an ACEC by Barnstable and Sandwich on October 13, 1978, and received its designation as an ACEC two months later on December 15, 1978. The key to the designation process appears to be prompt identification of an area as deserving of designation, and cooperation among those communities in which the area lies in pursuing the designation process.

The ACEC designation does not guarantee that an area will receive adequate protection. Put somewhat differently, the ACEC process is a special management tool rather than a strictly "hands-off" device to achieve a greater degree of environmental planning and protection. Massachusetts Audubon: North Shore has described the Parker River-Essex Bay ACEC which was designated in 1979 as one of the largest pristine salt marsh-estuarine ecosystems north of New York state (Mass Audubon). The ecosystem is home to over 75 species of rare birds, and the waters of the ACEC contain vast amounts of shellfish. Those shellfish are now threatened by bacterial contamination. Mass Audubon has recommended that stricter guidelines are needed at the community level with regard to setting buffer zone widths to further protect these areas.

Stricter community controls are needed regarding more than buffer zones. As the ACEC designation imposes only the relevant provisions of the c.91 program regulations (although other law may also apply), it is up to the local communities to take steps to strengthen their bylaws to protect these areas.

Massachusetts River Protection Act.

The Massachusetts River Protection Act (MRPA) is once again pending before the Massachusetts Legislature. This bill passed the Senate during the 1991 legislative session, but was unable to move out of the House Ways and Means Committee before the session

ended. The bill has been refiled for the 1992 session by Senator Robert Durand (D - Marlboro).

The MRPA received a hearing and a favorable report before the Joint Committee on Natural Resources and Agriculture on January 23, 1992. It has now been sent to the Senate Committee on Ways and Means where various proposed amendments are being considered. Supporters hope that the bill will move out of committee in early March and proceed through the Senate. [As of mid-March 1992, the MRPA had not been moved out of the Senate Ways and Means Committee. No estimate could be obtained as to when the bill might leave Committee. Governor Weld is among those who have expressed support for the bill.]

Among the reasons for the bill is the fact that over half of the State's river segments surveyed continue to fail to meet the Class B (fishable and swimmable) water quality standards mandated by the federal and state governments under the Clean Water Act. Encroaching development is also seen as requiring enhanced protection for the State's rivers. At the present time, local conservation commissions have jurisdiction over a 100' buffer area adjacent to rivers and streams. Some communities have established local river protection bylaws with setbacks as wide as 300 feet. However, the disparity in protection efforts by local governments is among the reasons why a State law is considered necessary.

The main thrust of the legislation is to establish a uniform State development setback of 150 feet from rivers and streams. The 150 foot riverfront area is measured horizontally from the river's mean annual high water line. Within this area the construction or placement of structures, roads, clearings, driveways, septic tanks, leaching fields, underground storage tanks, solid waste, or excavation or fill exceeding ten cubic yards is prohibited. The substantial expansion of existing structures is also banned. However, local conservation commissions are empowered to grant variances from compliance with the act if enforcement

would involve a substantial hardship and the desirable relief may be granted without substantial detriment to the public good.

Nonconforming uses in existence prior to the effective date of the act are exempt from compliance. Other exemptions exist for activities consistent with the standards and policies of the Department of Fisheries, Wildlife and Environmental Law Enforcement which are designed to improve fisheries or wildlife habitat, maintenance and other activities by the Department of Public Works, dams and other structures licensed by the Federal Energy Regulatory Commission, and other governmental activities. Public access to rivers, public non-motorized vehicular access and public boat launchings are also allowed, as is the expansion, repair and maintenance of docks, piers, wharves and other similar structures.

An agricultural exemption has also been written into the bill. The normal maintenance or improvement of land in agricultural use is exempt, provided that maintenance or improvement other than for the cultivation of cranberries occurs more than twenty-five feet from the mean annual high-water line.

The owner of land in agricultural use located within the riverfront area is required to advise the city or town whenever the owner proposes a change in use out of agricultural production and into residential, industrial or commercial use. Once a conversion notice has been received the city or town has a one hundred and twenty day option to purchase the property. The purchase price is specified as the difference between the development value and the agricultural value of the land, to be determined by an impartial appraiser. Enforcement authority is given to the conservation commission, building inspector, planning board, health board or other duly authorized agents, as well as environmental police officers. Cities and towns are also given authority to adopt zoning ordinances or bylaws for the purpose of river and stream protection. Appeals from decisions of conservation commissions

may be made to the Secretary of Environmental Affairs, and appeals from the decision of the Secretary are to be made to the superior court.

Both criminal fines and imprisonment and civil fines are authorized. The fines and penalties assessed accrue to the conservation commission in that jurisdiction. Restoration of the property to its prior or an improved condition may be ordered. Actions for injunctive relief or for civil penalties may be brought by the Commonwealth, any governmental subdivision having jurisdiction over the land or water upon which the violation is occurring or within the watershed where a violation is occurring, and any ten citizens, one of whom is a resident of the city or town in which the violation is occurring.

Recommendations.

1. In light of the movement by the federal government to weaken federal wetlands protection provisions, efforts must be made to resist attempts to amend State wetland protection provisions to make them consistent with the weaker federal provisions. Efforts must also be made to strengthen local wetlands protection ordinances and bylaws to supplement the protection afforded by State provisions.

2. To the extent possible, the federal and State permitting process should be harmonized to save time and effort on the part of the applicant. While steps have already been made in this direction in terms of the utilization of common permitting forms more must be done. Time requirements should be harmonized to the extent possible. Additionally, existing data banks at DEP and EOEA should be combined so that they may be accessed by all local, State and federal permitting authorities. This resource should assist in minimizing duplication of efforts and in avoiding inconsistent results.

3. Provisions relating to the issuance of certificates of occupancy by building inspectors should be amended to allow inspectors to withhold issuance of a permit until such

time as all conditions imposed by the local conservation commission and DEP have been complied with. Local authorities complain that a property can be occupied before all of the conditions imposed have been complied with, thus eliminating any incentive the builder may have to achieve compliance.

4. Better training for conservation commission members is needed. The qualifications and knowledge of commission members varies widely from community to community, and with it varies the quality and extent of enforcement.

5. State certification should be required of wetlands "experts", so as to establish at least minimum qualifications for those that provide technical assistance.

6. Efforts should be made to improve coordination and communication among agencies on the State level, and between State, federal and local agencies.

7. Wetlands should be viewed on a larger scale, either on a regional basis, or at a minimum on a watershed basis. Wetlands do not respect town boundaries. Comprehensive planning programs must be created to protect wetlands on a regional basis.

8. Buffer zones should be expanded beyond the existing 100 feet.

9. Efforts to create wetlands should be encouraged, when those efforts are intended to restore wetlands that have ceased to exist. Preferential treatment should be given to this type of wetlands creation effort over efforts to create wetlands as part of a mitigation requirement. At the present time, both types of efforts receive equal treatment.

10. Steps should be taken now to protect coastal wetlands against increasing water levels due to global warming. The recommended measures by the EPA, as well as other measures, should be considered for adoption.

11. Efforts should be made to educate the public as to the value of wetlands and the need for enhanced protection.

SELECTED WATER QUALITY ISSUES.

Introduction.

This section of the report examines federal and State programs dealing with selected water quality issues as they apply to the Mass Bays Program. There are three major topics covered: (1) point source discharges, including pretreatment/source reduction and toxic pollutant control efforts, (2) stormwater, erosion control and problems associated with combined sewer overflows (CSOs), and (3) enforceable State policies which address nonpoint source (NPS) pollution control.

Clearly, the physical phenomena associated with these categories cut across the artificial divisions chosen here to facilitate discussion. For example, stormwater falls as naturally within a discussion of CSOs as it would in one involving NPS pollution. Stormwater also necessarily implicates erosion and sedimentation control measures.

The foregoing concerns suggest, among other matters, the ultimate futility of a resource-by-resource management approach and raise directly the need for coordinated, cross-media planning on a regional or "integrated" management basis. Where feasible, this section includes a description of such efforts. At the outset, two general trends should be briefly noted.

First, a definite if still fledgling movement toward cross-media planning exists, exemplified both by pollution prevention through toxics reduction programs at both State and federal levels, as well as an integrated federal watershed protection approach, typified by the Merrimack River project. The second major trend may be summarized as "enforcement/enforceability." Enforceability constitutes the principal focus of current NPS planning efforts under the latest federal statutory revisions. Enforcement of pretreatment standards supplies a related, vital link in overall water quality management. Both directions

are perceived in this report as essentially correct. Recommendations for all topics are presented at the end.

Point Sources, Pretreatment, and Toxic Reduction.

This section addresses State and federal pollution control of point source discharges - and, more importantly, of the point sources' sources. First reviewed are the ongoing federal efforts to improve pollution control of point source discharges, in particular through tougher enforcement at the local level of pre-treatment standards under the Clean Water Act (CWA). Next to be considered is the State's innovative Toxic Use Reduction Act (TURA) M.G.L.c. 211. Based on the success of the Blackstone Project, TURA's first practical application, the Commonwealth's "Waste Prevention FIRST" (Facility-wide Inspections to Reduce Sources of Toxics) program is described and the FY 90 Report on the Blackstone Project briefly summarized.

The emphases on toxics reduction and pollution prevention point in part both to the continuing success of approaching pollution control through regulation, and to its inherent limits. A short summary of the considerable difficulties that still remain in this area closes this section.

Federal authority over pollutant discharges stems from Sections 301 and 307 of the Clean Water Act (33 U.S.C. 1311 and 1317) and may be considered under two types, or categories, of discharger - direct and indirect. "Direct" dischargers - including POTWs (Publicly-Owned Treatment Works) - are those who discharge wastewater directly into U.S. waters pursuant to the NPDES (National Pollutant Discharge Elimination System) program (see 40 CFR Part 122). This program establishes technology-based standards to achieve effluent limitations for pollutants classified as "toxic" (DDT, PCBs, etc.), "conventional" (BOD [biochemical oxygen demand], TSS [total suspended solids], fecal coliform, pH, oil and

grease), or "nonconventional" (i.e., nitrates, chlorides, phosphates, iron, etc.). In Massachusetts the program is jointly administered by EPA, under federal statutory authority, and DEP, acting under its own statutory mandate(s). Dischargers must meet any more stringent limitations necessary to meet applicable state water quality standards in addition to requirements imposed by the technology-based standards.

"Indirect" dischargers are also required to comply with technology-based standards. Industrial facilities that discharge wastewater into POTWs are "indirect" dischargers, and must comply with the "pretreatment" standards promulgated under CWA Section 307(b). Cf., 40 CFR Part 403. Despite efforts by EPA to develop general pretreatment standards, there is no national permit program for indirect dischargers. Instead, EPA regulations prohibit introduction into a POTW of pollutants which "interfere" with or "pass through" the POTW. In general, if an indirect discharger causes a POTW to violate its permit or sludge management requirements, it has violated the pretreatment standards.

EPA has developed thirty-four specific industry categories which are subject to pretreatment standards (40 CFR Part 403, Appendix C). In theory, this program would be comparable to that imposed on direct dischargers. However, due to the generally lax practice of POTWs - which bear primary enforcement responsibility for pretreatment standards - Congress has directed EPA to develop additional program requirements (Sullivan 1990). This direction may be aptly summarized under the heading of "water quality" - a re-emphasis of the other, nontechnological criteria of the CWA and the focus of its 1987 amendments.

P.L. No. 100-4, 101 Stat. 7 (1987) - the Water Quality Act of 1987 - amended, among other CWA provisions, several key items and added others. For example, grounds for criminal liability were expanded and the limits for both civil and criminal fines were increased. In

addition, EPA was granted authority, for the first time, to conduct administrative enforcement proceedings for violations.

The WQA of 1987 also amended Section 303(c) to address toxic pollutants by directing states to adopt specific numeric criteria where their discharge or presence could "reasonably be expected to interfere with those designated uses adopted by the State" in an individually affected water segment (33 U.S.C. 1313(c)(2)(B)). Also, Section 304(l) mandates development of individual control strategies for industrial and municipal sources of toxic pollutants where BAT (best available technology) fails to achieve relevant water quality standards (33 U.S.C. 1314(1)).

Subsequent EPA rulemaking built on previous agency efforts. For example, 40 CFR 403.8(f) amended the requirement that POTWs not only have the authority to implement a pretreatment program but specifying that they actually do so. In addition, new amendments require POTWs to inspect programs for each significant industrial user not less than annually, as well as to develop a program for addressing violations with appropriate corrective or enforcement action (55 Fed. Reg. 30117-30118, 30121 [1990]). The new regulations on toxic pollutants also call for toxicity testing as part of the NPDES application process for facilities with a design capacity greater than 1 million gallons per day or with an approved pretreatment program (Hogeland 1990).

Both tougher pre-treatment enforcement and further reduction of toxics, moreover, play an integral part in EPA's effort to foster an ethic of pollution prevention in "the American corporate lifestyle" (EPA 1991). As noted, Massachusetts, too, has moved in this direction. Here, however, the emphasis is - at least initially - non-regulatory.

Passed unanimously by both houses of the General Court as c. 265, St. 1989, TURA establishes a statewide goal of reducing toxic wastes production by 50% by 1997. By

comparison, EPA's "33/50" Program calls for reduction of TRI-listed chemicals by 33% as of 1992 and 50% by 1995 (EPA 1991). TURA enjoyed the joint support of both MASSPIRG (the Massachusetts Public Interest Research Group) and the Associated Industries of Massachusetts (AIM). This may be due as much to the structure of the Act as to its approach.

Representatives of industry, environmental groups and health organizations form an Advisory Board created by the Act to assist an Administrative Council on Toxics Use Reduction, also created by the Act, which is comprised of representatives of DEP, EOE, Economic Affairs, Labor, Public Health, and the State Office of Science and Technology. The Council's responsibilities include recommending to the Governor the allocation of a Toxics Use Reduction Fund and, after July 1, 1995, designating certain industry groups as "Priority User Segments". After July 1, 1995, DEP designation of certain industry groups as priority user segments may terminate prior exemptions from compliance with reporting and planning requirements. In certain cases, DEP might also impose performance standards.

Phase one of the Act - through June 30, 1995 - relies on a technical assistance and self-help approach facilitated by a State Office of Technical Assistance (OTA - formerly the Office of Safe Waste Management). During this period, "Large Quantity Toxic Users" - any firm reporting under SARA Section 313 - must develop an inventory of chemicals for each production process and, where applicable, a toxics use reduction plan for each process. The plans are certified by "Toxics Use Reduction Planners" and plans are forwarded to DEP. By 1995, other firms classified in SIC groups which use chemicals on the CERCLA list must also prepare inventories and reduction plans.

The Act initially avoids the "command-and-control" approach, mandating instead that the State provide technical assistance to industry in meeting its goals and, to that end,

creating a Toxics Use Reduction Institute at the University of Lowell. This Institute develops training programs for toxics use reduction planners and DEP personnel, engages in research and development of toxics use reduction methods, and conducts a study on the restriction of chemical use in the Commonwealth.

Overall, this approach may well represent a good example of moving away from "command-and-control" techniques. TURA embodies what has been termed the "Whole Facility" approach in contrast to a "One-Pipe-At-A-Time" approach (EPA 1990). The "bubble concept" may be analogous, but clearly the current State approach entails a central, proactive governmental role. TURA as implemented also well exemplifies a coordinated, cross-media approach to pollution prevention which looks to the point sources' sources as the most likely area from which to derive further reductions. As noted, the "Blackstone Project" is illustrative.

First proposed in 1987, this joint pilot project of DEM and DEP (funded by EPA and the National Association of Governors) involved twenty-six metal-intensive manufacturing facilities located in the service area of the Upper Blackstone POTW. After multi-media inspections performed by Blackstone Project staff, twenty of these facilities were found to be in violation of at least one environmental protection regulation. Of these violations, an estimated sixteen would probably not have been found by status quo DEP checks. To the extent that private industry must analyze its production processes in an integrated, comprehensive manner as part of the multi-media inspection process, benefits to the regulated community are also expected to enure as a result of more efficient planning (DEP, 1990). Also, because tougher enforcement of pretreatment standards will likely include relatively expensive toxicity testing programs being implemented by local POTWs - and passed on to industrial users, toxics reduction has potential to avoid or mitigate other costs, namely, monitoring and clean-up.

Two additional pilot projects are planned for FY 92: one in the Southeast region (New Bedford/Fall River) and one in the Northeast region (Newburyport). While it is interesting to note that both project locations lie within the coastal zone, this appears due rather to happenstance and existing problems with POTWs than to assignment of priority status to coastal waters as a matter of policy. Alert coastal zone managers might well take note of these pilot programs as an opportunity for the further advocacy of similar and/or additional measures. One or both new projects might provide an opportunity to evaluate overall program cost effectiveness.

The "Waste Prevention FIRST" program - essentially, the statewide extension of TURA through additional projects - clearly displays great potential as a cost-effective tool from both public and private perspectives. It should continue to receive State financial support and ongoing agency priority commitment. This is particularly true because, as previously mentioned, substantial problems remain in the area of point source pollution control.

Despite expenditures totalling billions of dollars to date, problems with POTWs predictably continue. Estimated annual repair and replacement costs statewide could average \$150-200 million, approximately the level of expenditure from 1983-87 under the Construction Grants Program (DEQE, 1989). In addition, the last Clean Water Act revisions - the Water Quality Act of 1987 - call for the phasing out of all federal financial assistance by 1994. During the interim, states may avail themselves of federal grant assistance in decreasing annual amounts in order to capitalize state revolving fund (SRF) programs.

The problem is especially acute at the local level, as the case of Gloucester perhaps best demonstrates. Gloucester now operates a primary treatment plant under a 301(h) waiver but may be required to move to secondary treatment. Additional capital intensive water pollution measures have been mandated under a consent decree, either upgrades - sewer

outfall pipe extension and the North Gloucester sewer extension - or planning for future CSO facilities improvements. In the current economic climate, the possibility of further encumbering a municipality with a debt of \$14 million (the cost estimate for Gloucester's CSO plan) causes considerable alarm among local officials (personal communication). Because Massachusetts shares NPDES authority with EPA, the State role in alleviating the local economic burden must also be emphasized.

Perhaps in part for such reasons, additional State funding has been committed in the past to assist localities with sewer collection system grants for projects ineligible for federal money (\$121 million since 1980), and another \$100 million in grants has also been provided under an Infiltration/Inflow Reduction Program (DEP 1989). Clearly, the Commonwealth will need to continue and enhance such efforts. It is also likely that localities will have to raise their water rates to cover these costs. Costs associated with sewage sludge disposal and related health issues also continue to loom large. Still, without doubt conventional pollution control efforts have succeeded to a measurable extent.

Biennial evaluations have been performed by the State since 1977. The first report indicated only 16% of waters surveyed supported their designated uses. The 1988 305(b) report estimates that 52% of the waters fully supported their use designation, and another 35% did so partially. Of the latter category, most restrictions resulted from stormwater NPS and CSO inputs.

Statewide environmental monitoring for water quality has not been implemented, in part due to DEP program cutbacks (EOEA, 1992). MCZMP has been working on a plan to compensate for the normal project-by-project statutory design; however, a funding mechanism has yet to be determined for its implementation requirements (EOEA, 1992). A watershed approach to simultaneous NPDES permitting has been proposed as part of a comprehensive

waste load allocation analysis - with contributions from dischargers to provide a program funding source (id.). The concept appears ready-made for a grant-funded demonstration project and might, given current initiatives, factor into an evaluation of the Merrimack River Watershed Protection Project now underway.

In sum, the current state of affairs with respect to the topics discussed above may be characterized as dynamic or, at least, progressive in that some of the often-noted but seldom-addressed problems of cross-media pollution have begun to receive systematic and coordinated attention. Moreover, cautious optimism seems warranted in the area of new non-regulatory programs. These efforts appear well-conceived and await appropriate funding for implementation before they can be properly evaluated.

Stormwater, Erosion Control and CSOs.

As noted above, stormwater raises issues involving both CSOs and NPS control. Under Section 402(p) of the 1987 WQA, stormwater discharges from non-CSO sources (i.e., storm drains) have - with four exceptions - not needed permits, although EPA must perform a study of this topic and propose a regulatory program by October 1, 1992 (33 U.S.C. 1342; 40 CFR 133). This section bridges the gap between the stormwater/CSO issue and NPS/stormwater concerns by a discussion of other non-end-of-the-pipe pollution abatement legislation, programs and projects.

The initial focus is on State CSO implementation policy which is critically viewed in part using Gloucester as an example. Next considered are recent legislative efforts at erosion and sedimentation control, both State and federal. Briefly, soil conservation has undergone a national re-birth over the past fifteen years; however, the Commonwealth still lacks basic legislation to comprehensively control erosion and sedimentation. Thus, leadership on this key issue, as various sources agree, is problematic.

