Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
Office of Coastal Zone Management

Section 309 Assessment and Five-Year Strategy for CZM Program Enhancement (FY2011-2015)

October 29, 2010

Contents

I. Introduction

Section 309 of the federal Coastal Zone Management Act establishes a voluntary enhancement grants program that, among other things, encourages states with federally approved Coastal Management Programs (CMPs) to develop and implement program changes in one or more of the following nine coastal zone enhancement areas: Wetlands, Public Access, Coastal Hazards, Cumulative and Secondary Impacts, Energy and Government Facility Siting, Marine Debris, Ocean Resources, Special Area Management Plans, and Aquaculture. The Office of Ocean and Coastal Resource Management (OCRM) within the National Oceanic and Atmospheric Administration (NOAA) works closely with state coastal programs in prioritizing and evaluating state program needs.

The Massachusetts Office of Coastal Zone Management (CZM) developed this document *Section 309 Assessment and Five-Year Strategy for CZM Program Enhancement (FY2011-2015)* in response to formal guidance issued by OCRM in July 2009 and detailed OCRM comments on a review draft received in September 2010. The purpose of the document is to evaluate and identify CZM's program needs and outline a five-year strategy for achieving program changes and associated implementation objectives. In this case, the proposed strategy covers the federal fiscal years from 2011 to 2015 and serves as an update to the previous Section 309 Assessment and Strategy published in 2006. Preparation of this document began in the Fall of 2009 and has involved the efforts of CZM management and a team of staff professionals with expertise and experience in the respective topics, who solicited input from other agencies as needed.

After this Introduction, the next section of this document is the Summary of Completed 309 Efforts FY2006-2010. Following that is the Assessment section which contains the required characterization of issues for each of the nine enhancement areas. The final section of the document is the Strategy portion which contains—for the seven issue areas designated as high or medium priority for enhancement—one or more projects that have been developed to address the programmatic gaps and needs identified in the Assessment.

The prioritization of the enhancement areas is based on three main criteria: (1) the severity of problem, (2) the potential for program changes or further implementation activities to effectively address outstanding issues, and (3) the availability other sources of funds to address issues (i.e., if an issue area has another dedicated source of funds, it may not be rated as a priority for use of limited 309 funds). For this Section 309 Assessment and Strategy, the following enhancement areas have been identified as "High" priorities:

- Coastal Hazards
- Cumulative and Secondary Impacts
- Ocean Resources

The following areas are ranked as "Medium" priorities:

- Wetlands

- Special Area Management Planning
- Public Access
- Energy and Government Facility Siting

Lastly, the following areas were assigned a "Low" priority rating:

- Aquaculture
- Marine Debris

It should be noted that assignment of a low priority rating should not be construed as an indication of the importance of an issue area for the Commonwealth; rather, it is only an indication of the relative priority of that enhancement area within the context of the Section 309 assessment. Further, it is important to understand that inclusion of a project within an approved Section 309 Assessment and Strategy in no way guarantees funding for those proposed efforts; however, in order to expend 309 funds that may be available to state Coastal Management Programs based on annual appropriations and allocation formulas, projects proposed in grant applications to NOAA/OCRM must be contained in an approved Section 309 Assessment and Strategy.

In the Strategy, enhancement projects are proposed for the issue areas ranked High or Medium. The following table summarizes the projects and resource needs by enhancement area.

Enhancement Area	Proposed Project	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Wetlands	Assessing Estuarine Habitats at Risk from Sea Level Rise	$78,000	$78,000	$78,000	$57,000	$42,000	$333,000
Coastal Hazards	Expanding StormSmart Coasts: Assessing and Reducing Risk from Climate Change on the Coast	$92,000	$92,000	$78,000	$78,000	$42,000	$382,000
Public Access	Improve Application of Facilities of Public Accommodation Requirements	$57,000	$42,000				$99,000
Cumulative and Secondary Impacts	Incorporating Marine Habitat Mapping Into Cumulative Effects Analysis	$78,000	$92,000	$92,000	$78,000	$57,000	$397,000
Special Area Management Planning	Designated Port Area Inventory and Outreach	$57,000	$78,000	$42,000			$177,000
Ocean Resources	Advancing Coastal and Marine Spatial Planning in the Northeast Region	$78,000	$78,000	$78,000	$78,000	$78,000	$390,000

Enhancement Area	Proposed Project	Year 1	Year 2	Year 3	Year 4	Year 5	Total
	Ocean Management Plan and CZM Program Updates	$57,000	$92,000	$78,000	$78,000	$57,000	$362,000
	Development of CZM Guidance for Offshore Sand and Gravel Extraction	$78,000	$78,000	$57,000	$57,000		$270,000
Energy & Government Facility Siting	Updated Assessment of Potential Siting Areas for Ocean-Based Energy Facilities	$78,000	$57,000	$57,000			$192,000
Total funding		**$653,000**	**$687,000**	**$560,000**	**$426,000**	**$276,000**	**$2,602,000**
Note: For the purposes of this 309 Strategy budget summary, the project years all begin in Year 1. The actual starting year will be dependent on 309 funding available and decisions regarding which project to include in annual 309 or 309 Projects of Special Merit grant applications (see below).							

Projects of Special Merit

As described in the Section 309 guidance issued by NOAA, OCRM expects that beginning in FY2012, ten percent of the total national 309 funds available are to be set aside for a competitive 309 Project of Special Merit process. Based on an annual evaluation and ranking of projects, awards will be made to projects that succeed in the grant award competition. In the guidance for developing Section 309 Strategies, OCRM invites coastal programs to include an optional section indicating potential Projects of Special Merit that states may wish to pursue to augment the Strategy. In regards to this optional component, CZM has not identified specific projects as "Projects of Special Merit" at this point; rather, in the Strategy we have identified a suite of innovative and effective projects that address defined issue area gaps and needs, advance the Massachusetts coastal program, and further national priorities. As such, the general descriptions provided above may serve as the basis for a separate proposal for a competitive grant application under the 309 Project of Special Merit program. Any proposal from CZM would be further developed in accordance with the guidance to be issued subsequently by OCRM.

II. Summary of Completed Section 309 Efforts FY2006 – 2010

In the period covered by the previous Section 309 Assessment and Strategy (FY2006-2010), Section 309 grant funds were expended on six enhancement areas, ranked as either "high" or "medium" priorities in the Section 309 Assessment and Strategy: Ocean Resources, Energy Facility Siting, Cumulative and Secondary Impacts, Coastal Hazards, Wetlands, and Public Access. The table below summaries the major accomplishments within the 309-designated enhancement areas. In addition to endeavors on those six enhancement areas, CZM also advanced efforts on developing elements of a multi-faceted program change. The proposed program change will include an update of CZM policies, changes to underlying state legal authorities made since last program change (including the state Ocean Act and Massachusetts Ocean Plan), and revisions to the program plan in form of a new Policy Guide. A formal submittal to NOAA/OCRM for this program change is anticipated during the FY10 grant period. Finally, during the latter part of the FY2006-2010 period, 309 funds supported work on this new FY2011-2015 Section 309 Assessment and Strategy.

Enhancement Area(s)	Fiscal Year Activity	Major 309 Accomplishments
Ocean Resources and Energy Facility Siting	FY10 FY09 FY08 FY07 FY06	CZM worked with Secretary's Office and legislature on drafting ocean management bill. Ocean Act signed by Governor in May 2008. Significant efforts on acquiring and developing data and information; conducting assessment and analysis for marine spatial planning; coordinating with state, federal, local, and regional entities; and engaging in extensive public processes. The Draft Massachusetts Ocean Management Plan was released in June 2009. The Final Massachusetts Ocean Management Plan was promulgated in December 2009. The Plan establishes three categories of management area: Prohibited, Regional Energy, and Multi-Use and provides significant protection for special, sensitive or unique natural resources and important existing water-dependent uses. Renewable energy facilities are screened through strict compatibility criteria, and—for commercial-scale wind facilities—are allowed only in designated areas. CZM also was fully engaged in ongoing participation and work with regional ocean partnerships such as Northeast Regional Ocean Council, Gulf of Maine Council, Northeast Regional Association of Coastal and Ocean Observing Systems, Northeast Ocean Data Partnership, etc.
Cumulative and Secondary Impacts	FY07	Increased technical and financial capacity for local stormwater management by providing coastal communities with guidance and resources to develop incentive-based funding sources for municipal efforts and laying the groundwork for the adoption of municipal stormwater utilities.
Coastal Hazards	FY06	Guidance developed and being used to delineate and assess the volume of primary frontal dune; data and information on known potential offshore sand resources for beach nourishment projects developed for ocean planning. Conducted geo-referenced Coastal Structures Inventory to improve state and local permit and other storm and coastal hazard-related decisions. Inventory added into the Massachusetts Ocean Resource Information System.

Enhancement Area(s)	Fiscal Year Activity	Major 309 Accomplishments
Wetlands	FY06	Integrated state's Wetlands Restoration Program into CZM as a result of 2003 Secretariat-wide restructuring of certain agencies and programs. The Wetlands Restoration Program works as a networked program in collaboration with restoration project sponsors, State and Federal partners (including Coastal America), and the Corporate Wetlands Restoration Partnership. At CZM the program focused on two types of projects: 1. Coastal inter-tidal or formerly inter-tidal wetlands, and 2. Brackish or freshwater wetlands that are associated with coastal rivers and streams as well as anadromous fish runs. To date, the program has completed 62 projects for more than 800 acres under restoration. Currently the Program is working with various partners on 50 active projects for over 3,000 acres of restorable wetlands. In 2009, CZM's Wetlands Restoration Program merged with the Department of Fish and Game's (DFG) Riverways Program to establish a new Division of Ecological Restoration within DFG.
Public Access	FY06	Established an electronic "State Register of Protected Coastal Accessways", to track all shoreline access entitlements that have been secured for the public not only through outright public and quasi-public ownership of land, but also in the form of easements, rights-of-way, Chapter 91 license conditions, or other encumbrances on private shorefront property. Building the Register database included an inventory of all publicly accessible coastal properties owned by federal, state, and local governments and by non-profit conservation organizations and subsequent work to add many privately owned sites on which nonwater-dependent development has resulted in the provision of pubic open spaces, as a condition of a Chapter 91 License issued by the Department of Environmental Protection (DEP). All this information is now available on the Online Locator of Coastal Public Access Sites. In addition to maps showing how to get to each property, the Access Locator offers printable site descriptions including parking information, directions, photos, a list of facilities, and links to trail maps if available.