In its May 1990 "Implementation Policy For The Abatement Of Pollution From Combined Sewer Overflows," the Commonwealth has articulated the goal of eliminating the adverse impacts of CSOs to surface water segments - both riverine and estuarine - as designated on a biannual basis (DEP, 1990). Typically, CSO impacts are abated by sewer separation. If elimination is not feasible, minimization of CSO impacts to achieve the "highest water quality attainable" serves as the alternative target. Elimination of impacts, and not "uniform treatment requirements" is the goal and DEP utilizes a "bubble concept" in looking at effluent limitations. Where CSO removal is not "feasible," impacted waters shall be reclassified as "partial use" to indicate occasional short-term impairment of uses. Because the issue is urgent in Gloucester, and because "feasible" is a regulatory term of art, the subject merits further analysis.

In order to demonstrate that sewer separation is infeasible, 314 CMR 4.03(4) requires a showing that the project cost will cause "substantial and widespread economic and social impact." This may consist of documentation that costs are excessive when compared to potential benefits. In determining benefits, DEP may consider potential interactive pollution sources such as storm drain discharges after separation. Once this burden is met, CSO relocation alternatives must be explored. In doing so, maximum recovery of water uses, including protection of critical uses, must be considered. If neither alternative is feasible, the segment impacted may be assigned the partial use designation.

According to this policy, attainment at all times of the fishable/swimmable goal would effectively require elimination of CSO impacts "since there is no finite limit to the magnitude and duration of a precipitation event." However, it would take more than sewer separation to make swimming a goal during at least portions of the year, because storm drains and NPS effects due to precipitation events might account for strategic closings. Also, while

there may be "no finite limit" to any precipitation event, this surely does not make the limit infinite. Thus, the wisdom of making swimmable waters an attainable goal at all times may be doubted. While seafood safety concerns are addressed elsewhere in this report, the same considerations might also validly apply to the goal of making waters fishable at all times. In current environmental policy parlance, the issue is one of "targeting" - or, in the keynote address to the National Press Club by EPA Administrator Reilly: "Aiming Before We Shoot" (EPA, 1990). This is particularly so because DEP's own regulations recognize the critical importance of other pollution sources.

For example, even after untreated sewage has been eliminated via sewer separation, the Departmental regulations recognize that storm drain impacts - and, by implication, NPS pollution - must still be taken into account. One might also add that the impact of private septage system leachates also may contribute to non-attainment of DEP goals. The partial impression that the Commonwealth's CSO policy may be lacking in certain respects receives at least tangential support when erosion control measures and revision of Title V of the State Sanitary Code - both now under active consideration - are included in the pollution calculus. Title V reforms, which would address some concerns already noted, are considered in the local/state section of this report.

At the State level, legislation to reduce pollution from erosion and sedimentation was introduced both in 1990 (House No. 3769) and again in 1991 (Senate No. 860 - the Durand/Wetmore bill). Briefly, the bill would authorize the State Commission for Conservation of Soil, Water & Related Resources to promulgate rules and regulations to be implemented by conservation districts in cooperation with municipal conservation commissions. It has been well received by the environmental community generally. Both the Massachusetts Association of Conservation Commissions and, with some relatively minor recommendations for revision,

the Massachusetts Association of Conservation Districts support the bill. According to a Status Report prepared in October 1991 for Conservation District Supervisors in Massachusetts, "erosion and sediment control and possibly stormwater management are the only remaining major pieces of environmental legislation not enacted thus far" (SCS, 1991). By contrast, twenty states - including New Hampshire and Maine - had enacted sediment and erosion control programs by 1980 (Malone, 1991). Program authority will typically prohibit issuance of subdivision approvals or building permits without local plan approved by the district (id.).

Currently, prospects for passage of the Durand/Wetmore bill this term seem remote. According to one source, the bill's sponsors expect that local conservationists, rather than legislative staff, will carry forward the cause (MACC, 1992). In part, this may be due to the opposition of developers to related legislation which came close to being enacted last term - the River Protection Act (Senate No. 905, also sponsored by Senator Durand) (NEEC, 1992) (see discussion of this proposed legislation elsewhere in this report). Yet another perspective emphasizes a lack of interest at DEP in actively pursuing this legislative agenda (personal communication 1992). Given the CSO/stormwater nexus, more active support for such measures by the chief environmental state agency would seem warranted.

At least in theory, whether in response to federal mandate or of its own initiative, the State could develop a separate piece of legislation in this area which, depending on its structure, might leave little if any role for conservation districts. Whether inadvertently or by design, then, an extant governmental resource which might otherwise serve to coordinate management of this topic - namely, the dozen State conservation districts and associated local conservation commissions - seems presently to be either ignored or underutilized.

By contrast, federal legislation has long recognized the importance of erosion and sedimentation control issues. Begun originally in response to the Great Depression and extensive contemporaneous droughts in the early 1930s, there are over twenty-seven federal programs under eight different agencies that are designed to control soil erosion (Malone, 1991). The U.S. Department of Agriculture (USDA) is the principal - but not sole - agency in charge of these programs. For example, the Department of Interior administers the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C.1201-1328). The program merits brief consideration for two reasons. First, minimum environmental standards must be met before a permit for surface mining of coal will be issued. If prime farmland is the mining site, additional requirements are imposed. Second, and far more importantly, the latter requirements constitute federal land use management enforced through permitting - an approach generally eschewed by Congress. Also, the additional requirements have been challenged - and upheld - by the Supreme Court in Hodel v. Indiana, (1981).

In 1977, Congress passed the Soil and Water Resources Conservation Act (RCA), reforming and improving USDA conservation programs. By 1982, the first USDA national RCA program report emphasized two concepts formerly anathematized as tending toward federal land use control: namely, targeting and cross-compliance. (Malone, 1991).

Targeting allocates funds on the basis of where they are most needed, and not only on the grounds of who may choose to apply. Cross-compliance restricts federal subsidies to farmers who fail to use acceptable conservation measures. Both strategies moderate, if they do not implicitly reject, a purely voluntary approach. This new direction received formal adoption in several provisions of the 1985 Farm Bill (also called the Food Security Act or FSA).

Two of the conservation measures enacted as part of this bill are the "Sodbuster" and "Swampbuster" programs; the other two are the conservation compliance and conservation reserve programs. While these programs do not compel soil and water conservation, a producer will forfeit USDA program payments - i.e., price and income supports, disaster payments, CCC storage payments, crop insurance, farm storage facility loans, etc. - if the conservation provisions are not fully met.

Swampbuster establishes the cross-compliance mechanism for farm subsidies and wetlands preservation. (Wetlands are addressed elsewhere in this report.) Under Sodbuster, a producer is ineligible for USDA program payments for agricultural commodities produced on highly erodible land absent an approved conservation plan. The Conservation Reserve Program reduces soil erosion on the most erosive land by converting it to permanent vegetative cover in accordance with an approved conservation plan. The government pays the producer "rent" (limited to \$50,000/yr/producer) and farmers may still charge access fees for hunting, fishing and camping - although grazing and timber cutting are not permitted. State programs that compensate landowners for access to private land for recreation and wildlife management do not violate the terms of the Conservation Reserve contract which must be signed.

In its most controversial program, the 1985 Farm Bill's Conservation Compliance provisions require that all farmers must be actively applying soil conservation plans to farmlands defined as "highly erodible" under Sodbuster. Producers must implement plans fully by 1995 or forfeit all USDA program payments. It has been estimated that the Soil Conservation Service will need 3,000 additional technicians at a cost of \$95 million for approximately one million farms to meet this requirement (id.).

The Food, Agriculture, Conservation, and Trade Act of 1990 (FACTA) posed the first major test of the current renaissance in soil conservation and its environmental linchpin, the cross-compliance strategy. The 1990 Farm Bill's conservation title conveys a mixed signal in that, while the "Conservation Program Improvements Act" significantly expands the reserve program, it also adds new exemptions. This compromise addresses both the environmental community's concern over the need for further wetlands preservation, as well as the view of producers and the administering agency that no additional action was needed (id.).

In sum, the federal approach in this area has shown progress in implementing mechanisms to optimize environmental benefits by their incorporation into ongoing programs. Massachusetts would clearly benefit by a more thorough adaptation of both targeting and cross-compliance strategies into its ongoing environmental policymaking endeavors. Soil erosion and sedimentation control might furnish the next best opportunity and DEP - as the primary state environmental agency - should consider either sponsoring its own legislation in this area or supporting more actively the legislative agenda put forth by Senator Durand and Representative Cohen. Moreover, while the topic of soil conservation/erosion and sedimentation control may be addressed discretely, this area needs to be understood in the context of other ongoing programs. For example, CSO policy necessarily intersects with NPS pollution control strategies. Thus, it is likely that NPS management measures may help fill in any gaps.

Nonpoint Source Pollution.

According to one estimate, NPS pollution may account for 65% of stream pollution, 76% of lake pollution, and 45% of estuary pollution of water bodies found by EPA to be unfit for their designated uses (ER 1987). Furthermore, NPS pollution is less (or not) amenable to technological controls than point sources. Given the resistance to "federal land use

management," the federal government has chosen to restrict its role to funding state and regional planning efforts. This section reviews three major phases of this federal involvement, then looks at some additional state NPS-related efforts.

As noted, planning efforts to control nonpoint source pollution are not new. What distinguishes the current political context is the real possibility that enforceable NPS plans can be implemented. The first federal attempt to address this issue comprehensively came in Section 208 of the 1972 FWPCA amendments under which a number of regional planning agencies received federal funds to prepare area-wide water quality management plans for their jurisdictions. Results of the Section 208 program, criticized for its lack of "teeth" - i.e., enforceability - varied depending on the regional agency's ability and commitment to create and maintain a local system of support. Thus, while the Metropolitan Area Planning Council (MAPC) plan contained both extensive analysis and specific recommendations for each of the ninety-two communities in its designated study area (Metropolitan Boston), little seems to have been acted on at the local level (Crystal, 1992). By contrast, the CCPEDC (Cape Cod Planning & Economic Development Commission - the Cape Cod Commission's predecessor), acting in a more cohesive region, saw many of its member communities implement its recommendations (id.)

Section 319 of the Water Quality Act of 1987 further amended the FWPCA and marks the second major federal effort to address this problem via comprehensive state management plans. The Section 319 Program is administered by the states, rather than regional entities, and requires both an "Assessment Report" and a "State Management Plan." If EPA approves the plan, states may win competitive implementation funding authorized specifically by Section 319.

The state Assessment Report must: (1) identify navigable waters which cannot reasonably be expected to attain or maintain applicable water quality standards without additional action to control NPS pollution; (2) identify, for the same waters, NPS categories and subcategories or, where appropriate, particular nonpoint sources which add significant pollution to identified waters; (3) describe the process, including intergovernmental coordination and public participation, for identifying best management practices (BMPs) and measures to reduce each NPS category to the maximum extent practicable; and, (4) identify and describe the pertinent state and local NPS programs (33 U.S.C. 1329).

The state Management Plan must include: (1) identification of BMPs to reduce NPS pollutant loadings; (2) identification of programs to achieve implementation of BMPs; (3) an implementation schedule; (4) certification by the state Attorney General that the legal authority to implement the program either exists or is being sought; (5) identification of funding sources to implement the program; and, (6) identification of federal financial assistance programs and projects which the state will review for consistency with the program (id.).

EPA has approved Massachusetts' Section 319 Management Plan. Generally, the Section 319 plan opts for a networked approach to existing measures rather than envisioning a comprehensive enactment for NPS control. Under the plan, "strategies" are articulated to pursue NPS controls on a source specific basis. For example, the Section 319 plan calls for amendment of the State subdivision control law, M.G.L.c. 41, Sections 81K-81GG, to require plans to show BMPs for controlling stormwater runoff. Again, there is the need for a more active leadership role in following through on such clearly sensible recommendations. DEP also recommends that BMP manuals be provided to local planning boards and boards of health to assist them in following through on this yet-to-be-enacted law. While funding for a State

Nonpoint Source Program has been proposed - but not authorized - to help implement such measures, DEP has elected to supply technical information through a demonstration grants program under the limited funding mechanism of the Section 319 program (DEP, 1989). National funding for this program has not exceeded 40 million dollars and should be increased.

The plan also recommends passage of a new, statewide law to require local approval by conservation commissions of an erosion and sedimentation control plan whenever projects entail major alteration - i.e., more than 10,000 square feet - or a slope of more than 8% - like the Durand/ Wetmore Bill discussed above (id.). Thus, while the earlier analysis of stormwater still holds, it is evident that State planners are well aware of the need to augment existing authority in this area. Indeed, a de facto piecemeal approach has been ongoing, as the Transportation Bond Act - Chapter 15 of The Acts of 1988 - demonstrates.

Among other matters, the Act provided for a sum of not more than \$20 million to treat or eliminate highway drainage into the Hobbs and Stony Brook Reservoirs or any land within 500' of either brook. Another provision, Section 3(q), established a sum not to exceed \$5 million for grants to localities to alleviate inadequacies, deficiencies and pollutants in public water supply systems and coastal waters due to stormwater runoff. However laudable, this sort of isolated improvement falls short of optimal rational planning. Moreover, such measures might not pass muster under the new directive for NPS control which requires "enforceable policies." Thus, unlike phase two - which failed to provide EPA with meaningful implementation authority - the focus has finally turned to additional program elements.

The U.S. Congress enacted its third - and most recent - effort to address NPS pollution in Section 6217 of Public Law 101-508, the Coastal Zone Reauthorization Act Amendments of 1990 (CZARA) (the Coastal Nonpoint Source Pollution Control Plan). In doing so, Congress added to its statutory findings Section 302(k) which acknowledges explicitly that "land uses

in the coastal zone, and the uses of adjacent lands which drain into the coastal zone, may significantly affect the quality of coastal waters and habitats, and efforts to control coastal water pollution from land use activities must be improved" (16 U.S.C. 1451 et seq., as amended). More importantly, P.L. 101-508 now requires that, to be approved, a state coastal zone management program must contain "enforceable policies and mechanisms to implement the applicable requirements" of Section 6217's Coastal Nonpoint Source Pollution Control Plan (Section 306 (d)(16), Environment Reporter, Federal Laws, 71:8006). Also, Section 304 (Definitions) amends the CZMA to define "enforceable policies" as those policies which are "legally binding through constitutional provisions, laws, regulations, land use plans, ordinances, or judicial or administrative decisions, by which a State exerts control over private and public land and water uses and natural resources in the coastal zone." Thus, while participation in the coastal zone program remains voluntary, federal approval - and a non-trivial amount of federal financial support (perhaps as much as thirty percent) - hinges on state compliance with this new requirement.

Under proposed program guidance developed jointly by NOAA and EPA, in addition to enforceable policies, state coastal NPS control plans must: (1) identify land uses which may cause or contribute significantly to coastal water degradation; (2) identify critical coastal areas impaired or threatened by NPS pollution; (3) implement management measures "in conformity with" those specified in EPA's Section 6217(g) guidance; (4) implement additional management measures for land uses or critical coastal areas as necessary to achieve and maintain water quality standards; (5) provide technical assistance to local governments and the public to implement management measures; (6) establish and/or improve mechanisms to coordinate relevant state and local land use, habitat protection, water quality permitting and public health and safety agencies/officials; (7) propose modifications as needed to the state

coastal zone boundary to implement NOAA's recommendations under 6217(e); and, (8) provide for public participation in all aspects of the program (56 FR 51882-51884). At present, consensus has yet to be forged on the subject of "enforceable policies" under the CZMA. However, as a term of art understood and applied through two decades of implementing state coastal zone management programs in the United States, its meaning should be relatively free of doubt and may be determined by examining the consistent interpretation and application of this formerly regulatory (now statutory) term by NOAA. NOAA has from the beginning interpreted "enforceability" to require that "enforceable" coastal policies be embodied in state law, binding upon state agencies and citizens. It is apparent that the proponents of the Section 6217 Coastal Nonpoint Source Pollution Control Program intended that such plans be backed up by implementable and enforceable policies and not suffer the fate of earlier NPS control efforts.

Coastal NPS plans are supposed to coordinate closely with other CWA Sections (208, 303, 319 and 320). And it is likely that land use measures such as those mentioned earlier for stormwater erosion and sedimentation control would, if enacted, satisfy this requirement at least in part (personal communication).

Citizen groups and non-governmental organizations will apparently be able to monitor progress toward developing enforceable state Section 6217 plans and may, in suitable circumstances, take appropriate action under the CZMA and state law to ensure that the enforceable policies required by the CZMA are adopted by state CZM programs.

Other federal enactments which take cognizance of the NPS issue include the Intermodal Surface Transportation Efficiency Act of 1991, Section 1057. Among other matters, this Act reauthorized federal highway legislation. The Section cited deals with

erosion control during highway construction by requiring the Secretary to develop guidelines for States in carrying out projects funded in whole or in part under this title.

Guidelines must be consistent with both NPS management programs under CWA Section 319 and coastal NPS programs developed under CZARA Section 6217. State laws which impose more stringent controls are not preempted by these guidelines. The Commonwealth's Section 319 Assessment Report contains an excellent summary of various NPS programs then extant (DEP, 1987). Some have already been discussed; for example, the Merrimack River Watershed Protection Project. Such efforts, in this case coordinated by the federal Office of Wetlands, Oceans and Waterways (OWOW) obviously have NPS potential. In addition to mixed state/federal efforts, the following purely state land acquisition programs require brief mention.

In Massachusetts, there is a "Self-Help Program" - M.G.L.c. 132A, Section 11 - which funds up to 80% of acquisition costs for conservation, open space and passive outdoor recreation lands obtained by local conservation commissions. There also exists both an Aquifer Land Acquisition Program and an Early Acquisition of Reservoir Sites Program to help localities protect their public water supplies. The "Scenic Rivers Program" - which targets "greenways" along rivers and streams for acquisition - would also serve an NPS function if it were funded. The issue of funding for such programs is likely to present continued problems in the future.

At the state level, too, Rep. David Cohen has introduced legislation - House No. 397, the "Watershed Protection Bill" or "Cohen Bill" - which would regulate land uses within 400' of the Quabbin and Wachusett Reservoirs and would also limit development densities both over aquifers within their respective watersheds and along the Ware River and major tributaries to the reservoirs. The measure has provoked great controversy among developers

and may serve as a bellwether for possible future watershed protection bills in closer proximity to the coastal zone. Takings claims - as well as NPS benefits - may be anticipated if it is enacted.

Dredged Material.

This section addresses management options for dredged material under both federal and State law. For purposes of this discussion, dredged - as opposed to excavated - material means any sediment removed from below the mean high water mark. Generally, management options fall into three broad categories: open ocean (with and without capping); near-shore (subaqueous borrow pits, containment areas, creation of habitat, beach nourishment and sidecasting); and upland re-use (landfill and landfill capping, habitat creation and other commercial activities). (Dolin and Pederson, 1991).

Major federal statutes governing dredged material are the Rivers and Harbors Act of 1899 (33 U.S.C. 401 et seq.), the Clean Water Act (CWA) (33 U.S.C. 1251 et seq.), the Marine Protection, Research and Sanctuary Act (MPRSA) (16 U.S.C. 1431 et seq. - also called the Ocean Dumping Act) and the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321 et seq.). Title III of MPRSA, the Marine Sanctuaries Act (MSA), also receives brief discussion. The federal Coastal Zone Management Act (CZMA) (16 U.S.C. 1451 et seq.) is considered under state authorities.

NEPA requires federal agencies either proposing or issuing permits for projects which may significantly affect the quality of the human environment to prepare an environmental impact statement (EIS). Guidelines for what must be included in an EIS have been developed by CEQ - the President's Council on Environmental Quality. Federal permitting authorities must take account, under the guidelines, of economic, historic, social and archaeological

impacts in addition to environmental ones. Alternatives to be evaluated must include a "no-project" option.

EPA normally designates open ocean disposal sites under the MPRSA, reviews all dredging disposal permits issued by the U.S. Army Corps of Engineers (COE) and possesses final statutory authority to resolve any disputes over site designation. COE is the principal federal permitting authority. For example, Section 10 of the Rivers and Harbors Act prohibits the alteration or obstruction of "navigable waters" except by COE permit. Included in the term "navigable waters" are those waters subject in the past, or potentially subject in the future, to tidal action or which may be suitable for interstate or foreign commerce. COE also issues permits under Section 103 of the MPRSA and Section 404 of the CWA. While the matter may not have been litigated to a certainty, COE jurisdiction under Section 103 of the MPRSA likely extends throughout the 200 mile EEZ. Because COE jurisdiction under the CWA Section 404 extends to essentially all U.S. waters, its upland reach is also potent.

Title III of the MPRSA - the Marine Sanctuaries Act (MSA) - confers on NOAA, among other matters, responsibility for the process of nomination and subsequent management of marine sanctuaries such as Stellwagen Bank (see the section elsewhere in this report on the Stellwagen Bank National Marine Sanctuary). Because NOAA's jurisdiction applies when an ocean disposal site actually lies within sanctuary bounds or negatively affects the quality or resources of the sanctuary, continued dumping of dredged material at the Mass Bay Disposal Site (MBDS) may pose management issues well into the future.

Other federal agencies involved in marine-dredged material management include the National Marine Fisheries Service (NMFS) - a division of NOAA - and the U.S. Fish and Wildlife Service (FWS). NMFS reviews COE permits and EPA site designations under its authority to

protect living marine resources, including endangered species. FWS exercises similar review authority for fish and wildlife in, for example, wetlands.

Major State enactments governing dredged spoil include the Massachusetts Environmental Policy Act (MEPA) (M.G.L.c. 30, Sections 62-62H) - discussed substantially elsewhere in this report, and the Public Waterfront Act (M.G.L.c. 91). Chapter 91 gives DEP authority to issue dredging and dredged material disposal permits for Massachusetts tidelands; that is, for lands seaward of the mean high water line as far as the limit of the State's territorial waters (generally, three nautical miles offshore) (see discussion of Chapter 91 elsewhere in this report). DEP authority over dredging activities in State wetlands and waterways also stems from CWA Section 401 - its Water Quality certification power (see discussion of the State's water quality certification elsewhere in this report). Under this program, proposed discharges of pollutants may not violate federal or State water quality standards. "Pollutants" include silt, soil, hazardous contaminants and fill material.

After projects have received all required State permits and completed the MEPA review process, the Massachusetts Coastal Zone Management office (MCZM) performs a consistency review to determine if the proposal accords with State coastal policies. In Massachusetts, there are twenty-seven policies, of which thirteen are regulatory. For example, regulatory policy 5 states that MCZM will ensure that dredging and disposal of dredged material has the minimum possible effect on water quality, marine productivity and public health. Non-regulatory policy 19 encourages targeting funds for channel dredging to designated ports and developed harbors. Negative determinations of federal consistency by MCZM may be appealed to NOAA's Administrator, the Under Secretary of Commerce (see discussion of the State's federal consistency authority elsewhere in this report).

Other State laws may also be implicated. For example, if dredged material disposal is proposed for an ACEC - an area of critical environmental concern - 310 C.M.R. 9.401(b) restricts such activities to beach nourishment, dune construction or the enhancement of fishery and wildlife resources. M.G.L.c. 21A). M.G.L.c. 132A - the Ocean Sanctuaries Act (OSA) - confers regulatory authority over dredged material disposal and fill activities on DEM (Department of Environmental Management)(OSA jurisdiction is further discussed elsewhere in this report). Additional State laws which may control the final destiny, or transportation thereto, of dredged spoil are not included in this discussion. Public meetings concerning dredged material from the Central Artery Tunnel and Boston Harbor Navigation Improvement projects will be sponsored by a Task Force which includes MCZM and COE's New England Division (Dolan and Pederson, 1991).

Recommendations.

1. The multi-media team approach employed by the State Waste Prevention FIRST program is being expanded and should be fully funded.
2. While local communities may have to increase water rates in furtherance of greater compliance with water quality goals, State and federal authorities have continuing leadership roles to play, particularly with respect to financing.
3. Because of financial constraints, targeting and cross-compliance strategies should guide policy at State and federal levels.
4. Evaluation research projects should be funded to help track program success as well as to inform more fully the public and policy debates over cost-benefit estimates. The two new TURA projects, for example, might provide a good opportunity.
5. Because stronger pretreatment and toxics reduction programs may yield large dividends, and also because NPS controls - including those affecting soil erosion and

sedimentation - may further abate the problem, current state enforcement policy should be revised to integrate better both structural and nonstructural controls.

6. Watershed management and protection approaches should be pursued. Obviously, the Merrimack River project, while only launched recently, will provide a benchmark. State and federal policymakers should evaluate all proposals, for example, the Cohen Bill and the MCZMP internal effort, and provide funding for additional watershed management projects.

7. The new Coastal Nonpoint Source Pollution Control Program (Section 6217) and the related 1990 amendments to the CZMA should be the basis for a major effort to put into place enforceable policies that will reduce the level of NPS pollution to Mass Bays coastal waters, and the Mass Bays Program (as well as NOAA and EPA) should support this effort as a matter of high priority.

8. DEP - as the key state environmental agency - should consider a more active advocacy role in supporting or sponsoring legislation to address issues of stormwater and soil erosion.

CAPE COD COMMISSION.

This section describes and considers the Cape Cod Commission (CCC; the Commission), enacted as c. 716 of the 1989 Mass. Acts, the Cape Cod Commission Act (Act). Signed by the Governor on January 12, 1990, the Act took effect on March 27, 1990, after a special county election at which a majority of voters in the fifteen municipalities of Barnstable County approved the Act in its entirety. While the CCC's relative newness makes impossible consideration of an extensive track record at present, this section will also include a review of the state-funded Monomoy Lens Groundwater Protection Project currently proceeding under the auspices of the Commission.

Purposes of the Act.

The purposes of the Act are "to further: the conservation and preservation of natural undeveloped areas, wildlife, flora and habitats for endangered species; the preservation of coastal resources including aquaculture; the protection of ground water, surface water and ocean water quality, as well as other natural resources of Cape Cod; balanced economic growth; the provision of adequate capital facilities, including transportation, water supply, and solid, sanitary and hazardous waste disposal facilities; the coordination of the provision of adequate capital facilities with the achievement of other goals; the development of an adequate supply of fair, affordable housing; and the preservation of historical, cultural, archaeological, architectural and recreational values."

Structure of the Act/Commission.

Under the Act, the Commission is an agency within Barnstable County government and serves as its regional planning/land use regulatory board. The Commission has 19 members: one from each municipality to be appointed by its Board of Selectmen; one County Commissioner for Barnstable county appointed by the Board of County Commissioners; one Native American appointed by the Board of County Commissioners; one minority representative appointed by the Board of County Commissioners; and one minority representative appointed by the Governor. Each member has one vote except the Governor's appointee whose role is advisory unless there is a tie vote.

The Commission is charged with reviewing and regulating "DRIs" (Developments of Regional Impact), recommending designation of "DCPCs" (Districts of Critical Planning Concern), and proposing and implementing a regional land use policy plan. The plan, as formulated by the Commission in consultation with local planning committees, the regional policy plan advisory board (a 17-member panel of diverse community members appointed by

the county commissioners) and the Governor's Committee, must identify the Cape's critical resources and management needs, establish a growth policy, set regional goals and develop a policy for coordinating pertinent planning at all levels.

The Regional Policy Plan must be approved by the Barnstable County Assembly of Delegates (Assembly), established by the Barnstable County Home Rule Charter, 1988 Mass Acts c. 163. In addition, the Assembly designates DCPCs - Districts of Critical Planning Concern - upon nomination by local boards (Historical Society, Conservation Commission, Board of Health, etc.), the County Commissioners, the Assembly or the Commission - after a written proposal recommending acceptance is forwarded by the Commission. The Assembly also adopts, upon their proposal by the Commission, standards and criteria for developments which could have an impact on more than one community (i.e., potential DRIs - Developments of Regional Impact), and enacts appropriate implementing regulations developed by the Commission.

The Act also established a Governor's Committee to assist in preparation of the Regional Policy Plan and to coordinate, to the greatest extent feasible, state agency planning with that of the Commission. The Governor's Committee also coordinates planning programs jointly pursued by the Commission and any state agency. Primary staff for the Commission consists of an executive director, a chief planner (whose duties include providing assistance to towns in preparing Local Comprehensive Plans - LCPs), an economic development officer, a chief regulatory officer and a fair, affordable housing specialist who assists towns in developing and/or evaluates the affordable housing component of LCPs.

After a final Regional Policy Plan has been adopted, a town may adopt a Local Comprehensive Plan consistent with the Regional Plan and submit it to the Commission for certification (LCPs are further described below). As an incentive to localities, the Act

authorizes imposition of reasonable impact fees on developments for municipalities with certified local plans. Municipalities may then also enter into development agreements with other towns, the Commission and property developers.

Any development project in Barnstable County requiring either an environmental notification form by a state agency or an EIR under MEPA must also be reviewed by the CCC. In addition, all coastal zone management consistency determinations and certifications must also be reviewed by the Commission for consistency with both the Regional Policy Plan and LCPs.

Local Comprehensive Plans, Impact Fees and Development Agreements.

The LCP may either antedate the Regional Policy Plan or it may be developed after adoption of the Plan, with or without the assistance of the Commission. The Act specifies two elements of an LCP which must be met before certification by the Commission: a plan for provision of capital facilities necessary to handle growth and development both in the municipality and throughout Barnstable County; and, a plan for fair, low and moderate income housing which meets local needs (Sections 9(a) and (b)).

If adopted by the town and certified by the Commission, LCPs must be reconciled with existing local development bylaws within two years. Also, fair, low and moderate income housing plans must be adopted within a "reasonable" period of time. Certification may be revoked by the Commission for failure to comply with either of these provisions. As noted, municipalities with a certified LCP may impose impact fees and enter into development agreements. The Act requires the Commission to adopt governing regulations, and offers further statutory guidance, on both.

Impact fees may be imposed either by a municipality having a certified LCP or by the Commission. Impact fees must be paid into a separate account either of the municipality, or

if apportioned by the Commission - into multiple municipal accounts. Impact fees must bear a rational nexus to an effect created by a development. The development itself must benefit from the use of the fee and it must be used to develop or improve capital facilities in keeping with either the Regional Plan or the LCP. Last, the fee must be expended within a reasonable period of time or returned to the party legally entitled to it.

A schedule of impact fees, or other conditions imposed on applicant/developers (contribution of public capital facilities, construction of fair/affordable housing, dedication of land for open space, etc.) may arise out of a development agreement, the principal purpose of which is to contractualize the development process between and among holders of private property, the Commission, and municipalities with certified LCPs. Development agreements vest land use development rights in the property for the duration of the agreement and are not subject to intervening changes in development bylaws, or CCC regulations or decisions.

Monomoy Lens Groundwater Projection Project.

The Sole Source Aquifer located on Cape Cod is comprised of six hydrogeologically separate underground water supplies - "lenses." The Monomoy Lens is the second largest and is shared by the towns of Dennis, Harwich, Brewster, Orleans, Chatham and a small portion of Yarmouth. In all, Monomoy Lens supplies water to approximately 40,000 homes. Prior to this project, wellhead protection efforts in the six towns included creation of water protection districts and new or revised board of health and/or zoning bylaws. Local strategies differed from town to town, as did enforcement. Hence the Commission's perceived need to propose a regional plan (CCC, FY 1991 604(b) Grant Proposal). Project objectives are four-fold: (1) to map physical and man-made water resource related aspects of the Lens; (2) to prepare a regional plan based on this data; (3) to use the data to support regional groundwater protection measures; and (4) to evaluate nominating a lens-based DCPC under

the Act or a water protection district pursuant to M.G.L. c. 361. Thus, the project focuses on land use practices as the key to water protection and coincides with a county program to inventory users and handlers of hazardous materials.

The 604(b) contract signed with DEP provides actual funding of \$15,000. CCC staff will contribute \$35,000 as in-kind service. The project will need extensive volunteer help to make the data-gathering aspect succeed. Thus far, the League of Women Voters has expressed its public support and a contact list is ongoing.

MASSACHUSETTS ENVIRONMENTAL POLICY ACT.

The Statute.

This section of the report examines the role of the Massachusetts Environmental Policy Act in the management of Mass Bays space, uses, and resources. The objective of the Massachusetts Environmental Policy Act (MEPA) is to prevent or minimize "damage to the environment" by requiring state agencies to evaluate the impact of proposed projects on the environment. The Act is administered by the Secretary of Environmental Affairs and the MEPA Office.

MEPA applies to the activities of all State agencies, to all activities carried out with financial assistance from State agencies, and to all activities which require permits granted by State agencies. Anyone applying for a State permit or for State assistance must file an environmental notification form (ENF) with the Secretary. The ENF must present the proponent's initial assessment of the project's potential impact on the environment. It must be circulated to specified State and local agencies, and a public notice of environmental review must be published in the local newspaper of every affected community.

The Secretary is required to hold a public consultation with the proponent, receive public and agency comments, and visit the site. The Secretary must then determine whether the proponent must submit an environmental impact report (EIR). When no EIR is required, the proponent may proceed with the project.

When an EIR is required, the Secretary determines the scope of the EIR. The EIR is to be limited to those aspects of the project which are likely, directly or indirectly, to cause damage to the environment. If an environmental impact statement is required for the project under the National Environmental Policy Act (NEPA) the draft and final federal environmental impact statements may be submitted in lieu of EIRs. Public notice must be given of the availability of the EIR, followed by a thirty day agency and public review period. The Secretary issues a written statement indicating whether or not "all feasible measures have been taken to avoid or minimize" the environmental impact of the project. If the final EIR is found to be adequate, the project may begin.

Pursuant to the accompanying regulations, proposed projects located in ACECs require MEPA review at more sensitive thresholds. The regulations also allow the Secretary to waive strict compliance with any provisions of the regulations not specifically required by law if the Secretary finds that strict compliance would result in undue hardship and would not serve to minimize or avoid damage to the environment.

The statute provides for the filing of an action by an agency or a person alleging an improper determination of whether a project requires an EIR, or alleging that a final environmental impact report fails to comply with the requirements of the Act. No sanctions are authorized by the Act.

Private actions for damages are not authorized by MEPA. In Connerty v. Metropolitan District Commission, (1986), the court rejected an action by a licensed master clam digger

asserting that his business suffered damages caused by the discharge of raw sewage by the MDC into Quincy Bay and Boston Harbor. The claim stemmed from the MDC's suspension of the chlorination facilities at the Nut Island wastewater treatment plant for four days, which caused the closing of shellfish flats for approximately seventeen days. Connerty asserted that the MDC failed to use "all practical means and measures to minimize damage to the environment." The court dismissed the complaint because the statute establishes a duty to the public generally, and to the plaintiff specifically, and because the statute lacked enforcement procedures.

Comments.

MEPA has been both praised and criticized by those that have examined its operation. The program has been praised because once any of the thresholds for MEPA review have been met, all of the project's anticipated environmental impacts are subject to review. However, MEPA review has been especially criticized as inadequate in dealing with cumulative impacts. The absence of guidelines in examining cumulative effects has been seen as resulting in inconsistent approaches by MEPA reviewers (Mass EOE, Final Assessment Document).

The fact that MEPA does not apply to all projects means that some projects escape scrutiny. While these projects are often small, they can have a cumulative impact. It has also been noted that the extent of review and comment by agencies varies from agency to agency. In particular, it has been observed that DEP and DEM often do not participate in the public review process. This can be due to insufficient staffing or poor coordination (Mass EOE, Final Assessment Document).

Recommendations.

1. Guidelines should be drafted for evaluating cumulative impacts. These guidelines should require that all projects proposed within a particular area be examined concurrently for cumulative impacts.

2. Procedures should be instituted to "red flag" projects that require close scrutiny by a particular agency to insure that the agency's limited resources do not allow a particular project to be overlooked.

MECHANISMS TO ACHIEVE INTERGOVERNMENTAL COORDINATION.

This section considers the difficult problems of ensuring coordination and cooperation among the various State and federal agencies, as well as local and regional governments, in operating an effective Mass Bays management program. As discussed below, the National Estuary Program provides for and funds an estuary-wide management planning process; it does not possess authority under the Clean Water Act separate from other federal or State law to implement a CCMP. A completed Mass Bays CCMP must look to and depend upon other federal and State (and local) laws and programs to achieve its goals. This section of the report analyzes the mechanisms that have been created during the past two decades to address and remedy these difficult jurisdictional and intergovernmental problems.

Introduction.

Mechanisms to achieve coordination and cooperation among federal and state agencies with responsibilities to manage Mass Bays land and water uses and resources are found in a number of important federal laws. This section of the report describes and analyses the mechanisms of most significance for governing Mass Bays uses and resources. One of the more far-reaching of these federal authorities is Section 307 of the Coastal Zone Management

Act of 1972, as amended -- the "federal consistency" provisions of the CZMA (16 U.S.C. 1456). As described more fully below, coastal states may review both federal agency and federally-permitted activities for "consistency" with federally-approved coastal policies contained in their coastal zone management program documents. Subject to certain limitations examined in this report, the states' federal consistency review authority may be employed to ensure compliance by federal agencies and permittees with coastal policies in a wide range of activities affecting Mass Bays space, uses and resources.

State agencies and local governments themselves are obligated to meet the standards and criteria established in state coastal zone management programs with respect to the management of coastal land and water uses and natural resources. The program approvability standards contained in the CZMA, and the requirement that the state must continue to implement the management program as approved by the Secretary of Commerce, including any implementation of all federally-approved program amendments, ensures that state agencies and local governments must adhere to the same policies applied to federal agency and federally-permitted activities.

Several mechanisms found in the Clean Water Act authorize states to control the activities of federal agencies and their permittees when such activities affect state waters. First, a state may ensure compliance with its state water quality standards established under the Clean Water Act by applicants for federal licenses and permits to conduct any activity leading to discharges to the "navigable waters" of the state pursuant to section 401 of the Clean Water Act (water quality certification). Applicants must obtain "certification" from the state that such activities will not violate any applicable water quality standard, and, if such certification is denied, the federal license or permit may not be granted.

Further, pursuant to Section 313 of the Clean Water Act, whenever federal agency activities and projects occurring on or off federally-owned lands lead to discharges or runoff of pollutants to state waters, states may require that federal agencies adhere not only to the substantive legal standards protective of these waters contained in state law, but may also require that state procedural standards be observed (i.e., by requiring federal agencies to apply for and obtain state permits).

In addition, Section 404 of the Clean Water Act provides that federal agencies conducting any activity leading to the discharge of dredged or fill material to navigable waters within a state's jurisdiction must comply with state substantive and procedural requirements to the same extent as any other person.

Section 319 of the Clean Water Act is another source of authority requiring "consistency" with the nonpoint source pollution plans established by the states under this section. Finally, Section 320 of the Clean Water Act, which authorizes the National Estuary Program, itself provides for "consistency" with the comprehensive management plans prepared and approved by EPA and the coastal states under this authority. These mechanisms to ensure coordination and cooperation by federal and state agencies involved in managing the uses and resources of Mass Bays are considered below.

Federal Consistency Review Authority under the CZMA.

Section 307 of the Coastal Zone Management Act of 1972, as amended (1990), authorizes states with coastal zone management programs approved under the CZMA substantial control over federal agency projects and activities, federally-permitted activities and federal assistance projects involving state agencies and local governments if these activities and projects "affect" or potentially affect the land and waters uses and natural resources of the coastal zone. "Land uses" and "water uses" of the coastal zone are defined

in the CZMA quite broadly, and include a wide range of activities taking place on the shores and in the waters of the coastal zone (16 U.S.C. 1453). Different standards of compliance and procedural requirements must be met depending upon the type of federal activity involved. In addition, the federal consistency provisions of the CZMA establish their own resolution procedures in case of disputes between federal and state agencies.

Clearly the CZMA and Section 320 of the Clean Water Act (the National Estuary Program) have compatible goals with respect to the wise management of land and water uses and resources of the coastal zone, including estuaries. Reflecting its origin in land use planning, the CZMA also charges state coastal managers with proper "development" of such coastal areas, uses and resources. But, despite the goal of coastal resource and land development, the thrust of the CZMA is as an environmentally-minded program whose primary mission is protection and management of the coastal zone and its resources.

But the two laws differ in an important area. The CZMA requires the coastal states to identify "enforceable" authorities upon which they will rely to implement their coastal management programs. The Secretary of Commerce may not approve a state's coastal program under the CZMA unless it is determined that the state has sufficient legal authority to enforce its program. Section 320 of the Clean Water Act is considerably less demanding of the federal, state and local agencies implementing estuary management plans in this respect, and provides "recommend[ed] priority corrective actions and compliance schedules" addressing a wide range of estuary environmental issues. The NEP, based solely upon the authority provided by Section 320 of the Clean Water Act, must rely in large part upon voluntary cooperation and coordination among the participants in the development of the estuary plan -- there is no Clean Water Act-based authority to require compliance with the provisions of the plan (but see the discussion of state authority with respect to federal agency

activities and projects affecting state waters under Sections 313 and 404 below). Thus, "enforceability," or the capacity to implement effectively the management plans developed and approved under Section 320, is or should be a matter of serious concern.