III. Assessment

A. Wetlands

Section 309 Enhancement Objective

Protection, restoration, or enhancement of the existing coastal wetlands base, or creation of new coastal wetlands.

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

1. Please indicate the extent, status, and trends of wetlands in the coastal zone using the following table:

Wetlands type	**Estimated historic extent** (acres)	**Current extent** (acres)	**Trends in acres lost since 2006** (net acres gained & lost)	**Acres gained through voluntary mechanisms since 2006**	**Acres gained through mitigation since 2006**	**Year and source(s) of data**
Tidal vegetated (salt marsh)	45,968 [1]	35,370 [2] 45,375 [3]	1.26 [4]	206 [5] (13 projects)	0.139 [6]	See below
Tidal non-vegetated (intertidal flat)	N/A	18,961 [3]	203.3 [4]	N/A	0 [6]	See below
Non-tidal/ freshwater (marsh, bog, swamp)	N/A	25,209 [3]	N/A	N/A	N/A	See below

Notes:

[1] Source data (historical USGS topographic quadrangles) are from 1893-1903. Data are for the following regions only: North Shore, Cape Cod, Boston Harbor, Nantucket Island, Martha's Vineyard Island, and the Elizabethan Islands. The South Shore and Buzzards Bay regions are not included. Historical data were derived from Carlisle, et al. 2005 and a similar, unpublished source. The extent presented is a conservative number. See Carlisle, et al. 2005 for enhanced estimates.

[2] Data are from the DEP Wetland Conservancy Program. Source photography is from 1990, 1991, and 1993. Data are for the following regions only (for comparison with estimated historic extent): North Shore, Cape Cod, Boston Harbor, Nantucket Island, Martha's Vineyard Island, and the Elizabethan Islands. The South Shore and South Coastal regions are not included. When compared to historical data for the same geographical area, there has been a loss of nearly 10,600 acres.

[3] Data are from the DEP Wetland Conservancy Program. Source photography is from 1990, 1991, and 1993. Data are for the entire coastal zone.

[4] Data are from DEP's new Wetlands Information Resource (WIRe) database for the period between January 1, 2009 and March 25, 2010. Data represents only a portion of the actual total since the database was launched in November 2009, and these are the only data that have been entered. Data represents wetland alteration and is not necessarily equal to loss in all cases.

[5] Data are from DFG's Division of Ecological Restoration.

[6] Data are from DEP's new WIRe database for the period between January 1, 2009 and March 25, 2010.

Data represents only a portion of the actual total since the database was launched in November 2009, and these are the only data that have been entered.

2. If information is not available to fill in the above table, provide a qualitative description of information requested, including wetlands status and trends, based on the best available information.

Data does not provide any reliable distinction between the historical extent of tidal non-vegetated and nontidal/freshwater wetlands. There is no recent photography that allows for precise numbers on acres lost since 2006, but the expectation based on past trends and current regulatory efforts is that tidal vegetated wetlands remain about the same, non-vegetated wetlands may vary with changes in coastal geology, and minor losses of non-tidal/freshwater wetlands continue. The acres gained through voluntary mechanisms do not distinguish among wetland types. Similarly, precise data on acres gained through mitigation is not available and it does not distinguish among wetland types.

3. Provide a brief explanation for trends.

See Notes #1 and 2 in the table above.

4. Identify ongoing or planned efforts to develop monitoring programs or quantitative measures for this enhancement area.

Aerial photography will be taken at irregular intervals to document trends in acreage. If funding is available, efforts will be made to examine historical trends in additional regions of the coast, as described in 1 above. Staff will continue to track acres gained through voluntary efforts, since specific state programs target wetlands restoration but resources do not exist to make precise distinctions among wetland types. Outreach on DEP's WIRe database is ongoing and usage rate is expected to significantly increase. Consideration for effects of climate change on coastal habitats and how to measure them will be an increasingly important issue.

5. Use the following table to characterize direct and indirect threats to coastal wetlands, both natural and man-made.

Type of threat	**Severity of impacts** (H,M,L)	**Geographic scope of impacts** (extensive or limited)	**Irreversibility** (H,M,L)
Development/Fill	L	Extensive	M
Alteration of hydrology	H	Extensive	M
Erosion	H	Extensive	M
Pollution	H	Extensive	M
Channelization	L	Limited	L
Nuisance or exotic species	H	Extensive	H
Freshwater input	M	Limited	L
Sea level rise/Great Lake level change	H	Extensive	H
Other (please specify)	N/A	N/A	N/A

6. [Contextual Measure (CM)] Indicate whether the Coastal Management Program (CMP) has a mapped inventory of the following habitat types in the coastal zone and the approximate time since it was developed or significantly updated.

Habitat type	CMP has mapped inventory (Y or N)	Date completed or substantially updated
Tidal (Great Lakes) Wetlands	Y	1993 [1]
Beach and Dune	Y	1993
Nearshore	Y	1993 [2]
Other (please specify)		

1. 2009 updated aerial photography for new wetlands baseline mapping is in the process of being analyzed by MA DEP. It is expected to be completed and available by the end of 2010.
2. Includes intertidal flats, SAV (submerged aquatic vegetation), and rocky shores for some locations. Data from the MA DEP Wetlands Conservancy Program.

7. (CM) Use the table below to report information related coastal habitat restoration and protection.

Contextual measure	Cumulative acres for 2004-2010
Number of acres of coastal habitat restored using non-CZM or non-Coastal and Estuarine Land Conservation Program (CELCP) funds	206 acres
Number of acres of coastal habitat protected through acquisition or easement using non-CZM or non-CELCP funds	2,556 acres [1]

1. This number represents wetlands habitat as mapped by MA DEP from land acquisition by the state in the 78 coastal communities for 2004-2010. The number does not distinguish between coastal and freshwater wetlands but cranberry bogs and marine open waters are excluded.

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

1. For each of the wetland management categories below, indicate if the approach is employed by the state or territory and if significant changes have occurred since the last assessment:

Management categories	Employed by state/territory (Y or N)	Significant changes since last assessment (Y or N)	If significant change, funding source
Wetland regulatory program implementation, policies, and standards	Y	Y (a)	State funds and 306
Wetland protection policies and standards	Y	Y (a)	State funds and 306
Wetland assessment methodologies (health, function, extent)	N	Y (b)	State funds, EPA funds, and 306

Management categories	Employed by state/territory (Y or N)	Significant changes since last assessment (Y or N)	If significant change, funding source
Wetland restoration or enhancement programs	Y	Y (c)	309, state funds, and other federal and NGO sources
Wetland policies related public infrastructure funding	Y	N	N/A
Wetland mitigation programs and policies	Y	Y (d)	State funds and 306
Wetland creation programs and policies	Y	N	N/A
Wetland acquisition programs	Y	N	N/A
Wetland mapping, GIS, and tracking systems	Y	Y (d)	State funds and 306
Special Area Management Plans	Y	N	N/A
Wetland research and monitoring	Y	Y (e)	State funds, EPA funds, and 306
Wetland education and outreach	Y	N	N/A

2. For significant changes since the 2005 assessment, characterize the change; specify whether it was a 309 or other CZM driven change, and specify the funding source; and characterize the outcomes and effectiveness of the changes.

2-a. Regulatory Program and Wetland Protection Policies

The primary responsibility for wetland regulatory programs and policies, including protection policies and standards, belongs to the Division of Wetlands and Waterways within the Massachusetts Department of Environmental Protection (DEP). Coastal Zone Management coordinates closely with staff at DEP on the development and implementation of these wetland regulatory and protection programs and policies, and several changes have been developed and put in place since the last assessment.

Surface Water Quality Standards were revised by DEP in 2006 and, with the assistance of CZM staff, included the protection of eel grass as a specific biological end point. Previous standards had relied solely on numerical standards and very general narrative standards to protect coastal habitats from impairment by excess nutrients. This standard originated with CZM staff and is intended to guide TMDL development and implementation for excessive nutrients in coastal waters.

Also in 2006, DEP issued guidance for improved procedures for incorporating and coordinating protection for State-listed wildlife in wetlands. Coordination with the Natural Heritage Program in the Division of Fisheries and Wildlife is required for any project proposed in estimated habitat for State-listed wildlife species. CZM was not directly involved in its development and DEP is in the process of evaluating its effectiveness.

In 2007, DEP issued a Guide to Best Management Practices for Beach Nourishment. The purpose was to provide guidance for beach nourishment projects on how to minimize erosion and to maximize the time that sand remains on the beach, to minimize any negative impacts to natural resource areas, to promote the reuse of clean dredge material, and to help expedite regulatory review. CZM was a major contributor to the document development and also served as technical reviewers. The guidance is regularly used by local communities and beach nourishment project proponents.

In 2008, DEP issued minor revisions and clarifications to its Stormwater Policy, including Standards and Guidance, adopted originally in 1996 and implemented through the Wetlands Protection Act and 401 Water Quality certification and subsequently incorporated into the regulations. These modifications are intended to improve efforts for wetlands protection through jurisdictional and maintenance issues related to the use of artificially created wetland systems for treating stormwater. CZM assisted with committee efforts leading to the changes, which are now routinely used by local Conservation Commissions in the implementation of stormwater standards for discharges to wetlands.

The Guide to BMPs for Beach Nourishment and the changes to the Surface Water Quality Standards were CZM driven changes to which CZM contributed staff time, but not funded under section 309. The changes in the Stormwater Policy and the improved procedures for protecting State-listed species were driven by MA DEP efforts.