Although the National Estuary Program was established with relatively little regard for the manner in which management plans developed under Section 320 would be coordinated with existing coastal management programs, it soon became apparent that these two authorities must be closely linked in order to function effectively in protecting important estuaries already subject to protection and management under state coastal programs. The legislative history of the NEP indicates that Congress contemplated that NEP plans would (or at least could) be incorporated into state programs. EPA and NOAA formalized this congressional intention in an agreement (NOAA/EPA Agreement, 1988) which provides that estuary plans approved under Section 320 would be incorporated into state coastal programs to the extent permitted by law. Further, the need for active participation and involvement of state coastal agency personnel in the comprehensive estuary planning process was agreed upon by the two federal agencies in this document, and has been acted upon in the case of Mass Bays Program development and other estuary planning conference efforts.

The effect of incorporating comprehensive conservation and management plans in their entirety or in relevant part in state coastal programs will be to give such plans an element of "enforceability" with respect to (1) state agencies and citizens subject to the requirements of state coastal programs and (2) federal agencies and private applicants for federal permits if their activities "affect" the coastal land and water uses and resources, including estuaries. In brief, the program implementation provisions of the CZMA and its federal consistency provisions assume a significant role in implementing comprehensive estuary management plans, unforeseen or at least not sufficiently acknowledged at the time the NEP was

established (1987), and without which the NEP would lack an important means of enforcement.

The Consistency Process.

The consistency review process applicable to the different categories of federal activities (federal agency, federally-permitted, and federal assistance projects) is discussed below.

Federal Agency Activities. Under section 307(c)(1) and (2) of the CZMA, "federal agency activities" occurring "either within or outside the coastal zone" that "affect" or are physically located "in" the coastal zone must be carried in a manner which is consistent "to the maximum extent practicable" with state "enforceable" coastal program policies. An "enforceable policy," with respect to all categories of federal activities, is defined by the 1990 amendments to the CZMA to mean:

State policies which are legally binding through constitutional provisions, laws, regulations, land use plans, ordinances, or judicial or administrative decisions, by which a State exerts control over private and public land and water uses and natural resources in the coastal zone. (16 U.S.C. 1453)

The 1990 amendments to the CZMA effectively settled disputes between federal and state agencies about the geographical scope of section 307(c)(1) (whether the CZMA's consistency provisions apply to federal agency activities occurring outside the coastal zone) and whether certain federal agency activities (e.g., designating dredged spoil disposal sites) are included under the Act. The 1990 amendments clarify that the scope of the consistency provisions extends to federal activities either within or outside the coastal zone and that no federal activities are exempted from coverage under Section 307 of the CZMA. With respect to other issues, few disagreements between the states and federal agencies concerning other

requirements of Section 307 have occurred. For example, no serious questions have arisen concerning the process requirements of state review of federal agency activities or about the meaning of the phrase consistent "to the maximum extent practicable."

With respect to the procedural requirements of section 307(c)(1), it is agreed that federal agencies initially determine whether their activities "affect" a state's water and land uses and natural resources of the coastal zone (33 F.C.R. 930.33). A state coastal agency, however, may object to the determination by the federal agency, and, if the disagreement cannot be resolved informally or through mediation by the Secretary of Commerce, the state may seek to enjoin the federal agency from carrying out its activity on the ground that the activity is "inconsistent" with the state program (15 C.F.R. 930.116).

With respect to the meaning of the phrase consistent "to the maximum extent practicable" -- the standard of compliance with state policies that federal agencies must meet -- NOAA and the coastal states have enforced the longstanding rule (since 1979) requiring federal agency activities to be "fully consistent" with state policies "unless compliance is prohibited based upon the requirements of existing law applicable to the Federal agency's operations" (15 C.F.R. 930.32(a)).

In view of the deference which a court would accord to NOAA's interpretation of this statutory standard requiring federal agency activities to be "fully consistent," a standard which the Agency justifies on the basis of the plain language of the CZMA and its legislative history, and in the absence of any serious legal challenge to this interpretation over a ten-year period, it is unlikely that this rule would be overturned (Archer and Bondareff, 1988). In consequence, federal agencies remain subject to a high degree of compliance ("full consistency") unless they can demonstrate that Congress has expressly exempted their activities affecting the coastal zone from the requirements of state coastal programs.

Efforts to mediate disputes between state and federal agencies concerning the application of Section 307 to their activities have not been very successful, indicating at least a partial failure in the consistency review process envisioned by the Congress (Federal Consistency Study 1985). But no serious legal challenge to the other elements of this process has yet been brought; the federal court cases decided to date have all concerned challenges to the state's right under the CZMA to review a particular federal agency activity rather than challenges to aspects of the section (c)(1) consistency review process (Eichenberg and Archer 1987). And the single U.S. Supreme Court decision (Secretary of the Interior v. California, 1984) denying the right of coastal states to review offshore oil and gas lease sales under Section 307(c)(1), was overturned by the 1990 Amendments to the CZMA.

In addition to judicial resolution of federal-state agency disputes and to the mediation provisions of the CZMA, the 1990 Amendments established yet another procedure to resolve disputes between federal agencies and coastal states under Section 307 (c)(1) in cases of the United States' "paramount interest" in ensuring that major federal projects or activities can proceed. After a "final judgment" of a federal court that a specific federal agency decision is not in compliance with the provisions of Section 307(c)(1)(A), and if the Secretary of Commerce certifies that mediation will not resolve the dispute, the Secretary may request the President, in writing, to exempt from compliance "those elements of the Federal agency activity that are found by the Federal court to be inconsistent with an approved state program." The President may grant the exemption if he or she finds that the activity "is in the paramount interest of the United States."

This obviously stringent procedure would nevertheless allow acknowledged inconsistent activities to occur, if the President reaches the required conclusion about their overriding significance to the nation. But it is clear from the legislative history of the 1990

Amendments that the President cannot grant categorical exemptions for federal agency activities, that a federal court must first find the specific activity inconsistent, that the Secretary must certify the futility of mediation between federal and state agencies to resolve the dispute, and that the exemption only applies to the elements of the activity that a federal court has ruled inconsistent with the state coastal program. All other elements of the exempted activity must be conducted in a manner consistent to the maximum extent practicable with state coastal policies.

In enacting these detailed 1990 Amendments to Section 307(c)(1) of the CZMA, Congress has in effect waived the sovereign immunity of federal agencies with respect to their activities affecting coastal water and land uses and natural resources -- a technique to achieve legislative purposes that Congress has employed in many similar instances (e.g., Sections 313 and 404 of the Clean Water Act, discussed below) -- and required federal agencies to subject themselves to the substantive and procedural standards of state coastal and environmental law. The 1990 Amendments clarify the conditions of the 1972 waiver of sovereign immunity by incorporating a Presidential exemption mechanism with respect to inconsistent federal agency activities that are determined to be in the nation's "paramount interest." This language closely parallels the provisions of other federal law waiving the immunity of federal agencies vis-a-vis state substantive and procedural requirements (Archer 1989; Breen 1985).

Federally-Permitted and Assisted Projects and Activities. Under Section 307(c)(3)(A) and (B), federally-permitted activities, either "in or outside of the coastal zone," including outer continental shelf oil and gas exploration, development, and production activities, must be "consistent" with state program policies if they "affect" the land and water "uses" and natural resources of the coastal zone (16 U.S.C. 1456(c)(3)(A) and (B)). Permit applicants "certify"

to the state that their projects are consistent with state policies; if the state determines that such projects are inconsistent, federal permits may not be issued, unless the Secretary of Commerce overrides the state's consistency objection and authorizes the permit to be issued. (See 15 C.F.R. Subpart D, 930.50 et seq. (federal permits); Subpart H, 930.120 et seq. (administrative appeals); also see Eichenberg and Archer 1988, for a fuller description and analysis of the section 307(c)(3) consistency review process.)

The Secretary may override a state's objection after finding that the activity or project, although inconsistent with the state program, is (1) nevertheless consistent with the national objectives of the CZMA or (2) is necessary in the interest of national security (16 U.S.C. 1456(c)(3) and (d)).

The statutory override criteria have been further defined by NOAA in its consistency regulations. To override on the first ground, the Secretary must find that the activity meets all of four separate tests:

- 1) it must further one or more of the "competing national objectives" of the CZMA;
- 2) its contributions to the national interest must outweigh its adverse individual and cumulative environmental impacts;
- 3) it must not violate any standard under the Clean Air and Clean Water Acts; and
- 4) there must be no "reasonable alternative" to the activity that would allow it to be conducted consistently with the state coastal policies (15 C.F.R. 930.121).

To override on the second ground, the Secretary must find that the activity "directly supports" national defense or other national security objectives or that such objectives would

be "significantly impaired" if the activity were not permitted to go forward as proposed (15 C.F.R. 930.122).

Legal Basis for State Consistency Review. The legal basis for state consistency review of applications for federal permits, and of proposed federal financial assistance projects, may be set forth briefly. Congress, which possesses sufficient authority under the U.S. Constitution to enact legislation regulating such areas as water quality, offshore energy exploration and production, and the filling of wetlands, may delegate to the states all or any part of such authority. As is well-understood, such delegations have occurred under the Clean Water and Air Acts, as well as other federal laws.

Although federal agencies and some legal writers have argued that the CZMA does not authorize the states to impose requirements upon applicants for federal permits in addition to those imposed by other federal law (Whitney, *et al.*, 1988), it is clear that the CZMA's consistency provisions (section 307(c)(3)) are in fact a delegation of authority by the Congress to the states, and that states may effectively prohibit the issuance of federal permits for activities that are inconsistent with state program policies developed under the CZMA and approved by the Secretary of Commerce.

Consistency Review in Massachusetts. The Massachusetts Coastal Zone Management Program (MCZMP) does not directly regulate activities occurring in the State's coastal zone by issuing permits, as do many other coastal states with federally-approved coastal management programs. Instead, Massachusetts is a "networked" coastal management program linking the separate authorities of many State agencies within the context of 13 "regulatory" and 14 non-regulatory policies that constitute the heart of the MCZMP. The review of federal agency and federally-permitted activities is conducted by the MCZMP against the legally-enforceable standards that implement the 13 regulatory policies adopted

in the State coastal zone management program document (Massachusetts Coastal Zone Management Program and Final Environmental Impact Statement (MCZMP and FEIS) 1978). These 13 regulatory policies provide protection for wetlands and other "ecologically significant resource areas (Policy 1) and for important marine resource areas (areas of critical environmental concern) (Policy 2); support water quality goals (Policy 3); govern construction projects in state waters (Policy 4); establish standards to minimize the effects of dredging and disposal of dredged materials (Policy 5) and offshore sand and gravel mining (Policy 6); preserve maritime and other water or coastal dependent uses, including energy facilities (Policies 7 and 8); apply to offshore energy exploration, development, and production (Policy 9); require all coastal development projects to conform to standards affecting sub-surface waste discharges, air and water pollution, and protection of inland wetlands (Policy 10); protect scenic rivers designated by law (Policy 11); preserve historic districts and sites (Policy 12); and protects public access to recreation areas (Policy 13).

The MCZMP sets forth a comprehensive federal agency and federally-permitted review process (MCZMP and FEIS 1978). According to NOAA's consistency regulations, the MCZMP identifies certain federal agency activities of particular interest:

Army COE -- dredging, channel works, breakwaters and other navigation works, erosion controls, beach replenishment projects, dams, etc.;

Department of the Interior -- OCS lease sales, National Park Service acquisitions, Fisheries and Wildlife Service acquisitions;

Department of Defense -- location and design of new defense facilities;

Department of Transportation -- location and design of Coast Guard facilities, location and design of aviation facilities;

General Services Administration -- location and design of federal facilities, disposal of surplus federal lands;

Amtrak -- expansion, new construction, or abandonment of tracks and facilities.

The MCZMP reserves the right to identify other federal agency activities of interest, and may review any unlisted activity according to NOAA's consistency regulations. Federal agencies remain obligated to consider the consistency of any agency activity whether listed or unlisted that affects or may affect the land or water uses or natural resources of the coastal zone (Section 307 of the CZMA, as amended 1990).

The MCZMP also identifies categories of federal permits and licenses that require consistency review, including: permits under Section 404, CWA (dredge and fill), Section 10, Rivers and Harbors Act (obstruction and alteration of navigable waterways), and Section 103, Marine Protection, Research, and Sanctuaries Act (transport of dredged materials); for construction and modification of bridges; Deepwater Port licenses; NPDES permits; ocean dumping permits; pipeline permits for OCS oil or gas transmission; OCS energy permits; permits and licenses for planning, constructing, and operating non-federal hydroelectric power facilities; certificates for natural gas pipelines and facilities and authorizations to import or export natural gas; and licenses for construction and operation of nuclear power plants.

In reviewing federal agency activities and projects requiring federal permits, MCZMP functions more as a coordinator of reviews by the relevant State agencies of these activities and projects. MCZMP's ultimate concurrence in the consistency determinations by federal agencies and certifications by private applicants is the means by which MCZMP exercises control over this review process. MCZMP plays the same role with respect to State agency and permitted activities affecting the coastal zone. In effect, MCZMP is the "last stop" before such activities and projects affecting coastal uses and resources can go forward, and thus

occupies the pivotal position with respect to managing a broad range of activities affecting Mass Bays uses and resources.

Coordinative Mechanisms in the Clean Water Act.

Section 401 Water Quality Certification.

Section 401 of the Clean Water Act provides, in relevant part:

Any applicant for a Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certification from the State in which the discharge originates or will originate, ... that any such discharge will comply with the [water quality standards] of this Act ... No license or permit shall be granted until the certification required by this section has been obtained or has been waived ... No license or permit shall be granted if certification has been denied by the State ...

Section 401 water quality certification is carried out in Massachusetts pursuant to two separate regulatory programs: the Surface Water Discharge Permit Program (314 CMR 3.00) and the program for Certification for Dredging, Dredged Material disposal, and Filling in Waters (314 CMR 9.00). Massachusetts shares responsibility with the EPA for implementing the State's Section 402 NPDES permitting program. The Army COE administers the Section 404 dredge and fill permitting program.

Water quality certification for projects requiring Section 402 permits is carried out by the Division of Water Pollution Control in the Department of Environmental Protection (DEP). EPA receives the applications and issues the permits. Clearly the State possesses sufficient authority under Section 401 and the State regulations to ensure that all activities permitted under Section 402 comply with State water quality standards. But adequate staffing for site

visits and monitoring of projects is a serious problem, and DEP's small Section 401 staff (two individuals) must handle a large volume of permit application reviews. MCZMP, however, carries out a coordinated if separate federal consistency review of Section 402 projects, and as the "last stop" before a final State decision is made, exercises considerable control over the permit review process under the CZMA.

The Division of Water Pollution Control also implements the water quality certification program for dredging and filling projects and for the disposal of dredged materials. This program covers dredging projects in State waters or wetlands that require a federal or state permit, and is intended to be coordinated with the review and approval of projects subject to other State authority (i.e., projects requiring a permit under M.G.L. c. 131, Section 40 (Wetlands Protection Act) or M.G.L. c. 91 (Waterways)). Dredging projects in wetlands require an order of conditions from local conservation commissions (see wetlands section of this report); dredging projects below the mean high water mark or in rivers, streams, and ponds require a permit from the DEP's Division of Waterways.

The State water quality certification regulations applicable to such dredging and filling projects define the relationship between the policies established in the MCZMP and the policies and standards established by the regulations themselves for certifying such projects: "[t]hese regulations...are adopted independently of and do not depend for their force and effect on the CZM Program or the CZM Regulations."

It should be recalled that Section 307 of the CZMA establishes independent grounds for the State to object to the issuance of federal permits under Section 404 to conduct dredging and filling projects affecting navigable waters (see discussion above). The State water quality certification regulations for dredging and filling projects make clear that, although the specific standards established under these regulation for review of such projects

under Section 401 are to be regarded as superior to any standards enforced by the MCZMP pursuant to Section 307 of the CZMA, any conflicts between these two sets of standards will be resolved by the Secretary of the Executive Office of Environmental Affairs.

If MEPA thresholds are exceeded, the MEPA review process also applies to projects requiring State permits as well as a federal Section 404 permit. For projects of sufficient size subject to the federal NEPA process, the State environmental review may be combined with the federal process.

Generally, DEP lacks sufficient staff to perform the site visits necessary to maintain a reasonable level of surveillance of Section 404 permitted activities. MCZMP, however, in its role as the final State agency reviewer of the consistency of Section 404 projects with State coastal policies, including Chapter 131, Section 40, and Chapter 91, can give additional attention to projects affecting coastal uses and resources. Further, because Massachusetts, like many other coastal states with coastal zone management programs, does not recognize all of the nationwide permits authorized by the COE, many projects that would receive little or no review under Section 401 water quality certification by the State, can be treated as individual projects for the purposes of federal consistency review under the CZMA. Again, MCZMP can effectively ensure that Section 404 projects meet State legal requirements.

Sections 404 and 313.

Section 404 of the Clean Water Act provides, in relevant part:

Nothing in this section shall preclude or deny the right of any State ... to control the discharge of dredged or fill material in any portion of the navigable waters within the jurisdiction of such State, including any activity of any Federal agency, and each such agency shall comply with such State ... requirements both substantive and procedural to control the discharge of dredged or fill material to the same extent that any person is subject to such requirements. This section shall not be construed as affecting or impairing the Authority of the Secretary [of the Army] to maintain navigation.

Section 313 provides, in relevant part:

Each [federal agency] ... shall ... comply with ... all ... State ... and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution in the same manner, and to the same extent as any nongovernmental entity ... [This] shall apply (A) to any requirement whether substantive or procedural (including ... any requirement respecting permits and any other requirement, whatsoever), (B) to the exercise of any ... State, or local administrative authority, and (C) to any process and sanction ... This subsection shall apply notwithstanding any immunity of such agencies ... under any law or rule of law.

The United States Court of Appeals for the Ninth Circuit has applied these statutory provisions to require that the US Navy must obtain and conform to the provisions of a permit issued by the State of Washington before the Navy could implement a major dredging and fill operation necessary to establish porting facilities for a Carrier Battle Group at Everett, Washington (Friends of the Earth v. U.S. Navy, (1988)).

Although rarely invoked by the states to require the "consistency" of federal agency activities with state environmental policies applicable to coastal and estuarine areas and resources, these Sections of the Clean Water Act provide a potent tool to ensure cooperation by federal agencies with state policies developed under the comprehensive estuary planning process established under Section 320 of the Act. They are instances of the waiver by the Congress of the immunity of federal agencies to the requirements of state law, as stated above. Although it is argued in this report that Section 307(c)(1) is another example of the waiver of the sovereign immunity of federal agencies by the Congress, when their activities affect coastal land and water uses and natural resources, and that state officials have ample authority under the CZMA to enforce state law, nothing is lost (and potentially much is gained) by state officials also relying upon the authority provided by Sections 404 and 313 in their review of federal agency activities and permitted projects for consistency with state coastal and estuarine policies.

Sections 319 and 320 of the CWA.

Section 319 requires each state to prepare a management program for the control of pollution to navigable waters from nonpoint sources. Section 320 authorizes the convening of management conferences to prepare comprehensive management plans for identified estuaries. Both Sections contain relatively weak "consistency" requirements when compared to the substantial consistency provisions in the CZMA and the CWA that devolve significant authority to the state level to control coastal and estuarine lands, waters, and resources.

Section 319 specifies that the management programs prepared through the five-year long planning process include an identification of "Federal financial assistance programs and Federal development projects" which will be subject to review to determine their effects upon water quality and their "consistency" with estuarine management programs. Federal agencies

are obligated to "accommodate, according to the requirements of Executive Order 12372, ... the concerns of the State regarding the consistency of such [programs] or projects with the State nonpoint source pollution management program."

Similarly, Section 320, in defining the purposes of the management conferences called to prepare estuarine management programs, specifies that such conferences shall "review all Federal financial assistance programs and Federal development projects in accordance with the requirements of Executive Order 12372, ... to determine whether such assistance program or project would be consistent with and further the purposes and objectives of the plan prepared under this section."

Neither Section 319 nor 320 provides any mechanism to require consistency between federal financial assistance and development projects and state nonpoint source pollution control programs and estuarine management plans. Although Section 319 mandates that federal agencies "shall accommodate" state "concerns," the Section invokes as process the very weak provisions of Executive Order 12372 (see discussion below). Section 320 has no similar mandate requiring "accommodation," and the Section's reference to Executive Order 12372 is unclear whether the process provisions of the Order are available to states participating in and attempting to enforce a Section 320 estuary management program. But even if Executive Order 12372 is available for such purpose, it provides scant authority to require "consistency."