2-b. Assessment Methodologies

CZM continues to work on the development of wetland assessment methodologies. Based on field work in 2004 and 2005, a draft Rapid Assessment Method was developed (the project report can be found at http://www.mass.gov/czm/wetlandassessment.htm). In 2008, MA DEP decided to join CZM efforts, through work based on a Wetlands Program Development Grant from EPA.

In 2006, DEP collaborated with the University of Massachusetts (UMass) in Amherst to develop a wetlands monitoring and assessment strategy that was based the Conservation Assessment and Prioritization System (CAPS), a landscape level assessment model that had been under development by U Mass for several years. From geographic information system (GIS) mapping and satellite imagery and integrity metrics developed by an expert team, CAPS produces a land cover map that calculates a value for every 30 m^2 point in the landscape. The value represents the index of ecological integrity or prediction of the wetlands to sustain its ecological condition in the long term and to recover from stress. Site Level Assessments (SLAMs) and Rapid Assessment Methods (RAMs) based on field data are needed to test and validate CAPS.

In 2007, DEP and UMass began research to understand how forested wetlands are influenced by land use in the surrounding landscape. Recognizing the work that CZM had done in coastal systems, DEP and UMass joined CZM in 2008 to extend the capability of the CAPS model to

coastal wetlands and to develop coastal SLAMs, based on CZM expertise. In 2009, CZM began extensive field work in partnership with DEP to support the development of the CAPS model to coastal wetlands and to collect field data for coastal SLAMs. The goal is to produce a CAPS model that can be used statewide across all wetland types to assess the condition and function of wetlands.

CZM staff has been integrally involved in designing the inputs for the CAPS model in coastal wetlands and leading the effort to collect field data to support model development. Efforts have included measures for the magnitude of hydrologic alteration due to tidal restriction, measures of the density of tidal ditching, and collecting field biological data at 45 sites with an approved QAPP for vegetation, habitat complexity, invertebrates, and human disturbance. It is anticipated that intensive field work will continue through 2010, with analysis requiring additional time. A draft model for assessing condition in coastal wetlands systems should be prepared by 2012, after which plans for implementation will be developed. CZM has led the efforts in coastal wetlands, which has been supported by NOAA funds for many years and which is now supported in part by funds from EPA. CZM efforts have been significantly enhanced by the 2008 commitment by DEP and UMass to develop a statewide assessment method for all wetland types. CAPS is also being used to identify habitat of statewide or regional importance for the purpose of implementing the recent wildlife habitat evaluation described above in the regulatory section.

Assessment methodologies (and research and monitoring) were jointly driven by CZM and DEP, with CZM taking the lead for the coastal wetlands portion. It was not a 309 driven change but was done with CZM staff time.

2-c. Restoration/Enhancement Programs

The 2005 Assessment and Strategy described the state's Wetlands Restoration Program (WRP), which was transferred to CZM in 2003. An FY06 Section 309 Task (#3) aimed to institutionalize the WRP as an integral part of the networked Coastal program. The subtasks were accomplished with linkages established to the CZM Enforceable Policies and a project portfolio and tracking system was developed. Statewide coordination was improved with the establishment of a Partnership to Restore Massachusetts Aquatic Habitats, which includes state and federal agencies and non-profit conservation groups. The Partnership continues to meet twice annually.

The Executive Office of Energy and Environmental Affairs (EEA) developed and implemented a significant change to WRP, in coordination with CZM and the Department of Fisheries and Game (DFG), beginning in FY10 (starting July 1, 2009), when WRP was moved and joined with the Riverways Program in DFG to form a new streamlined Division of Ecological Restoration (DER) within DFG. DER combines the wetlands and rivers restoration work of the two programs into one agency with similar shared goals of habitat restoration within DFG. DER continues to maintain a close partnership with CZM, and CZM staff continues to coordinate closely on coastal restoration projects. No substantive changes were made to the goals, objectives, and operating procedures of the former WRP.

The work on integrating WRP into CZM was supported in part through 309 funding in FY06. New directions being evaluated include how to assess potential effects of climate change on past, current, and future restoration planning efforts.

2-d. Mitigation and Creation Programs and Policies and Wetland Mapping, GIS, and Tracking Systems

The last Section 309 Assessment described efforts by DEP's Wetland Conservancy Program to use remote sensing to discover wetlands violations. The violations detected were subject to enforcement and fines. A new aerial survey in 2005 helped to identify additional violations from 2001 to 2005. Although most of the violations were in freshwater systems, the new information shows a reduction in the rates of wetland loss, perhaps as a result of the publicity given to enforcement efforts. DEP is continuing these efforts and the next set of flyover information is expected to be released in 2010.

DEP also began a 3-year effort in 2007 called the Wetlands Information Resource (WIRe) to integrate permitting, enforcement, and wetland loss databases. The goal of this effort is to redesign the data collection and management system to allow staff to more easily determine the extent of wetland loss/alteration, the history of enforcement actions on the site, and to better record data on permitting and enforcement actions. The new system will improve DEP's ability to determine whether wetland losses are permitted or illegal, to prioritize enforcement actions, and to quickly address the loss. The system is being rolled out and tested in segments, beginning in 2008, with the eventual goal of having the system accessible to state agencies and the public by 2010. The hope is that increased transparency will further discourage wetlands violations.

DEP has also periodically done flyovers to obtain data on submerged rooted vegetation (SRV) beds, as described in past Section 309 Assessments. DEP plans for updated mapping of SRV resources with new flyovers in 2010 and 2011.

The work on mitigation and creation programs and on wetland mapping, GIS, and tracking were all driven by DEP with support and participation of CZM staff.

2-e. Research and Monitoring

As described under Wetland Assessment Methodologies above, CZM has worked closely with DEP on the research and data collection needed to support the CAPS model since 2008. This partnership will continue with extensive additional field planned in 2010 and with data analysis and metric development planned through 2011. This work has been supported, in part, through funding from EPA Wetlands Program Development Grants.

3. (CM) Indicate whether the CMP has a habitat restoration plan for the following coastal habitats and the approximate time since the plan was developed or significantly updated.

Habitat type	**CMP has a restoration plan** (Y or N)	**Date completed or substantially updated**
Tidal (Great Lake) Wetlands	Y	Great Marsh Plan completed in 2007 Regional Atlases for tidal restrictions were completed in 2001 and earlier
Beach and Dune	N	N/A
Nearshore	N	N/A

CZM has worked with the Natural Resources Conservation Service on a restoration plan for Cape Cod for habitat and shellfish restoration and stormwater improvements. The plan was completed in 2004 and has awaited funding from Congress through the US Department of Agriculture. The funding (authorized at $20 million over 10 years) was recently approved (December 2009) and the list of restoration projects is being reviewed and updated, while state and federal agencies start coordination to begin implementation.

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the Coastal Management Program and partners (not limited to those items to be addressed through the Section 309 Strategy).

Gap or need description	**Select type of gap or need** (regulatory, policy, data, training, capacity, communication & outreach)	**Level of priority** (H, M, L)
Effects of sea level rise on estuaries and coastal marshes	Data, capacity, and communication and outreach	H
Development and Implementation of Wetland Condition Assessment	Data and capacity	H
Wetlands trends analysis for remainder of the coast (South Shore and Buzzards Bay)	Data	H

High priority needs and information gaps include 1) efforts to improve our understanding and quantification of the effects of sea level rise on coastal estuarine and other habitats in order to improve implementation of programs and policies to increase resiliency to climate change; 2) efforts to develop and implement wetlands condition assessment to link biological condition and ecosystem health in a feedback loop for wetland protection efforts; and (3) completing estuarine marsh trends analysis to gain a complete statewide picture for historical changes to marsh resources.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)? Briefly explain the level of priority given for this enhancement area.

Medium. Protection and restoration of coastal habitat, including wetlands, have always been a strong priority for CZM. CZM staff has worked since 1996 on efforts to develop methods for assessing wetland condition with the goal of having this approach incorporated into statewide regulatory wetland protection programs. These efforts have been supported through funding from various sources, notably with competitive grants from the NOAA Coastal Services Center and from EPA's Wetland Program Development Grants and with ongoing support from CZM's NOAA grant. Current goals are to have methods finalized for inclusion into state regulatory programs by 2015.

2. Will the CMP develop one or more strategies for this enhancement area?

Yes. A Strategy will be developed for this enhancement area because there is a need to continue work to institutionalize wetland assessment methods into state regulatory programs and to address coastal wetland habitat issues related to climate change and sea level rise.

B. Coastal Hazards

Section 309 Enhancement Objective

Prevent or significantly reduce threats to life and property by eliminating development and redevelopment in high-hazard areas, managing development in other hazard areas, and anticipating and managing the effects of potential sea level rise and Great Lakes level change.

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

1. Characterize the level of risk in the coastal zone from the following coastal hazards:

(Risk is defined as: "the estimated impact that a hazard would have on people, services, facilities and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage." *Understanding Your Risks: Identifying Hazards and Estimating Losses. FEMA 386-2 [August 2001])*

Type of hazard	**General level of risk** (H,M,L)	**Geographic Scope of Risk** (Coast-wide, Sub-region)
Flooding	H	Coast-wide
Coastal storms, including associated storm surge	H	Coast-wide
Geological hazards (e.g., tsunamis, earthquakes)	M	Coast-wide
Shoreline erosion (including bluff and dune erosion)	H	Coast-wide
Sea level rise and other climate change impacts	H	Coast-wide
Great Lake level change and other climate change impacts	N/A	N/A
Land subsidence	M	Coast-wide
Other (please specify)	N/A	N/A