Executive Order 12372.

Issued in 1983, Executive Order 12372 was intended to "foster an intergovernmental partnership and a strengthened federalism" by allowing greater participation by state and local governments in the review of federal assistance and development projects affecting these governments. Under the Order, federal agencies are required to provide opportunities for

consultation between themselves and state and local governments and to use the process that states develop to carry out their review of such federal projects. But, in the event of conflict, the only obligation upon federal agencies is to "explain the bases for [the federal] decision in a timely manner."

Most states, including Massachusetts, have established an E.O. 12372 federal projects review process. Typically, a "clearinghouse" or designated review agency coordinates the review of federal assistance and development projects in the state. Such federal projects are identified by category, and mechanisms to accomplish state review are formally established.

Although the E.O. 12372 review process is a useful mechanism to provide notice of pending federal projects and to elicit information and data about such projects from federal agencies, states and local governments may only require an "explanation" regarding inconsistent projects. States and local governments participating in estuarine management programs must rely instead upon the more substantial authority discussed above deriving from the CZMA and the Clean Water Act to require federal agencies and permittees to adhere to their coastal and estuarine management policies.

Recommendations.

1. The existing intergovernmental mechanisms analyzed in this section of the report provide ample authority to coordinate the activities of State and federal agencies in the management of Mass Bays space, uses, and resources. The critical mechanism, with respect to reviewing federal agency activities and the large category of federally-permitted activities affecting Mass Bays uses and resources and ensuring that they are consistent with the policies governing coastal and Mass Bays uses and resources, is the CZMA Section 307 federal consistency process. This process applies not only within the State's defined coastal zone (a narrow belt of land adjacent to the shore and State waters extending three nautical

miles from shore), but to federal agency and permitted activities outside the coastal zone if they would affect the coastal zone. Clearly federal agency and permitted activities will be an important focus of the Mass Bays CCMP, when completed. Because the MCZMP exercises the federal consistency authority on behalf of the State, it will necessarily occupy the pivotal position with respect to federal agencies in coordinating the Mass Bays CCMP.

In addition, the requirements of the CZMA and the MCZMP establish important standards applicable to Mass Bays uses and resources which local governments and other State agencies must meet. They too must act "consistently" with the State's coastal policies. For these reasons, the MCZMP should be the principal coordinative and management agency to implement a completed Mass Bays CCMP.

2. The first recommendation is supported by the analysis of the limited nature of the authority of the National Estuary Program to implement CCMSs once they are approved. Without the implementation and enforcement mechanism provided by state CZM programs, CCMPs would find their primary usefulness as planning mechanisms. But, by linking the authority of the MCZMP under the CZMA, and State authority under other provisions of the CWA (e.g., Sections 404 and 313), as well as the networked system of State laws that make up the MCZMP, the Mass Bays CCMP will find potent enforcement tools to achieve its goals. Of course, the CCMP, when completed, may call for substantial improvements in the laws and programs that constitute the MCZMP. In any event, the linkage between the NEP, the CZMA, and MCZMP is critical to implementing the Mass Bays CCMP.

THE STELLWAGEN BANK NATIONAL MARINE SANCTUARY AND STATE OCEAN SANCTUARIES.

This section of the report considers the role of two unusual ocean resource management and protection programs in the context of the Mass Bays Program. Both the National Marine Sanctuary Program and the State Ocean Sanctuaries Program possess extraordinary authority to manage the waters, uses, and resources subject to the. Because the Stellwagen Bank Sanctuary and the State Ocean Sanctuaries occupy a significant portion of the area of Mass Bays, these programs necessarily are of importance to any system of Mass Bays management.

Stellwagen Bank National Marine Sanctuary.

Stellwagen Bank is located in the southwestern part of the Gulf of Maine, within Massachusetts Bay. The glacially-deposited Bank measures approximately 19 miles in length and more than 6 miles in width at its widest point. Stellwagen Bank supports a wide range of commercially important fisheries, including benthic, invertebrate, and pelagic species. The Bank also provides important feeding and nursery grounds for both large and small cetacean species, several of which are endangered. In addition, many bird species feed on the Bank. Commercial fishing is the most extensive human activity conducted on the Bank, although both recreational fishing and whale-watching are important commercial activities. Because of its location across the approach to Boston Harbor, significant commercial shipping moves through the Bank. Other activities with the potential to affect the resources of Stellwagen Bank include dredged material disposal at sites east of the Bank, discharge of effluents from the Deer Island Wastewater Treatment Facility, and sand and gravel mining on or near the Bank (U.S. Department of Commerce, 1991; Urban Harbors Institute, 1990).

Stellwagen Bank was proposed for designation as a national marine sanctuary in 1982, under Title III of the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA) (16 U.S.C. 1431 et seq.) (National Marine Sanctuary Program). The draft environmental impact statement was issued in January 1991. Congress designated the Stellwagen Bank National Marine Sanctuary by legislation late in 1992. The issuance of the final environmental impact statement, the final sanctuary management plan, and implementing regulations are expected soon (spring 1993).

The management and regulatory authority of the National Marine Sanctuary Program is quite broad .. in fact, in terms of jurisdiction over activities, uses and natural resources, this authority equals or exceeds that of any other federal program. In brief, any activity or use of sanctuary space and resources may be regulated under Title III of the MPRSA, including used or activities that were initiated before sanctuary designation, irrespective of any other federal authority. The National Marine Sanctuary Program, although relatively small (8 designated sanctuaries and 6 sites under active consideration for designation as of January 1992), possess arguably the most extensive authority to engage in comprehensive coastal and ocean resource management of all federal marine resource management programs. Under the "terms of designation" issued with respect to each designated sanctuary, the Secretary of Commerce must (1) identify the "characteristics of the area" that merit the site's protection and management under Title III and (2) list the "types of activities that will be subject to regulation ... in order to protect those characteristics" (Section 304(a)(4), Title III). This authority, coupled with the strong enforcement powers given to the Secretary (Section 307, Title III), and the authority to recover for damages to the natural resources of the sanctuary (Section 312, Title III), provides an effective framework for protecting sanctuary space, uses, and resources. It should be noted, however, that the availability of this extensive authority is offset to a

degree by a cumbersome and lengthy sanctuary designation process that may take many years to complete (Urban Harbors Institute 1990).

The consideration of Stellwagen Bank for designation as a national marine sanctuary has been marked by a high degree of cooperation and coordination between the National Marine Sanctuary Program, National Oceanic and Atmospheric Administration (NOAA), and the State agency most concerned with the designation -- the Massachusetts Office of Coastal Zone Management. For the first time nationally, State officials have actively participated in the preparation of the draft environmental impact statement on the proposed designation of a national marine sanctuary, pursuant to an agreement between the federal and State agencies, although NOAA bears the ultimate responsibility for the choice of the alternative to be followed in deciding to designate the Stellwagen Bank sanctuary.

The major issue in contention concerned alternative boundary proposals for the site. NOAA had proposed a smaller boundary alternative that would exclude the location of the Massachusetts Bay Disposal Site (MBDS) from the sanctuary; the State and several important citizens groups and interests supported a larger boundary alternative that would include the MBDS within the sanctuary's boundaries (U.S. Department of Commerce 1991; Urban Harbors Institute 1990; Stellwagen Bank Coalition News 1990-92). Inclusion of the MBDS within the boundaries of the sanctuary would have subjected activities at the MBDS to the authority of the sanctuary managers under Title III, MPRSA, with respect to any impact upon sanctuary space, uses, or resources. Of course, this authority could only have been exercised according to the "terms of the designation," which, as explained above, are determined through the sanctuary designation process in which both federal and state agencies actively participate. Both the process of review as well as the decision-making authority with respect to activities at the MBDS potentially harmful to the sanctuary's uses and resources could have

been fashioned to provide for federal-state interagency decision-making, if NOAA had chosen to pursue this route. By legislation, however, Congress adopted a modified version of the larger boundary alternative, excluding the MBDS.

The "terms of designation" proposed by NOAA for the Stellwagen Bank National Marine Sanctuary identify the following activities as subject to regulation, including possible prohibition:

1. discharging or depositing, from within the boundaries of the Sanctuary, any material or substance;
2. discharging or depositing, from beyond the boundaries of the Sanctuary, any material or substance;
3. exploring for, developing, or producing clay, stone, sand, gravel, metalliferous or non-metalliferous ores, and any other solid material or substances of commercial value ("industrial materials") in the Sanctuary;
4. drilling or digging into, dredging, or otherwise altering the seabed of the Sanctuary; or constructing, placing or abandoning any structure or material on the seabed of the Sanctuary;
5. moving, possessing, injuring, or attempting to move, possess, or injure a Sanctuary historical resource;
6. taking a marine reptile, marine mammal, or seabird in or above the Sanctuary, except in accordance with and as permitted by the regulations promulgated under the Marine Mammal Protection Act and the Endangered Species Act;
7. exploring for, developing, or producing oil or gas in the Sanctuary; and
8. operation of commercial (other than fishing) vessels (U.S. Department of Commerce 1991).

Commercial fishing activities and operating recreational vessels are not proposed for regulation under Title III.

Clearly the management of a designated Stellwagen Bank National Marine Sanctuary may contribute significantly to the protection of the resources and uses of Mass Bays. Although the preparation of the Mass Bays CCMP and the designation of the Stellwagen Bank sanctuary have proceeded along different tracks and according to separate schedules, the role played by the State in each process will help to ensure a measure of consistency between these two planning and management efforts. Unfortunately, however, the process of amending the marine sanctuary management program for Stellwagen Bank, once it is approved by NOAA, may be as complex and lengthy as the original designation process (Section 304(a)(4), Title III). Any inconsistencies between these two programs will require a concerted effort to remedy. But, anticipating that both the Mass Bays CCMP and the Stellwagen Bank management program will share a common approach to protecting the resources of Mass Bays, the broad regulatory authority of the National Marine Sanctuary Program should provide a complementary federal mechanism to achieve Mass Bays resource and use management goals and standards.

State Ocean Sanctuaries.

Under the State Ocean Sanctuaries Act (M.G.L.A. c. 132A:12A-18), Massachusetts has established ocean sanctuaries to protect offshore areas from activities that would significantly alter or endanger the ecology or appearance of the ocean, the seabed, or subsoil. Massachusetts' offshore areas seaward of the mean low water line in all rivers, bays, harbors, and coves extending to the three-mile limit, except the area seaward of Boston from Lynn to Marshfield, are designated as part of 5 ocean sanctuaries: the North Shore Ocean Sanctuary, the South Essex Ocean Sanctuary, the Cape Cod Ocean Sanctuary, the Cape Cod Bay Ocean

Sanctuary and the Cape and Islands Ocean Sanctuary. The landward boundary of each sanctuary may, through rulemaking and at the discretion of the Department of Environmental Management (DEM), be extended landward in rivers, bays, harbors, or coves to include environmentally sensitive areas.

Within each sanctuary the following activities are prohibited:

1. building any structure on the seabed or subsoil or under the subsoil;
2. constructing or operating offshore or floating electric generating stations;
3. drilling or removal of sand, gravel, minerals, gas, or oil;
4. dumping or discharge of commercial, municipal, domestic, or industrial wastes (municipal waste may be discharged by means of a variance);
5. commercial advertising; and
6. incineration of solid waste or refuse on moored vessels.

With the exception of the Cape Cod Sanctuary, the following activities are permitted:

1. discharges and intake systems for electrical generation;
2. discharges from the operation of existing municipal, commercial and industrial facilities;
3. channel and shore protection projects and nautical aids deemed of public necessity and allowed under Chapter 91;
4. harvesting and propagation of fish and shellfish; and
5. sand and gravel extraction for shore protection or beach restoration.

Variations may be granted for discharges of municipal wastes, except in the case of the Cape Cod Sanctuary, if the following stringent conditions are determined to be met:

1. no feasible alternative to the discharge exists, after considering technical, economic, environmental, and public health factors;

2. the discharge will meet water quality standards and will not harm the appearance, ecology, or marine resources of the sanctuary;
 3. the discharger will implement (a) a pretreatment plan for all commercial and industrial wastes discharged to the municipal wastewater treatment facility, (b) a plan for water conservation, and (c) a plan to control inflow and infiltration;
 4. a plan is prepared to review and control connections to municipal wastewater treatment system to ensure that the design and treatment capacity is not exceeded; such plan required notification to DEP whenever average flows exceed 80% of the design capacity of the treatment plant; such exceedances may trigger the design and construction of additional treatment capacity or other appropriate measures;
 5. the discharge will not affect the quality or quantity of ground or surface water supply;
 6. the discharge receives secondary treatment;
- the discharge will comply with all applicable State and federal law; and
8. the discharge will not adversely affect fisheries or interfere with fishing activities.

No variances will be issued for discharges into an estuary or coastal embayment of land subject to tidal action, except those designed to abate existing combined sewer overflows that threaten to degrade an ocean sanctuary.

DEM does not issue any permits under the Ocean Sanctuaries Program; instead it oversees the regulatory and permitting activities of other State agencies to ensure compliance with the Ocean Sanctuaries Act. In addition, the Office of Coastal Zone Management, through its federal consistency authority under the Coastal Zone Management Act, may, in addition to other State authority, apply the policies of the Ocean Sanctuaries Act in its review

of federal agency and federally-permitted activities affecting the uses and resources of State ocean sanctuaries.

Acting directly through the State Ocean Sanctuaries Act, and through its participation in the management of the proposed Stellwagen Bank Marine Sanctuary, the State (and the Mass Bays Program) possesses a wide range of regulatory and management tools to protect Mass Bays uses and resources in addition to other State and federal authorities. The State and DEM has acted to revise and extend inland boundaries of ocean sanctuaries to include areas determined to be environmentally sensitive (e.g., Waquoit Bay), but inland boundaries have not been extended to areas that are not strongly influenced by the ocean; nor have they been extended upriver. According to one respondent, although not often invoked as a regulatory tool, the Ocean Sanctuaries Act has been cited as authority to deny permission for an activity affecting the "ecology" or "appearance" of a sanctuary that might have been permitted under other State authority (e.g., denial of permission to expand a marina facility in Wareham).

"Ecology," "esthetics," and "scenic values," which as noted above are protectable under the Ocean Sanctuaries Act, are also protected under the common law public trust doctrine of many states. Although not previously recognized (and there are no judicial decisions), the Ocean Sanctuaries Act could, without doing violence to the Act or to the public trust doctrine, be viewed as a legislative enactment of an important public trust principle -- the protection of ecological and aesthetic values of public trustlands (see the discussion of the public trust doctrine elsewhere in this report).

Recommendations.

1. The Mass Bays Program should seek to coordinate its policies with respect to the resources and uses to be protected and managed by the proposed Stellwagen Bank National

Marine Sanctuary under Title III of the MPRSA with the Sanctuary's managers. Significant federal enforcement authority is found in Title III; the National Marine Sanctuary Program, the NEP, and MCZMP as well as other State agencies share common interests in protecting Mass Bays resources. Depending upon the decision by NOAA with respect to the boundaries of the new sanctuary (if NOAA chooses smaller boundaries), Mass Bays Program policies affecting activities at the MBDS may be of great significance to Sanctuary managers.

2. The State Oceans Sanctuaries Program provides substantial authority to protect coastal waters from harmful discharges and, in addition, from activities that affect the "ecology" and "appearance" of these waters. These latter values are ones often protected under the common law public trust doctrine. Although regulatory actions are typically based upon other State authority, the State Program's review of activities affecting State sanctuaries can provide additional or alternative authority to manage such activities. The Mass Bays Program should carefully evaluate the potential role of the relatively small State Ocean Sanctuaries Program as the source of broad authority to preserve the "ecology" of a major part of Mass Bays (to the three nautical mile limit).

FISHERIES AND SEAFOOD SAFETY

This section briefly reviews the federal and State management measures for regulating fisheries in both federal (EEZ) and State waters. The State and the fishing industry participate fully in the elaborate federal-state management system created under the Magnuson Act both to conserve and allocate EEZ fisheries. Two major problems persist: over-fishing and loss of critical habitats for important fisheries. Loss of habitat issues are addressed elsewhere in this report. The problem of remedying over-fishing is obviously complicated because of the often severe economic effects on fishermen and the fishing industry of placing limits upon fishing.

This section also briefly examines the current regulatory system by which the safety of seafood is assured in the United States.

Federal and State Fisheries Management.

Magnuson Fishery Conservation and Management Act.

The primary federal vehicle for managing fisheries is the Magnuson Fishery Conservation and Management Act of 1976 (FCMA). The FCMA establishes sovereign rights for the purposes of exploring, exploiting, conserving and managing all fish within the exclusive economic zone. The United States assumes exclusive fishery management authority beyond the exclusive economic zone over anadromous species and Continental Shelf fishery resources.

Management Procedure.

Eight Regional Fishery Management Councils were established to carry out management responsibilities. Massachusetts is part of the New England Council. Each council is advised by a scientific and statistical committee comprised of fishery scientists, and an advisory panel made up of individuals informed about each fishery under the council's jurisdiction. The councils are charged with preparing fishery management plans. These plans are to prevent over-fishing while achieving the optimum yield from each fishery for the United States fishing industry. The measures taken to achieve these goals must be based upon the best scientific information available. Unfortunately, the best scientific information available often is not very good. Efforts need to be made to improve the quality of data collection methods, and the data itself.

The plans must contain the measures necessary for the conservation and management of the fishery. Conservation and management of fish habitats is as important as conserving and managing fish stock, although more attention is paid to the latter. This is due in large

part to the fact that the FCMA provides authority only to regulate fishing. Consequently, the councils cannot directly control many of the threats to fish habitat. Some councils have issued policy statements regarding habitat issues and try to address these issues indirectly whenever possible.

At the present time the plans focus on the fish stock. The fishery must be accurately described, along with an assessment of the number of vessels involved, the type of gear used, etc. Estimates must be set forth as to the maximum sustainable yield and the optimum yield from the fishery. The optimum yield levels required to rebuild stocks are often a source of disagreement among diverse fishery interests, as is the method for determining the yields. On more than one occasion the determination of optimum yield has lead to litigation (see State of Maine v. Kreps, 1977).

Once the optimum yield has been established, the plan must address the extent to which United States fishing vessels will harvest the optimum yield. An allocation of fishing privileges among United States fisherman must be done on a fair and equitable basis, with no discrimination between residents of various states. The plans must also establish the portion of the optimum yield which will not be harvested by United States fishing vessels, and can be made available for foreign fishing.

The council may include permit requirements in the plan, as well as designated no-fishing or limited fishing zones. Catch limitations may be imposed, as well as restrictions upon the type of equipment, gear and vessels utilized.

Fishery management plans are usually prepared in a two-step process. The council prepares a draft FMP and supporting documents which are made available to the public and the National Marine Fisheries Service (NMFS). The Regional Director of the NMFS provides

comments regarding the plan to the council. The documents are then finalized by the council and submitted to the Secretary for final approval.

Comments.

Among the problems which have been noted is the difficulty experienced by the councils in preparing approvable plans. This has been attributed in part to lack of coordination between the NMFS regions and the councils in the development of the plans, as well as occasional disregard by the councils of the recommendations of the NMFS. Inadequate analysis has also been observed, as has poor documentation (Council/NOAA Task Group).

Criticism has also been directed at the enforceability of the provisions of the FMP. Some of the management measures have been characterized as difficult-to-enforce, while others are simply not economically efficient to enforce. The enforcement capabilities of the NMFS and the Coast Guard have been found inadequate in some areas. Additionally, the penalty and prosecution system has been found to be inadequate to deter violation (Council/NOAA Task Group).

State Jurisdiction.

The FCMA purports not to extend or diminish the jurisdiction of any state within its boundaries. Exceptions do apply, however, if it is found that the fishing in a fishery is engaged in predominantly within the exclusive economic zone and beyond such zone, or if any state has taken any action or omitted to take any action which will adversely affect the carrying out of the fishery management plan. In such an instance the Secretary will notify the State and the Council of his intention to regulate the fishery within the boundaries of the state pursuant to the fishery management plan.

State Fisheries.

Principal state authority over marine fish and fisheries is set forth in M.G.L.c. 130 (Act). Purposes of the Act are: to preserve and protect marine fisheries; to promote and develop the commercial fishing industry; to create institutions and procedures to regulate fishing and facilitate enforcement; to transfer regulatory authority over shellfishing, alewife and herring runs to towns within whose limits those fisheries occur; and to insure that shellfish taken for human consumption is safe to eat.

Under the Act, the Division of Marine Fisheries (DMF) in the Department of Fisheries, Wildlife and Environmental Law Enforcement is the lead regulatory agency. DMF and the Department of Public Health are each authorized to close contaminated shellfish beds. Shellfish taken from mildly contaminated areas for purification are regulated by DMF unless a municipality has a DMF-approved shellfish conservation and management plan. Fairly extensive local control of shellfisheries is permitted under the Act (Sections 52-68A). The Act contains numerous specific measures for managing and conserving marine fisheries, most notably a limited entry system for commercial lobster permits (Section 38B). In an Appendix, the Act also approves and ratifies in advance an Atlantic States Marine Fisheries Compact which would create an advisory committee - and possibly a regulatory agency - in which other seaboard states might join.

Seafood Safety.

The federal Food and Drug Administration (FDA) bears the major responsibility for protecting the safety of seafood in the United States. Under the Federal Food, Drug and Cosmetic Act (FFDCA) (21 U.S.C. 301 et seq.), the FDA is responsible for ensuring that seafood shipped in interstate commerce is "safe, wholesome, and not misbranded to deceptively packaged." Under the Public Health Service Act (42 U.S.C. 262, 294 et seq.),

the FDA may control the spread of communicable disease among the states. Two other federal agencies play important roles as well: the Environmental Protection Agency, which recommends and sets regulatory guidelines for pesticides, and the National Marine Fisheries Service, which conducts the Voluntary Seafood Safety Program.

FDA has broad authority under FFDCa to regulate contaminant levels in seafood by controlling the production and commerce in "adulterated" seafood product. Under FFDCa, a food is "adulterated" if it "bears or contains any poisonous or deleterious substance which may render it injurious to health ..." Historically, FDA has employed three methods to determine whether a food, including seafood, is deemed "adulterated." If sufficient data and information is available, FDA may set formal "tolerance" levels that specify a limit above which the food is considered "adulterated." Tolerance levels are determined by the Agency through formal rulemaking procedures requiring notice and an opportunity for public comment under the federal Administrative Procedure Act (APA). FDA typically would remove a food product from the market if a tolerance level is exceeded.

Lacking sufficient toxicological data for particular substances, FDA may choose to establish "action levels" which, if exceeded, may lead to enforcement actions. "Action levels" do not require formal public notice and comment procedures under the APA to be issued, and they are not binding upon either the FDA or the regulated industry. If FDA chooses to act because an action level is exceeded it must prove that the product exceeding the action level is injurious to health. FDA may also take action to remove a product from interstate commerce if it establishes that it poses a threat to public health despite the lack of tolerance or action levels.

In response to a challenge to the Agency's practice of enforcing "action levels" in essentially the same manner as if they were "tolerances" determined through formal

rulemaking procedures, with notice and an opportunity for public comment, (Community Nutrition Institute v. Young, 1987), FDA abandoned this practice and instituted a procedure for setting "regulatory limits" after providing notice and an opportunity for comment to determine whether a product is adulterated under the FFDCa. "Regulatory limits" may be set when (1) the substance cannot be avoided through good manufacturing practices, (2) no tolerance level has been determined for the substance, and (3) information is lacking to justify setting a tolerance level or technological changes appear reasonably certain which may affect a decision to set tolerance levels.

Although the FDA no longer seeks to enforce action levels, the Agency continues to use them as guidance for Agency personnel and the regulated industry. Working with EPA, the FDA has established action levels for residual chemical contaminants, including pesticides, rather than issuing formal tolerance levels, although EPA reserves the right to do so.

FDA plays an important role in the Interstate Shellfish Sanitation Conference and its National Shellfish Sanitation Program. This Program attempts to control the quality and safety of oysters, clams, and mussels sold in interstate commerce by setting product guidelines and standards, evaluating state compliance with such guidelines and standards, and certifying a state's participation in the Program. One of the Program's significant contributions is the creation of methods to classify and monitor the safety of shellfish products by ensuring that the shellfish are taken from harvesting waters without significant microbial contamination. In order for a state to continue to receive certification by the FDA as a member of the Program, it must survey and classify all growing waters for harvesting shellfish. Unsurveyed and unclassified waters must be closed to harvesting. Receiving states must sample shellfish products within 24 hours of their arrival in the state.

In a 1989 review by the Institute of Medicine, National Academy of Sciences, the following seafood regulatory concerns were noted:

1. funding for regulatory work and staff to perform seafood safety inspections and for monitoring harvesting water quality is limited;
2. Public health reporting, including seafood safety reporting, is focused at the local government level; less than one-third of Massachusetts towns and cities have fulltime health officers;
3. The level of technical skill and training to carry out seafood safety functions at the local government level is very uneven;
4. Massachusetts waters are contaminated with chemicals that are not addressed in EPA-FDA guidance and action levels;
5. Aquaculture is a growing industry that is not well regulated;
6. Massachusetts has established vessel-based regulations to protect seafood, but has not publicized these regulations very well; and
7. Massachusetts does not enforce the FDA action level for mercury in marine fish.

LEGAL ISSUES.

Regulatory Takings Analysis

Introduction:

The relevance of regulatory takings law to the governance of Mass Bays land and water uses and natural resources has become specially acute during the past year because of widely-shared expectations that major changes in the law are imminent. Several cases in federal and state courts (Lucas v. South Carolina Coastal Council, 1992, recently decided by the U.S. Supreme Court; Florida Rock I and II, 1986, 1990; Loveladies Harbor, 1990; Wilson

v. Commonwealth of Massachusetts, 1992) involving challenges to governmental regulation of private property in the coastal zone (residential property development in beach areas, development projects in wetlands) have raised issues anew that were presumed to be settled as a result of a series of Supreme Court decisions running back more than one hundred years. Although these pending cases have serious implications for environmental management and regulation generally in the United States, because they directly concern coastal areas, uses and resources, they are of critical importance to Mass Bays managers at all levels of government. Further, because these cases are grounded upon the constitutional prohibition against uncompensated takings of private property, decisions finding takings will create major obstacles to the management and protection of wetlands and other coastal areas, uses, and resources.

This section of the report reviews briefly the basic principles of regulatory takings law, and considers the impact of possible changes in takings law and their implications for Mass Bays managers.

General Principles.

The principles that have been developed by the federal courts to guide the analysis of regulatory takings claims derive from the fifth amendment prohibition against uncompensated taking of private property: "[n]or shall private property be taken for public use, without just compensation." The original intent of the amendment was to ensure compensation to landowners whose real or personal property was physically occupied or "taken" for public use by the government. In the 19th century, attempts to extend the constitutional prohibition against the taking of private property to governmental exercise of the police power to protect public health, safety, and general welfare could not be construed as a physical taking of private property (Mugler v. Kansas, 1887). But as government regulation of economic activity

increased during the latter 19th and 20th century, the federal courts became more receptive to this argument. In the early part of the 20th century, federal courts began to recognize that governmental regulation could so severely restrict the use of private property than an owner may be deprived of the use of all or a major portion of the property. In such cases the courts were willing to find that a "regulatory" taking had occurred, despite the lack of any physical invasion or occupation of the property by the government.

In 1922, the U.S. Supreme Court established the fundamental rule "that while property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking" (Pennsylvania Coal Co. v. Mahon). Since this ruling, the Supreme Court has refined its analysis, focusing upon a "weighing of private and public interests" (Agins v. Tiburon, 1980). Because the outcome of the weighing or balancing of private and public interests to determine whether governmental regulation has gone "too far" is dependent upon the specific facts of each case, the results of takings claims have varied widely. Yet, federal courts have achieved a reasonable measure of orderliness in reviewing claims of takings during the past two decades, by establishing a multi-part framework analysis -- the foundation of current takings law. This "framework" analysis may be understood by briefly considering several major Supreme Court decisions.

In Penn Central Transportation Company v. New York City (1978), the plaintiff applied to the NYC Landmarks Preservation Commission to construct an addition to Grand Central Station, a designated historical landmark. The application was denied and the plaintiff sued claiming that the permit denial "took" its property. Finding that the denial of the permit did not constitute a taking of plaintiff's property, the Court identified three general lines of analysis to guide its enquiry into the taking claim. Henceforth, the judgment that a taking of property has occurred as a consequence of governmental regulation required considering:

- 1) the economic impact of the regulation on the claimant,
- 2) the extent to which the regulation interfered with "distinct investment-backed expectation, and
- 3) the "character" of the governmental action.

The three elements established by the Court in Penn Central provide a means to determine the effect of governmental regulation upon private property interests in takings analysis. But other factors influence the outcome of the court's takings analysis. The government must, of course, regulate private property in support of the public "good" or interest. In weighing the effect of the regulation upon private property, the court will examine the relationship of the regulation to the public good or interest it presumably serves. How directly does the regulation support the public interest? Related questions distinguish between two categories of public "goods" or interests. Is the effect of the regulation to acquire for the public an interest that it did not formerly possess, or does the regulation protect the public from harm to a presently-held interest (Just v. Marinette County, 1971)? In the former case, a taking is more likely to be found; in the latter, the regulation may be held to prevent a public "nuisance," and, therefore, not a taking (Keystone v. DeBenedictis, 1987). The elements of takings analysis are examined further below.

The Regulation's Economic Impact upon the Claimant.

Deciding at what point the economic impact of regulation on property goes "too far" and must be compensated has been troublesome for the courts. Destruction of all or a major portion of the property's value has been upheld in cases where the use of the property is determined to constitute a serious public harm or nuisance (Mugler v. Kansas, 1887; Hadacheck v. Sebastian, 1915; Miller v. Schoene, 1928; Goldblatt v. Hempstead, 1962; Keystone v. DeBenedictis, 1987). In cases where the degree of harm to the public is

perceived by the court to be less serious, consideration of the regulation's economic impact becomes a more important factor (e.g., Florida Rock I and II, 1986, 1990).

However, in considering the economic impact of the regulation upon the use of the property, the courts have not permitted the owner to claim the property's "highest and best use" as the measure of the property's value. In Deltona Corp. v. United States (1981), in which the U.S. Army Corps of Engineers denied permission to fill a wetland area, the court stated that "the highest and best use argument is merely another way of saying that there has been some diminution in value." In effect, the necessity of some or considerable economic impact upon the value of regulated property has long been recognized by the courts, and considered alone does not establish a taking (Euclid v. Ambler Realty Co., 1926). Allowing the owner to argue the "highest and best" use of the property as the measure of economic impact would clearly overstate the impact of the regulation, thus making it easier for the owner to demonstrate a significant economic impact as the result of the regulation.

In assessing the economic impact on the owner, the court focuses upon (1) the extent to which the regulation "denies an owner economically viable use of his land (Agins v. Tiburon, 1980), and (2) the remaining uses and value of the property after the regulation has been imposed (Florida Rock I, 1986). As indicated above, diminution of value of the property cannot alone prove a taking. Instead the owner must demonstrate either a substantial loss of value or a lack of remaining uses of the land as a result of the regulation. No "threshold" limits have been set by the courts to establish a compensable loss of property value and such decisions vary with the facts of each case; other factors in the takings analysis may have a greater effect upon the outcome than economic impact (e.g., the character of the government's action or the relative significance of the public purpose served by the regulation).

The Regulation's Interference with Distinct Investment-Backed Expectations.

This element in the taking analysis addresses the reasonableness and appropriateness of the expectations of the owner with respect to the property. Are the owner's plans for the property appropriate under the circumstances? Are such plans or expectations financially supportable or viable in the current market (Mandelker, 1987)?

It is clear that a distinct, investment-backed expectation cannot be based on the property owner's hope that the government will grant the necessary permits for a specific use of the property. In Ruckelshaus v. Monsanto Company (1980), the Supreme Court stated that "a reasonable investment-backed expectation "must be more than 'unilateral expectation or an abstract need'." Plans to develop land must be examined carefully in light of this factor of the takings analysis. In Graham v. Estuary Properties, Inc. (1981), in which a permit was denied to construct a residential community in a wetland, the developer's expectations were not legitimately "investment-backed" because it "had only its own subjective expectation that the land could be developed in the manner it now proposes."

Another consideration concerns the owner's expectations when the regulations applicable to property change. In Kirby Forest Industries v. United States (1984), the Supreme Court stated that investment-backed expectations are protected only when a regulatory change is unforeseeable. In Sucesion Saurez v. Gelabert (1983), a federal court found:

[Plaintiffs] should have known given the law of property of Puerto Rico regarding natural resources, that the operations they chose to conduct were subject to constant regulations, supervision and were intertwined with matters of public policy that at some time might not be balanced in their favor. Whatever "investment-backed

expectations" ... plaintiffs had in their land were unreasonable if they ignored the law of Puerto Rico on the exploitation of natural resources.

Unless a regulatory change is entirely unforeseeable by the landowner, the court will recognize only those expectations which appropriately anticipate governmental regulation affecting the use of the owner's property.

The Character of the Government's Action.

The court considers several issues when it examines the character of the government's regulatory action. First, what is the nature of the relationship between the regulation and the public interest it serves (Agins v. Tiburon, 1980)? Courts have generally shown considerable deference to governmental regulation that demonstrates a reasonable basis for the action, but language in some decisions requiring a "substantial relationship" between the regulation and the legitimate state interest it serves indicates that the courts may sometimes take a closer look at the regulation-interest nexus (Nollan v. California Coastal Commission, 1987).

In Nollan, a permit to construct a new house within California's coastal zone was conditioned upon the requirement that the owner grant a lateral easement for the public to pass and repass along a portion of the property abutting state waters. The strip of land was beach above the mean high tide line and linked two state parks on either side of the owner's property. The Commission argued, among other reasons, that the presence of the new structure, when considered in addition to the other structures along the coastal highway fronting the area, would create a "psychological barrier" that would interfere with the public's view and awareness of its right of access to the public beach. Requiring a lateral easement from the owner allowing passage along the beach between the state parks would help offset this "barrier."

The Court found a taking because it failed to find a "substantial relationship" between the lateral easement along the beach and the interest served by the condition -- overcoming the "barrier" to the public's view of and perception of access to the public beach created by the new structure. Although the effect of the Nollan decision has not proved to be as great as originally feared by state and local governments (Connecticut Department of Environmental Protection, 1990), the decision is an example of the "heightened scrutiny" of issues by the courts that have heretofore been left to the discretion of regulators (Nollan, 1987).

Another important issue in considering the nature of the government's action is whether the regulation permits public use or occupation of private property. If the regulation is tantamount to or leads to a "physical invasion" of the property by the public, the courts will find a taking (Loretto v. Teleprompter Manhattan CATV Corp., 1982; Nollan, 1987). The public right of access across the owner's beach property demanded by the Commission in Nollan was a significant factor in the Court's finding that a taking had occurred (Nollan, 1987).

The issue of immediate and serious interest with respect to the character of the government's action concerns whether the action may be regarded as advancing a public good or prohibiting a harm to a public interest (i.e., preventing a "public nuisance"). If the regulation may be regarded as "advancing a public good," compensation may or may not be required depending upon the result of the court's consideration of the other relevant factors in the framework takings analysis set forth above (i.e., the regulation's economic impact, its interference with investment-backed expectations, whether the regulation substantially advances" public interests). Such consideration is highly dependent upon the facts of specific cases. But courts have long held (for the past one hundred years) that a taking does not

occur if the government, through the exercise of its police power, is merely acting to prevent or remedy a public nuisance or noxious use of property (Mugler, 1887; Keystone, 1987).

In Keystone, the Court found that legislation preventing coal companies from removing more than a specified percentage of the coal under private and public property during mining operations was not a taking because it prevented damage caused to property through subsidence of the land. The Keystone Court noted that "[l]ong ago it was recognized that 'all property in this country is held under the implied obligation that the owner's use of it shall not be injurious to the community'" (Keystone, 1987, quoting Mugler, 1887). In such cases, no compensation is due regardless of the remaining value of the regulated property (Lucas v. South Carolina Coastal Council, 1991, citing Keystone, 1987).

Yet recent decisions may lead to substantial modification or repudiation of these longstanding principles.

Lucas v. South Carolina Coastal Council.

The Lucas case provided the opportunity for the Supreme Court to reconsider its reaffirmance in 1987 that governmental regulation to protect the public from harm (i.e., a public nuisance) does not effect a taking of private property (Keystone, 1987) irrespective of the remaining value of the property after the regulation is imposed.

In Lucas, the owner of two ocean front lots was denied permission under the State Beachfront Management Act to construct a permanent structure on his lots because their location seaward of the setback line specified by the Act to protect a critical beach/dune system. The findings and policies of this Act, justifying the need for such restrictions to protect the public from substantial harm if the beach/dune system were threatened due to the effects of "permanent," hard structures too close to such system, were not contested by the plaintiff. The argument made by the plaintiff was that, because the regulation deprived him

of "all viable economic use" of his property, compensation was due him regardless of the purpose of the regulation or the harm his project might cause the public. In Keystone, the majority opinion denied compensation to a coal company prohibited by Pennsylvania law from mining more than fifty percent of the coal underlying other property because of the threat of subsidence of superjacent lands. In Keystone, the majority upheld the state law on "the simple theory that since no individual has a right to use his property so as to create a nuisance or otherwise harm others, the State has not "taken" anything when it asserts its power to enjoin the nuisance-like activity" (Keystone, 1987). Justice Rehnquist, writing for the minority, argued that the Court has never "accepted the proposition that the State may completely extinguish a property interest or prohibit all use without providing compensation" (Keystone, 1987). The South Carolina Supreme Court noted that Lucas' argument was simply a rephrasing of Justice Rehnquist's position in Keystone (Lucas, 1991), and based its decision denying compensation to Lucas on both longstanding South Carolina precedents and the majority decision in Keystone.

On appeal to the U.S. Supreme Court, the decision by the South Carolina court was reversed. In doing so, the Supreme Court modified the position it took in Keystone, holding that a regulatory action depriving a landowner of all economically viable use of the property constitutes a taking, except in narrow circumstances. In brief, a "total taking" may only be sanctioned by "background principles of nuisance and property" law. Further, such principles may only be found in common law nuisance and property, established by the courts. Legislatures may not, according to the Lucas decision, define new nuisances or "nuisance-like" activities that would justify regulations eliminating economically viable uses of property. The implications of the Lucas decision for regulatory actions protecting wetlands and other

vulnerable areas from development activities ("total takings") are severe, and so far, not well appreciated by coastal managers.

In Wilson et al. v. Commonwealth of Massachusetts (1992), the Massachusetts Appeals Court affirmed a Superior Court's dismissal of all claims brought by plaintiffs against Massachusetts for denial of permission to construct revetments in front of their coastal property to protect their homes from destruction by the sea, with the single exception of the claim of regulatory taking. The plaintiffs alleged that the State, in enforcing the Wetlands Protection Act's restrictions on altering coastal dunes and banks, prevented them from erecting revetments which presumably would have protected their property from destruction by a coastal storm. The Appeals Court remanded the case to the lower court for trial on the takings claim.

In deciding that the plaintiffs were entitled to a trial on their claim of taking, the Appeals Court commented on several points it considered relevant. First, it called the trial court's attention to the series of cases (Mugler, 1887; Hadacheck, 1915; Goldblatt, 1962) all holding that the state's action based upon its police powers would insulate the state from a takings claim. The Appeals Court noted that a primary purpose of the Wetlands Protection Act's regulations is to prevent flooding and storm damage caused by the destruction of natural formations (coastal dunes and banks) which perform such functions: "[t]hese regulations essentially prevent the creation of a nuisance by property owners who would prevent the natural disposition of sand along the beachfront" (Wilson, 1992). Finally, the Appeals Court called attention to the effect of the public trust doctrine upon the outcome of the trial on the takings claim, noting that if the land upon which the revetments would be built are public trust lands, "the plaintiffs, from the outset, have had only qualified rights to their shoreland and have no reasonable investment-backed expectations under which to mount a

taking claim" (Wilson, 1992). (See section on the public trust doctrine for an analysis of the public trust doctrine.) Except for the possible effect of the public trust doctrine on the decision in the Wilson case, its outcome may well be governed by the Supreme Court's ruling in the Lucas case.

Hence, in view of the recent changes in the membership of the Court, the concern that the longstanding tenet of takings law (since 1887) that police power regulation to prevent a public harm does not constitute a taking of private property is about to be fundamentally altered. The consequences of a reversal of Keystone for environmental management generally and coastal management and wetlands protection in particular, when private property interests are involved, as they often are, are several. Because regulation with respect to wetlands may often leave little viable economic value in such wetlands to the owner, or at least substantially reduce such value (especially if the owner is able to argue that he or she is deprived of the "highest and best use" value if the wetland is filled or dredged (see discussion of Florida Rock I and II, 1986, 1990), wetlands protection will become increasingly problematic or prohibitively expensive. Mass Bays managers will be forced to find other, constitutionally permissible grounds on which to base wetlands management (the potential of the public trust doctrine in this respect is discussed in another section of this report; also see the report's section on wetlands management).