2. For hazards identified as a high level of risk, please explain why it is considered high risk.

High risk levels for flooding, coastal storms, shoreline erosion, and sea level rise reflect the value of residential and commercial development and natural resources, vulnerabilities or weaknesses in natural and engineered defense measures, and actions required to reduce or eliminate vulnerabilities to these hazards along the coast of Massachusetts. The Massachusetts State Hazard Mitigation Plan defines vulnerability by the frequency, severity, number of communities impacted, and areas that experience natural hazards. CZM is a member of the Massachusetts State Interagency Hazard Mitigation Committee involved in updating the plan every five years and guides the coastal assessment. Coastal flooding and erosion occur frequently and are associated with scattered major property damage and some infrastructure damage. Coastal storms, especially northeasters,

exacerbate this situation from October to April due to high winds and storm surge. Hurricanes are less frequent in Massachusetts, but have the potential to cause even more serious damages including the loss of life. Finally, sea level rise is persistent and will likely inundate or overtop low elevation topographic features and structures in the next 50 to 100 years resulting in extensive damages. Coastal communities in all five regions are susceptible to these hazards, which require continued management.

3. If the level of risk or state of knowledge of risk for any of these hazards has changed since the last assessment, please explain.

The relative level of risk for all types of coastal hazards in Massachusetts remains the same. The state of knowledge is described in the responses below.

4. Identify any ongoing or planned efforts to develop quantitative measures of risk for these hazards.

The Commonwealth has an ongoing partnership with the Federal Emergency Management Agency (FEMA) to assist in the management and coordination of flood assessments and mapping in Massachusetts. FEMA delineates Flood Insurance Rate Maps (FIRMs) for the National Flood Insurance Program (NFIP) and has undertaken an effort to "modernize" and update their FIRM inventory nationwide. Modernized FIRMs, known as digital FIRMs (or DFIRMs), include an ortho-photograph base map and a digital geo-database. The Commonwealth maintains a Map Modernization Business Plan that outlines mapping needs and proposes sequencing for future mapping projects. Through this partnership and the map modernization effort, revised analyses of coastal flooding and storm damage were undertaken for 12 of the 78 coastal communities in Massachusetts. Of the remaining 66 coastal communities, nearly half (31) received updated flood zone delineations based on higher resolution topographic data. Additional analyses and updates need to be conducted.

Areas vulnerable to flooding and storm damage are monitored using NFIP claims and repetitive loss property data. The majority of repetitive loss properties in Massachusetts are located in coastal counties (i.e., Essex, Suffolk, Norfolk, Plymouth, and Barnstable). The last major flood event – the Patriot's Day northeaster in April 2007 – caused inland and coastal flooding severe enough to trigger a presidential disaster declaration (FEMA-1701-DR-MA). Coastal communities tend to have much higher individual claim amounts, numbers of claims, and repetitive claims to the NFIP (see table below).

Table: National Flood Insurance Program repetitive loss claims and property data for top ten Massachusetts coastal communities (as of October 2009)

Coastal Community	State Repetitive Loss (RL) Rank	2006		2009		Change	
		RL Properties	RL Claims	RL Properties	RL Claims	RL Properties	RL Claims
Scituate	1	502	1504	503	1551	1	47
Revere	2	274	873	288	935	14	62
Hull	3	230	680	235	713	5	33
Marshfield	4	155	419	156	442	1	23
Quincy	5	131	364	144	408	13	44
Winthrop	6	139	386	136	396	(3)	10
Nantucket	7	45	106	47	113	2	7
Nahant	8	45	123	46	133	1	10
Duxbury	9	39	107	42	121	3	14
Peabody	11	30	105	37	131	7	26

CZM leads a statewide Storm Team to identify the location and extent of coastal storm damage during and immediately after events. CZM developed a concept to standardize, record, and share these observations of flooding, erosion, and other storm damages. StormReporter, an online form and database, is being developed with the assistance of NOAA to archive and communicate Storm Team reports in real time. This data will provide quantitative indicators of coastal hazards risk and better inform emergency operations and local forecasts.

Efforts to begin quantifying future vulnerability and risk to sea level rise are also ongoing and planned. Narrow coverage of high-resolution elevation data, limited understanding of the response of developed coastal resources to sea level rise, and broad projections of rates largely constrain inundation mapping for coastal communities. However, due to the availability of LiDAR data and recently modeled flood elevations for Hull, the town served as a pilot community for the StormSmart Coasts program (described below) and the study area for the development of storm surge visualization models under a range of higher sea levels. Much of Hull's land area and numerous critical facilities, including a waste water treatment plant, stormwater pump station, post office, and school reside in the 100-year floodplain, which has a history of storm damage. Photorealistic 3D models of seven critical facilities were built along with five inundation layers at Base Flood Elevation and with sea-level rise at current (3 mm/yr) and accelerated rates (5, 10, 30 mm/yr) over a 100-year time horizon. The 3D models and inundation images are being posted to Google Earth for accessible viewing. This project has already informed local officials, increased support for freeboard, and will facilitate development of similar products for other communities with adequate elevation data.

5. Use the table below to identify the number of communities in the coastal zone that have a mapped inventory of areas affected by the following coastal hazards.