But the reversal or substantial modification of the principles upheld in the Keystone case (1987) would also seriously affect all regulatory decisions by Mass Bays managers concerning uses of private property. Whenever the economic value of private property is diminished as a result of management decisions affecting Mass Bays space, uses, and resources, takings claims will be raised as a barrier to such management. Because of its

constitutional dimension, a takings claim blocking proper management of Mass Bays lands, waters, and resources cannot be remedied through legislative action.

Temporary Takings.

The "chilling effect" of the threat of such takings claims on regulatory decision-making is magnified today following the U.S. Supreme Court's ruling in First English Evangelical Lutheran Church of Glendale v. County of Los Angeles, Ca., (1987). Although the First English Court did not find that a taking had occurred, it did rule that if there were a taking, even if only temporarily, the landowner would be entitled to compensation from the date the regulation was imposed on the property: "temporary takings which, as here, deny a landowner all use of his property, are not different in kind from permanent takings for which the Constitution clearly requires compensation." The First English decision did recognize that no compensation would be required if the regulation was legitimately based upon the state's police power to provide for the public safety, but this latter issue is of course the matter to be decided by the U.S. Supreme Court in Lucas. Under the ruling in First English, the remedy for temporary takings requires the payment of monetary damages.

Wetlands Takings Cases: Florida Rock I and II.

In addition to the modifications to the law of regulatory takings as a result of the Supreme Court's decision in Lucas, other changes are possible as a result of decisions by the U.S. Claims Court that a taking occurred when the U.S. Army Corps of Engineers denied Section 404 dredge and fill permits for projects involving wetlands. The best known of these decisions is Florida Rock I and II, (1986, 1990) (also see Loveladies Harbor, 1990). These decisions concern the valuation of wetlands and the measure of the economic impact on wetland landowners denied the right to drain or fill them.

The two decisions by the Claims Court in Florida Rock focus almost exclusively upon the economic impact on the owner of the denial of permits to drain a wetland in order to conduct a mining operation. Little attention is given in the decisions to the value of wetlands preservation, and both the Claims Court and the Court of Appeals are unreceptive to the argument that allowing the wetlands to be drained and mined constitutes a harm to public interests that must and can be protected via implementation of Section 404 of the Clean Water Act. Consequently, both courts view the government's action as primarily an interference with the investment-backed expectations of the landowner, although the two courts to date have differed on the methods used to determine the economic impact of the permit denial upon the owner, as discussed below.

Florida Rock Industries acquired 1,500 acres of sawgrass marsh in Dade County, Florida, in 1972, for the purpose of mining limestone. The property is a wetland under the Clean Water Act regulations, and a permit is required to dredge or fill the property. Because of adverse market conditions, Florida Rock did not begin mining operations until 1978, without seeking a permit from the COE. Mining was stopped pursuant to a cease and desist order issued by the COE in September, 1978. Later Florida Rock applied for a permit to dredge and fill a portion of its property, which was subsequently denied by the COE on the grounds that the project would pollute navigable waters, destroy wetlands and associated wildlife resources, and because upland alternatives existed for limestone mining, the project was determined not to be in the public interest.

In Florida Rock I, the Claims Court accepted the claimant's argument that, by denying a permit to dredge and fill the wetlands in order to conduct a mining operation, the COE had destroyed all economic value of the property. The argument by the United States that the property retained significant economic value to the owner, and that a market analysis of this

value supported the Government's position, was rejected by the Claims Court. The Claims Court also found that the Government's claim of harm as a result of pollution of navigable waters was not supported in the record, even though the claimant did not contest the validity of the COE's decision, and the record of the administrative decision reflected findings of such harm. The Claims Court found that the denial of a permit to dredge and fill a 98-acre portion of the property was a taking of the entire property by the Government, and that the proper measure of damages was the purchase price of the property, adjusted for inflation. The Claims Court refused to credit the market analysis data and information offered by the Government to determine the property's value after the permit denial.

On appeal, the Court of Appeals reversed, finding that the Claims Court had erred by refusing to admit the Government's market value analysis and testimony at trial. In addition, the Claims Court erred by second-guessing the COE with respect to its finding that Florida Rock's dredge and fill project would cause pollution. Because of the limited jurisdiction of the Claims Court only to determine whether a taking had occurred, and not to review the administrative decisions of the COE, the Claims Court had exceeded its authority. But, in remanding the case to the Claims Court, the Court of Appeals invited the lower court to determine the economic impact upon the landowner by comparing the owner's basis or investment in the property before the denial of the permit to develop the wetland and the fair market value of the property after the permit denial. Because Florida Rock's 1972 investment in the property reflected its value as a mining site, its "highest and best use," the effect of the Court of Appeals decision was to invite the claimant and the Court of Appeals to assert "highest and best use" as a measure of the property's value rather than the residual fair market value of the property after the permit was denied. This result contradicts a well-

developed tenet of takings law that "highest and best use" may not be claimed as a measure of damages in a takings case (see discussion of general principles of takings above).

On remand (Florida Rock II), the Claims Court again found a takings by rejecting the Government's evidence of the residual fair market value of Florida Rock's property and admitting and relying upon a "questionnaire" circulated by the claimant among property owners in the region in order to determine the knowledge and motivation of purchasers of property comparable to the claimant's. Although the Government had introduced evidence of comparable sales in the area of Florida Rock's property that substantiated considerable residual value in the property, after denial of the permit, the Claims Court relied upon the questionnaire to hold that the Government's comparable sales survey was not valid because the purchasers were not "knowledgeable;" i.e., did not appreciate the effect of the permit denial upon the claimant's property. Again, the Claims Court found that the permit denial was not justified as preventing a harm to the public interest in maintaining wetlands because the effects of Florida Rock's proposed mining would, in the Court's view, have only "de minimis" effects upon water quality. Finally, the Claims Court awarded damages based upon Florida Rock's original investment in the property, adjusted for inflation.

The decision in Florida Rock II is on appeal to the Court of Appeals. This controversial ruling by the Claims Court with regard to the method of determining the economic impact upon the landowner may be overtaken by the decision in the Lucas case. The decision in Lucas that the Government must compensate the landowner even when the Government acts to protect legitimate public interests from harm (by prohibiting a "nuisance-like" activity as defined by the Legislature) would seem to put the Florida Rock case on a different footing. As noted above, the Claims Court sought to minimize the "nuisance" aspects of Florida Rock's proposed mining operation, finding only "de minimis" effects upon navigable waters protected

by the Clean Water Act and its regulations. In view of the Supreme Court's decision in Lucas, the Claims Court's rejection of the Government's claim of acting to prevent a nuisance by denying a permit to Florida Rock arguably becomes irrelevant and attention will turn to the method of determining the economic impact of the regulation upon the landowner -- the issue of most concern presented by Florida Rock I and II. Therefore an affirmation of Florida Rock poses a serious problem for Mass Bays managers. Landowners prevented from developing property according to its "highest and best use" may be able to claim the maximum economic damage from such management decisions, thereby contributing to the "chilling effect" noted earlier on the willingness of Mass Bays managers to make difficult decisions affecting development projects, large or small.

Recommendations.

1. In view of recent and pending takings decisions in the U.S. Supreme Court, Claims Court, and Court of Appeals indicating that the takings analysis followed by the courts may change significantly, Mass Bays managers and regulators must anticipate that their reliance upon traditional police power as justification for imposing limits upon the use of private property may be seriously curtailed. In the case of development projects involving wetlands or coastal areas, where the effect of the regulation is to severely limit economic use of the property, the impending changes in the law will have the most critical impact.

2. Alternative measures to management development activities in environmentally-sensitive areas should be seriously considered (e.g., tax-based incentives to protect such areas from development or to promote less-intensive development, purchase of fee simple interests and/or development rights in lands adjacent to sensitive areas, etc.).

3. Where possible, consideration should be given to basing management and regulatory decisions concerning public trust lands in the State upon the governmental trustee's

"property" interests in these lands, rather than upon the State's police power. Limits upon the use of private property that are grounded in the State's public trust doctrine should be shielded to a significant degree from takings claims (see discussion of the public trust doctrine).

The Public Trust Doctrine.

This section discusses the current and potential role of the public trust doctrine in managing Mass Bays space and resources. Under the common law public trust doctrine, the public possesses property rights in public trust lands and resources that cannot not be extinguished except in certain narrow circumstances, as examined below. Further, the doctrine is the source of resource management principles that are increasingly important to the effort to protect sensitive coastal and ocean resources. Finally, the geographical scope of the public trust doctrine in Massachusetts, from tidal areas to the three nautical mile limit, coincides well with the boundaries of the Mass Bays Program. Thus, any advantage which the public trust doctrine may offer in managing Mass Bays space and resources must be carefully considered and evaluated.

The Development of the Doctrine.

The public trust doctrine in the United States has its roots in English common law of the early 17th century, when the doctrine was first brought to North America. Under English common law, the Sovereign held title to coastal waters and tidelands. As holder of the "jus privatum" aspect of this title, the Sovereign could freely grant such lands to private persons and did so. But under the "jus publicum" or public right attaching to the title, the Sovereign held these lands "in trust" for the people. These "public trust" rights originally included access to coastal areas for navigation, commerce, fishing, and associated activities. Because the Sovereign's trust responsibilities under the "jus publicum" survived any grant of trust

lands to private persons, the people's right embodied in the trust to use and occupy such lands for certain purposes (including the traditional uses of navigation, commerce, fishing, and fowling) also survived.

This division of property interests between the Sovereign (and those holding title through the Sovereign) and the public limited the uses to which trust lands could be put. An owner claiming title through the Sovereign could not legally oppose the public's exercise of its traditional rights. Of course, private owners of trust lands often excluded the public and disputed its rights in trust lands. Nevertheless, in the United States, public rights in trust property long thought to be wholly privately owned have sprung up again to justify a growing and diverse list of public uses of such lands, providing significant protection for such lands and public rights in them. It is important to note that such protective measures taken by states or by citizens enforcing their public trust rights are based upon the property rights of the public in trust lands, waters, and resources, not upon an exercise of the state's inherent police power. The implications of this critical distinction are discussed more fully in the section of the report examining the interface between the public trust doctrine and takings law.

Common law public trust principles and concepts spread throughout the United States as a result of the "equal footing" doctrine, which holds that states newly admitted to the Union acquire the same rights and privileges as possessed by the original states. Because the original states succeeded to the rights and obligations of the British Sovereign, including both the title to and trustee responsibilities over public trust lands, waters, and resources, new states similarly acquired both title to and duties owed the public respecting such lands, waters, and resources. As a result, the public trust doctrine is effective in all states, and,

although the doctrine varies in scope and effect from state to state, it has become an increasingly powerful legal tool both to manage and protect trust lands and waters.

The public trust doctrine in the United States during the 19th and early 20th century was essentially restrictive -- the courts applied the doctrine to limit what state legislatures, officials, and private parties claiming title from the state could do with respect to trust lands, waters, and resources. Sales of trust assets by the state trustees and the claimed destruction of public trust interests were overturned by the courts as violations of the duties imposed by the trust upon the states.

From such decisions has emerged the standard against which the courts will measure the sale of trust lands. First, there must be no "substantial impairment" of the public interests in the remaining trust lands and waters as a result of the sale. Second, the grant or sale must serve a valid public purpose. Third, a number of procedural requirements must be met before the public rights in the lands or waters sold or granted are terminated:

1. The grant by the legislature must describe the trust lands and waters sold in particular detail;
2. The legislature must acknowledge the public interests to be relinquished, and if certain public rights are not specifically identified, then courts will be reluctant to find that they have been destroyed by the grant; and
3. The grant must identify the uses to which the lands and waters may be put. Grants that do not identify such uses will be interpreted to authorize only public uses for trust lands and waters in private ownership. (Illinois Central Railroad, 1892; Appleby, 1926).

Since the 1960s, public trust theory in the United States has become increasingly positive in effect (rather than merely restrictive with respect to actions by the governmental

trustee) as many state courts have expanded the doctrine beyond the traditional uses of navigation, commerce, and fishing to include a variety of new uses and activities in response to changing societal conditions and public needs. In a series of influential state court decisions, the doctrine has been interpreted to protect conservation, esthetic, scenic and ecological uses, including preservation of trust lands and waters "in their natural state," for scientific study, as open space, and as habitats for birds and marine life; and to require access to public trust lands and waters for recreational purposes, including bathing, swimming, boating and other activities both on or in the water or on shore. Modern courts have been willing to find that the public trust doctrine imposes affirmative obligations upon governmental trustees to act conservatively with respect to trust lands, uses, and resources.

For example, in National Audubon Society v. Superior Court of Alpine County (1983) (the Mono Lake case), the California Supreme Court found that the public trust doctrine not only limited the uses to which waters flowing into Mono Lake could be put, but also held that the State's trust duties over Mono Lake and its resources, including the waters of non-navigable tributaries, included the obligation to preserve the trust property:

. . . the public trust is more than an affirmation of a state power to use public property for public purposes. It is an affirmation of the duty of the state to protect the people's common heritage of streams, lakes, marshland and tidelands, surrendering that right of protection only in rare cases when the abandonment of that trust is consistent with the purposes of the trust.

The California Court also held that the state trustee must consider the effects of one use of trust lands and waters (e.g., the diversion of water from streams feeding into Mono Lake for consumption in Southern California) upon other, competing trust uses and values

(e.g., the public's interest in the wildlife, ecology, and scenic and recreational values of the Lake itself):

The state has an affirmative duty to take the public trust into account in the planning and allocation of water resources, and to protect public trust uses whenever feasible. . . . As a matter of practical necessity the state may have to approve appropriations [of water] despite foreseeable harm to public trust uses. In so doing, however, the state must bear in mind its duty as trustee to consider the effect of the taking on the public trust, and to preserve, so far as consistent with the public interest, the uses protected by the trust.

The Public Trust Doctrine in Massachusetts.

California's reliance upon the public trust doctrine to protect trust lands and waters may be contrasted with the role of the doctrine in Massachusetts. The Massachusetts Bay Colony's Ordinances of 1641 and 1647, which marked the emergence of the doctrine in America, set certain limits on its legal effect use in the Colony and State that have persisted until the present. Under those Ordinances, the Colony granted title extending to the low water mark to owners of land adjoining tidally influenced waters, and granted title to the high water mark to owners of land adjoining "great" ponds over ten acres in size. The purpose of the Ordinances was to encourage private wharf building for the stimulation of commerce. Despite this expansion of private ownership, the Ordinances expressly reserved for the public the right to use these areas for navigation, fishing, and fowling. In addition, the public retained the right to pass over the private land itself between the high and low water marks or next to great ponds in order to exercise its reserved rights. This extension of the doctrine from the intertidal area to fresh waters, adopted later by most states as the country grew, was the first indication of the doctrine's dynamic nature in the United States.

Because of the importance of the reserved public rights in privately-owned trust lands in Massachusetts, this section first describes the system of land use management established by the Legislature to protect and preserve such public rights (the "Chapter 91" program, as amended in 1990). Second, the potential role of the doctrine in the management of Mass Bays space, uses, and resources is examined via a discussion of public trust principles. Finally, in view of possible changes in takings law, addressed in another section of this report, the interface between the public trust doctrine and takings law is considered.

The Chapter 91 Program. The legal status of titles to tidelands or filled tidelands out to mean low water in Massachusetts, although generally settled through the long period from the 17th to the mid-20th century, was occasionally drawn into question. In 1941, the Massachusetts Supreme Judicial Court held that licenses issued under an 1866 law and subsequent amendments governing tideland projects could be revoked without compensation for any improvements erected on the filled land (Commissioners of Public Works v. Cities Service Oil Co.). The uncertainties created by this decision lead to the Legislature initiating the practice of issuing "irrevocable licenses" for tidelands projects. By 1969, 45 irrevocable licenses had been issued by the Legislature (Rice, 1971). In 1979, the Supreme Judicial Court issued another decision calling into question the effect of such licenses by holding that such licenses did not grant title to the property without limitations but are "subject to the condition subsequent that [the public trust property] be used for the public purpose for which [the license] was granted" (Boston Waterfront Development Corp. v. Commonwealth). If the land was no longer used for such original purpose, the State could repossess the land.

In response to this decision, the Massachusetts Senate requested an opinion of the Supreme Judicial Court on the constitutionality of a bill it was considering to give up the public's interest in filled tidelands in Boston. The advisory opinion issued by the Court in

1981 concluded that the State could relinquish the public's interests in such lands, but that legislation effecting the extinction of public rights in such lands must conform to the standards described above (Opinion of the Justices). Specifically, the opinion identified four criteria that must be met: (1) the legislation must define the land involved explicitly; (2) it must acknowledge explicitly the public interest being surrendered; (3) it must recognize the new use to which the land is being put; and (4) the grant of public rights must have "a valid public purpose." The test whether a "valid public purpose" exists is "whether the expenditure confers a direct public benefit of a reasonably general character ... as distinguished from a remote and theoretical benefit ... and whether the aspects of private advantage ... are reasonably incidental to carrying out the public purpose in a way which is within the discretion of the Legislature."

Following the decision in Boston Waterfront (1979) and the Opinion of the Justices (1981), Massachusetts undertook to revise Chapter 91 governing the issuance of tidelands licenses. These revisions provide for the payment of compensation if a license is revoked for any reason other than noncompliance with license conditions. This financial protection, however, is only provided prospectively to holders of licenses issued after January 1, 1984. Formerly filled tidelands are made subject to the licensing requirements. Substantial changes in the use of public trust lands or substantial alteration of a structure requires a new license. Finally, the revised Chapter 91 establishes a process for choosing among competing uses of public trust lands and waters in Massachusetts by giving a priority to water dependent over non-water dependent uses. Water dependent uses require direct access to or location on the water and can be licensed without a public hearing. Non-water dependent uses require a public hearing and a determination that such uses serve "a proper public purpose and ... shall

provide a greater public benefit than ... public detriment to the rights of the public in [these] lands" (M.G.L. chapter 91).

Regulations to implement the amended Chapter 91 were issued in 1990. A more detailed description of Chapter 91 authority and regulations follows.

Chapter 91 and Implementing Regulations. The statute contains strict public purpose requirements for public tidelands and for any non-water dependent use on tidelands. Second, a new license must be obtained any time there is a change in use or a structural alteration. Third, the amendments require that a license for non-water dependent uses must be consistent with the Massachusetts CZM program. Fourth, the amendments impose a more extensive fee assessment structure for tideland use (Lahey, 1985).

Proper Public Purpose. Required of non-water dependent projects as well as water dependent projects in Commonwealth tidelands. Water dependent uses are defined as:

those uses and facilities which require direct access to, or location in, marine or tidal waters and which therefore cannot be located inland, including but not limited to: marinas, recreational uses, navigational and commercial fishing and boating facilities, water-based recreational uses, navigation aids, basins, and channels, industrial uses dependent upon waterborne transportation or requiring large volumes of cooling or process water which cannot be located or operated at an inland site. M.G.L. chapter 91

"Commonwealth tidelands" are defined as "tidelands held by the Commonwealth in trust for the benefit of the public or held by another party by license or grant of the Commonwealth subject to an express or implied condition subsequent that it be used for a public purpose." "Private tidelands" are defined as "tidelands held by a private party subject

to an easement of the public for the purposes of navigation and free fishing and fowling and of passing freely over and through the water." M.G.L. chapter 91.

Non-water dependent projects must serve a proper public purpose which provides "a greater public benefit than public detriment to the rights of the public in said lands" (M.G.L. chapter 91). This statute, with a preference for water dependent use imposes less stringent scrutiny of license applications for water dependent projects and water dependent projects in private tidelands. For example, a public hearing must be held on any license application for non-water dependent uses of tidelands. After the public hearing, no license may be issued for a non-water dependent project unless the DEP makes a written determination contending (1) that the project "serve[s] a proper public purpose," (2) that the project "provides a greater public benefit than public detriment to the rights of the public," and (3) "that the determination is consistent with the policies of the Massachusetts Coastal Zone Management Program" (M.G.L. chapter 91). This provision, mandating a balancing of the public's rights in tidelands, gives breadth to the public purpose requirement established by case law.

New License Requirement. A new license is required when a change in use or a structural alteration occurs. This provision operates retroactively. Further, this provision codifies the common law holding that the licensee holds title subject to the condition that it be used for the originally legislated purpose (Boston Waterfront, 1979).

Consistency with Coastal Zone Policies. In addition to serving a proper public purpose, non-water dependent uses of tidelands must be consistent with the policies of the Massachusetts CZM Program. The CZM Office reviews proposed activities to determine whether they are consistent with thirteen regulatory and fourteen non-regulatory policies. These policies are intended to be the bases for the protection and rational management of the Massachusetts coast.

License Fee. In recognition of the fact that the use of tidelands is a valuable privilege for which the Commonwealth deserves adequate compensation, the amendments give DEP the authority to determine by regulation more adequate fee assessments for tidewater displacement fees and tideland occupation fees. Tidewater displacement fees are the fees incurred depending upon "the amount of tidewater displaced by any structure below high water mark, or any filling of flats." Tideland occupation fees are the fees associated with the rights granted in any lands to which the Commonwealth has title, such as the right to build a wharf or other structure on such lands. Prior to the 1983 amendments, the fee assessments were minimal. For example, the tidewater displacement fee was not to exceed \$0.375/cubic yard of water displaced. Under the 1990 regulations, the tidewater displacement fee for water dependent use projects is \$2.00/cubic yard of water displaced, while for non-water-dependent use projects the fee is \$10.00/cubic yard. This is a significant increase over the \$0.375/cubic yard in effect prior to the 1983 statutory amendments. Finally, each license is required to contain a statement of the tidewater displacement fee and that payment for said fee has been made or performance of other conditions in lieu of the fee have been completed, and a statement of the tidewater occupation fee, if applicable, and that payment for said fee has been made or will be made.

License Term. Prior to 1986, all Chapter 91 licenses expired within a five-year period. Language from the 1986 amendments suggests, however, that a license could be issued for a period in excess of five years: "[O]r such other period of time specified therein" (M.G.L. chapter 91). Under the 1990 regulations, the basic license term is 25 years, with extended terms available for 65 years for projects over the water and 99 years for projects on filled land. In addition, DEP is given the authority to extend the license period for good cause, without public hearing or notice. Thus, this provision provides DEP with flexibility to extend

the license period to the advantage of the licensee. The public, in essence, is afforded no voice in the extension; extensions are subject to DEP's discretion.

Increased Procedural Protections. Article 97 to the Massachusetts Constitution, which requires a two-thirds vote for the Legislature to dispose of or put to a new use lands or easements acquired for several conservation-related purposes, and the "prior public use" doctrine, which requires, among other things, a majority vote of the Legislature when public lands devoted to one purpose are directed to another inconsistent public use, establish significant procedural protections with regard to the transfer of public property (see Robbins v. Dept. of Public Works, 355 Mass 328, 244 N.E.2d 577 (1969); Gould v. Greylock Reservation Comm'n, 350 Mass. 410, 215 N.E.2d 114 (1966)).

Consistent with these policies, Chapter 91 imposes procedural requirements aimed at protecting the public when tidelands licenses are issued. First, public notice must be given in advance of license issuance. Second, a public hearing must be held in certain circumstances before the issuance of a license. Third, an aggrieved individual has the right to an adjudicatory hearing. Fourth, the license and plan must now be promptly recorded in the appropriate registry. Fifth, private tideland licenses must comply with local zoning laws. Sixth, local governments have great authority over tideland development in their affected area. Finally, licensees are offered additional procedural protections against revocation of tidelands licenses.

Public Notice. Prior to the 1983 amendments, public notice was required to be given to appropriate government officials before the license was issued, but there was no time limit specifying how far in advance of license issuance the notice needed to be given. Conceivably, public notice could be given the day before license issuance or even the day of license issuance, provided it occurred before the license was issued. Further, the public notice

requirement was deemed satisfied as long as the license stated that the appropriate city or town officials had not objected. The general public, therefore, was never guaranteed notice of proposed tidelands projects.

In an effort to increase the procedural protection of the public's trust rights, the 1983 legislation not only required DEP to give notice to appropriate government officials, but also required publication of such notice in at least one newspaper with circulation in the affected area, at the applicant's expense. In addition, both notices must be given at least forty-five days in advance of license issuance. Thus, the general public, as well as affected local governments, are given an opportunity to present informed, reasoned objections with respect to projects which might diminish their public trust rights.

Public Hearing. Again reflecting a preference for water dependent use of tidelands, the amendments to Chapter 91 require a public hearing on any license application for non-water dependent uses. In addition, a written determination, stating that the project satisfies certain criteria, is required after the public hearing for all non-water dependent uses of tidelands. The written determination must find that the project will serve a proper public purpose which provides greater public benefit than detriment to the public's tidelands rights and that the project is consistent with the Massachusetts CZM Program. With regard to water dependent projects, a public hearing is not mandatory but may be held upon the request of any affected local government.

Adjudicatory Hearing. A right to an adjudicatory hearing in accordance with the state's administrative procedure act is afforded for any person aggrieved as a result of a license issuance. In keeping with the underlying premise of the public trust doctrine, there is no right of review for denial of a license application since the issuance of a tidelands license conferring privileges to individuals is a proprietary decision of the state, and not a regulatory decision

based on the state's police power (Lahey, 1985). The proprietary nature of the state's grants is underscored by Chapter 91's explicit statement that no property right is conveyed by the issuance of a license. Thus, the two-thirds vote requirement of Article 97 of the Massachusetts Constitution before land or easements acquired for natural resource purposes can be used for other purposes is inapplicable to the issuance of Chapter 91 licenses because Article 97 applies only to the conveyance of property rights.

Recording. License was issued, but there was no incentive to expedite the recording. After 1983, licenses and their accompanying plans must be recorded in the appropriate registry within sixty days of issuance and the licensee may not begin work or change the use on the property until the license is recorded and DEP receives notice of the recording.

Local Zoning Regulation. The amendments mandate that private tidelands uses comply with local zoning ordinances and by-laws before a license can be issued.

Local Government Control. As a result of the amendments, local governments are given more control over development of their tidelands. Applicants must submit the license application to both DEP and the local planning board of the city or town where the work is to be performed. The planning board is authorized to conduct its own public hearing. In addition, it must submit written recommendations to DEP stating whether the proposed project meets the necessary criteria. The local planning board must decide whether the proposed project would serve a proper public purpose that would not be detrimental to the public's rights. DEP is then required to take the planning board's recommendations into consideration when making a license determination.

The 1990 regulations offered local governments greater control if they implement a state approved municipal harbor plan. Such plans create dimensional and use requirements

for licensed projects that may differ from the statewide requirements imposed by the regulations.

Protection Against Revocation. Finally, licensees are offered greater procedural protection regarding revocation of tideland licenses. After the 1983 amendments, the statute stated that licenses could only be revoked without compensation for noncompliance. The 1986 amendments further require that the licensee receive both written notice of noncompliance and an opportunity to correct the noncompliance before DEP revokes the license. The 1990 regulations make discrimination practices a ground for license revocation.

The Public Trust Doctrine and Managing Mass Bays Lands and Waters.

The Chapter 91 program is itself an example of the application of public trust principles to the management of Mass Bays lands and waters, particularly those that have been conveyed into private ownership but remain subject to certain public rights. It is possible, however, that a more pervasive application of public trust principles to Mass Bays space, uses, and resources, or at least an articulation of management actions with respect to these trust assets based upon the public trust doctrine in addition to the state's police power, would be beneficial. Two specific applications of public trust principles are considered: managing trust uses and regulating cumulative effects on the basis of the public trust doctrine.

Managing Trust Uses. Land and resource management authority applicable to Mass Bays space, uses, and resources obviously derives from several sources: federal, state, and local. There is considerable jurisdictional and geographical overlap between many of these separate legislative authorities; e.g., the "coastal zone" as defined by the CZMA includes much of the same land and water territory as "estuaries" and "estuarine zones" as defined by the CWA. Distinct from these legislative authorities, as noted above, is the common law public trust doctrine, but operative in much of the same land and water space and applicable to the same

uses and resources. This overlap between the coastal and estuarine zone and the "zone" of public trust lands, waters, and resources permits a Mass Bays management system grounded in public trust principles as a source of legal authority in addition to police power. Certain advantages are gained through this approach. First, uses, activities, and projects within the public trust/coastal zone area can be prioritized or prohibited upon the basis of the public's property interest in trust lands, waters, and resources. Second, management actions based upon public trust property principles can secure a measure of protection from regulatory takings claims, in addition to the protection derived from the state's police power. (For a discussion of the public trust doctrine and takings law, see below.)

The public trust doctrine does not treat all uses of trust lands, waters, and resources as being of equal importance. From its origin, the doctrine has permitted a ranking of uses reflecting the relative value placed upon such uses by contemporary society. In applying the doctrine in this country, state courts have included new uses within the doctrine, and recognized a different ranking of uses establishing environmental protection as a more important use. Moreover, "trust uses" do not encompass all "public uses" that may be made of trust lands, waters, and resources. The fact that trust lands may be productively used and serve a public purpose, such as increasing tax revenues, does not mean that the trustee may permit almost any use of trust lands and resources. U.S. courts have usually required that there must be a relationship between the proposed use and the purposes of the trust: "[m]ost decisions and commentators assume that 'trust uses' relate to uses and activities in the vicinity of the lake, stream, or tidal reach at issue" (Mono Lake, 1983).

Thus, according to the public trust doctrine, the reasonableness of a particular use depends upon how it is perceived in the context of the trust lands, waters, and resources affected by the use. A use that is perceived not to "fit" this natural, physical environment,

or which unduly consumes or destroys trust lands and resources, may be prohibited by the doctrine. In addition, the doctrine may prohibit a use if such use is perceived to serve largely private as opposed to public interests.

In summary, the public trust doctrine permits resource managers to distinguish between permissible and prohibited trust uses -- a management decision that may be grounded in the public's property interest in the lands, waters, and resources, rather than merely in the state's police power. Further, such managers may create an order of permissible public trust uses. The legal preference stated in the Chapter 91 Program for water dependent over non-water dependent uses is an example of such a priority based upon the public trust doctrine's property basis.

Managing Cumulative Effects. Just as the public trust doctrine permits a ranking of uses of trust lands, waters, and resources, the doctrine also justifies managers to set limits upon the cumulative effects of numerous individual projects affecting trust assets. For example, limits may be imposed on new trust uses upon the ground that such uses damage the public interest in trust lands, waters, and resources. Acting upon the governmental trustee's duty to preserve trust property, and in response to the threat posed by the cumulative effects of individual projects, the state may determine that a rate of development above a specified level may damage trust property and impose limits based upon such cumulative effects.

Expanding the Public Trust Doctrine in Massachusetts. The proper scope of the public trust doctrine in Massachusetts is not well understood or appreciated. With respect to tidelands that have been sold into private ownership, attention has focused upon the surviving public trust rights: fishing, fowling, and navigation. But with respect to other trustlands (tidelands still in public ownership; submerged lands below mean low water), little attention has been given to determining the scope of such rights. As noted above, Chapter 91's preference for

water dependent over non-water dependent uses is an example of the Legislature declaring a favor of certain public trust uses. It is also suggested that a more thoroughgoing specification of public trust uses may be helpful in Mass Bays management, and that the doctrine may provide a legal principle on which to base limitations upon the cumulative effects of individual uses of Mass Bays resources. But the public trust doctrine may be expanded in Massachusetts by considering actions by the State Legislature as the "trustee" of public trust lands and resources.

For example, and as noted elsewhere in this report, the State Ocean Sanctuaries Act protects most of the coastal waters, seabed, and subsoil of Massachusetts, with the exception of waters facing Boston Harbor, including their "ecology" and "appearance." The coastal waters and submerged lands protected by the Ocean Sanctuaries Act are the same as the State's public trustlands, as defined by Chapter 91, extending to the three nautical mile limit. Further, these values, "ecology" and "appearance" or esthetics or scenic value, are recognized as included among the values protected by the public trust doctrine, the State may avail itself of important, new authority with which to manage uses and activities affecting Mass Bays space and resources, applicable to public trust lands not subject to the Ocean Sanctuaries Act.

Public Trust Doctrine and Takings Law.

The law of regulatory takings in the United States (i.e., the elements of the takings analysis established by the U.S. Supreme Court during the past two decades) has been discussed in a separate section of this report. The interface between the public trust doctrine and the law of takings is briefly examined in several contexts: (1) when restrictions are imposed upon uses of public trust property; (2) when restrictions are imposed upon privately-

owned trust property in which the public has certain reserved rights; and (3) when the government seeks to require public access across privately-owned trust lands.

When restrictions are imposed upon uses of public trust property, the analysis is relatively straight-forward. As discussed above, the doctrine permits establishing a hierarchy of public trust uses, including the prohibition of certain uses harmful to public trust interests. Because the basis for this management decision lies in the public property interest held by the governmental trustee rather than exclusively in the state's police power, claims of a regulatory taking because certain uses are prohibited should not succeed (Orion Corp. v. State of Washington, 1987; Mono Lake, 1983).

Although the argument is less certain, and precedents are few, the public trust doctrine may be invoked in circumstances in which activities on privately-owned lands abutting trust property may adversely affect trust interests. For example, normally regulatory restrictions upon activities on private property adjacent to trust property (e.g., a wetland) would be grounded in the state's police power. In this case, however, such restrictions may be grounded as well in the duty of the trustee under the public trust doctrine to protect such property from harm. Of course, this application of the public trust doctrine depends upon the willingness of government trustees (legislatures, public agencies) and the courts to recognize that the doctrine imposes such a duty upon the trustee (Connecticut Department of Environmental Protection, 1990). But to the degree that the public trust doctrine is seen as the source of authority for imposing such restrictions, rather than the state's police power, the more likely that restrictions of this kind will be insulated from takings claims.

In the case of restrictions upon uses of privately-owned trust lands (e.g., activities in intertidal areas) in which the public possesses certain rights, the analysis is more difficult. In Orion v. State of Washington (1987), the Orion Corp. claimed a taking of tidelands it had

purchased from the State for the purpose of building a residential community along dredged canals. After the sale, the State adopted coastal and tidelands regulations that prevented construction of such a community. Holding that the tidelands are public trust property and that Orion purchased the property subject to the public trust, the Washington Supreme Court found that Orion could not have any "reasonable investment-backed expectations" with regard to the property other than those uses permissible under the public trust doctrine. Therefore, to the degree that the regulations restricted uses impermissible under the doctrine, no taking could occur. But if the regulations restricted uses that were permissible under the regulations (e.g., shellfishing), then the court must carry out a takings analysis as established by the U.S. Supreme Court to determine whether a taking had occurred (see discussion of the framework takings analysis above).

The Orion decision reconciles the public trust doctrine and the constitutional prohibition against the taking of private property without just compensation, with respect to uses of public trust property, in a reasonable manner. But when the trustee seeks to reclaim public rights that have been surrendered (e.g., access across privately-owned trust lands), the public trust doctrine, at least in states such as Massachusetts that hold a narrower view of the doctrine than other states, can not avoid a takings claim (Connecticut Department of Environmental Protection, 1990). In view of the finding of the Massachusetts Supreme Judicial Court that claiming the right for the public to pass across private property subject to the public trust doctrine (e.g., a privately-owned beach) would constitute a taking of private property (Opinion of the Justices, 1979; also see Bell v. Town of Wells, 1989), the governmental trustee has no other recourse than to purchase such public rights of access, or to obtain them as a condition of granting a permit for other uses of private property subject to the public trust, a technique that has been successfully used in Chapter 91 licensing

proceedings, but which may be seriously curtailed as a result of takings cases currently before the federal courts (see takings section of this report).

In 1991, Massachusetts enacted into law authority for the Department of Environmental Management to take a "public-on-foot free right-of-passage" across privately-owned beaches "between the mean high water line and the extreme low water line" (M.G.L. Chapter 138, section 294). The new law authorizes the Department to select a beach in Plymouth or Falmouth for such purposes and to file the appropriate notice of a public taking of an interest in private land. The law sets certain limits upon the exercise of this new right (e.g., foot passage is permitted only during daylight hours; no other recreational use of the private property is allowed). In addition to reclaiming an important recreational use of lands subject to the public trust doctrine for the public, although on a limited basis, the new law will require a determination of the value such a right. Whether this technique of broadening the public's rights with respect to public trust property succeeds depends entirely upon the value the courts are willing to place on this limited right of passage. If such value is too high, little use is likely to be made of this technique.

Recommendations.

1. Mass Bays managers may use the State's public trust doctrine as a primary authority for distinguishing between permissible and prohibited uses of public trust resources (e.g., Mass Bays resources within State waters, all of which fall under the public trust). To a degree, as reflected in Chapter 91, the State already distinguishes between water and non-water dependent uses, and legislatively has declared a preference for water dependent uses. Management decisions designed to control the combined, cumulative effects of small-scale activities and projects may also be grounded in public trust principles, thereby providing a

justification for imposing limits upon development based upon the doctrine in appropriate cases rather than solely upon the State's police power.

2. Opportunities should be sought to expand the scope of the public trust doctrine in Massachusetts (e.g., by legislative enactments or by administrative interpretations and applications of existing authority to assert public trust interests). The uncertain scope of public rights in Massachusetts trust lands protected by the doctrine needs clarification, which can only come by the governmental trustees seeking actively to expand the doctrine in the State.

3. The State public trust doctrine may provide a significant barrier, in certain cases, against takings claims where local or State regulation severely restricts the use of private property (see recommendations in the section of this report on regulatory takings law).

MAJOR CONCLUSIONS AND RECOMMENDATIONS.

Part II of this study concludes that generally there is generally sufficient authority at the local, State, and federal levels of government to effectively manage and protect the lands, waters, uses, and natural resources of Mass Bays. Both Section One and Two identify where additional authority is required, especially with respect to critical area management (wetlands, ACECs, river protection, etc.). The present problem is not so much that additional authority is needed as it is to preserve the hard-won authority that currently exists.

Wetlands programs at both the federal and State levels are under particularly severe pressure to weaken standards and enforcement mechanisms, with the greatest pressure being exerted on the federal COE-EPA Section 404 program. The sources of this pressure are: takings challenges to denials by COE of Section 404 permits to dredge or fill wetlands; amendments to the Clean Water Act that, if enacted, will drastically curtail regulation of

activities harmful to wetlands preservation and require that privately-owned wetlands must be purchased in order to protect them; and changes to wetlands regulations and definitions that will effectively exclude a significant portion of currently-protected wetlands from coverage by the Clean Water Act. Changes in these directions in the federal program, it is recommended, can be remedied to some degree by maintaining a vigorous wetlands protection program at the State level. Possible changes in the law of regulatory takings applicable to wetlands, as a result of federal court decisions, will be more difficult to address, although as recommended in this report, public trust rights in coastal wetlands, including privately-owned wetlands, may provide a basis for protective measures secure from takings claims. But, if such changes in federal and State programs occur, this report recommends that other strategies be examined, including tax-based incentives to preserve privately-owned wetlands and funding of programs to purchase fee simple interests and development rights in wetlands and adjacent lands and other critical areas.

Information and data needs, and the serious program implementation and enforcement problems caused by inadequate technical assistance and staff, particularly at the local level, are major obstacles to the effectiveness of existing programs and will pose serious obstacles to implementing a final Mass Bays CCMP. Section One and the analysis in Section Two on wetlands programs examine these problems in considerable detail and provide specific recommendations. Certainly increased funding will be necessary to acquire both needed information and technical assistance and staff, especially at the local government level. On the assumption that funding will be appropriated to implement the Mass Bays CCMP, once it is approved, it is recommended that a high priority be given to paying for technical assistance and staff at the local government level to operate the regulatory programs currently in place. Such technical assistance and staff, funded at least in part by the Mass Bays

Program, may be shared by local agencies and governments in the Mass Bays region. In fact, such sharing arrangements may be desirable as helping to create common standards and practices throughout local governments in the region.

In view of the report's conclusion that, with some exceptions, sufficient authority exists to operate an effective Mass Bays use and resource management program, attention turns to an appropriate structure to implement such a program. A management perspective informing this report is that the Mass Bays Program must take an area or basin-wide ecosystemic approach to its use and resource management problems. Review of the intergovernmental coordinative mechanisms available to Mass Bays managers argues for reliance upon existing mechanisms, such as provided by the MCZMP, rather than attempting to create yet another areawide or regional management structure, on the order of the Cape Cod Commission, for Mass Bays. Aside from the formidable political, administrative, and funding difficulties of establishing such a new structure, the success of the MCZMP in forging a network of local, State, and federal authorities and programs to implement coastal management in the State provides an functioning entity to implement the Mass Bays CCMP and argues strongly against any alternative management system for Mass Bays.

Finally, the analysis of legal issues in Section Two of this Part indicates that pending changes in takings law have important consequences for Mass Bays management. These changes have been noted above, in reference to wetlands protection. The report also identifies the public trust doctrine as providing principles for Mass Bays management deriving from the doctrine's fundamental property basis. Because the doctrine's geographical scope is approximately the same as the boundaries of the Mass Bays region, the report recommends that the doctrine's potential for Mass Bays use and resource management be carefully considered.

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