Type of hazard	Number of communities that have a mapped inventory	Date completed or substantially updated
Flooding	78	2009 (FEMA)
Storm surge	78	2009 (FEMA)
Geological hazards (including Earthquakes, tsunamis)	78	2008 (USGS)
Shoreline erosion (including bluff and dune erosion)	78	2001 (MA CZM using a 1994 shoreline)
Sea level rise	*78	2000 (EPA)
Great lake level fluctuation	N/A	N/A
Land subsidence	*78	2009 (Englehart)
Other (please specify)	N/A	N/A
* Sea level rise and subsidence of land have been estimated using the two long-term tide gauges in Massachusetts: Boston (1921) and Woods Hole (1932). The trend in relative sea level rise for Boston and Woods Hole is approximately 2.6 mm/yr (26 cm per century). Over the last century, the global rate of sea level rise was about 1.7 mm/yr. A comparison of the relative and global sea level rise rates reveals a local subsidence rate of close to 1 mm/yr. This rate of subsidence is also supported by salt marsh records. Translating sea level rise and subsidence to community maps is limited by the resolution of elevation data. Communities with some LIDAR coverage, such as Hull and Boston (both StormSmart Coasts pilot communities), are beginning to map future risk due to sea level rise; however, no comprehensive local scale inventories currently exist.		

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

1. For each of the management categories below, indicate if the approach is employed by the state or territory and if significant changes have occurred since the last assessment:

Management categories	Employed by state/territory (Y or N)	Significant changes since last assessment (Y or N)	If significant change, funding source
Building setbacks/ restrictions	Y	Y (a)	State funds and 306
Methodologies for determining setbacks	N	N/A	N/A
Repair/rebuilding restrictions	Y	Y (a)	State funds and 306
Restriction of hard shoreline protection structures	Y	N	N/A
Promotion of alternative shoreline stabilization methodologies	Y	N	N/A
Renovation of shoreline protection structures	Y	N	N/A
Beach/dune protection (other than setbacks)	Y	N	N/A
Permit compliance	Y	N	N/A

Management categories	Employed by state/territory (Y or N)	Significant changes since last assessment (Y or N)	If significant change, funding source
Sediment management plans	Y	N	N/A
Repetitive flood loss policies, (e.g., relocation, buyouts)	Y	N	N/A
Local hazards mitigation planning	Y	Y (b)	FEMA / MEMA, CSC Fellow
Local post-disaster redevelopment plans	N	N/A	N/A
Real estate sales disclosure requirements	N	N/A	N/A
Restrictions on publicly funded infrastructure	Y	N	N/A
Climate change planning and adaptation strategies	Y	Y (c)	State funds, 306
Special Area Management Plans	Y	N	N/A
Hazards research and monitoring	Y	Y (d)	State funds, 309
Hazards education and outreach	Y	Y (e)	CSC Fellow, state funds, 306
Other (please specify)	N/A	N/A	N/A

2. For management categories with significant changes since the last assessment, characterize the change, specify if it was a 309 or other CZM-driven change, and specify the funding source, and characterize the outcomes and effectiveness of the changes.

2-a. Building setbacks/restrictions and repair/rebuilding restriction

CZM assisted DEP and Department of Public Safety with 2008 revisions to Appendix G of the Massachusetts Basic Building Code 780 CMR 120. The amended Code promotes the natural storm damage prevention and flood control capacity of coastal dunes. It establishes special administrative, design and construction requirements for new and existing buildings and structures located in flood-hazard zones ("A" Zones); high hazard zones ("V" Zones) and/or in coastal wetland resource areas containing coastal dunes. For proposed or substantially renovated buildings and structures in a V Zone, a two feet "freeboard" requirement was added to the base flood elevation setting for the lowest horizontal structural member supporting the lowest floor. It is too early to assess outcomes or effectiveness of the amended Code.

2-b. Local hazards mitigation planning

Most communities in Massachusetts do not have staff capacity to develop hazard mitigation plans without technical assistance or funding. FEMA has funded regional planning agencies in Massachusetts to develop and now update regional and local hazard mitigation plans. The town of Falmouth requested the assistance of the StormSmart Coasts program (described below) to analyze their vulnerability to current and future hazards and develop a plan. A NOAA Coastal Management Fellow is working on this project. The hazard mitigation plan for Falmouth is expected to be

completed by summer 2010, so there are no outcomes to be reported at this time. The approved plan will enable the community to better address sea level rise and lead to guidance for other communities.

2-c. Climate change planning and adaptation strategies

Recognizing the complexity of climate change and the need for solutions, Massachusetts enacted the Global Warming Solutions Act of 2008. Along with calling for immediate action to reduce Massachusetts's contribution to global climate change, the Act launched the Climate Change Adaptation Advisory Committee (CCAAC). In May 2009, the CCAAC was named and charged with investigating the potential impacts of climate change in Massachusetts and proposing strategies to adapt to sea level rise, warming temperatures, increased incidence of flood and drought, and other predicted effects of climate change. CZM provided staff support to the CCAAC and the Coastal Zone and Ocean subcommittee as well as the four other subcommittees. Outcomes will be assessed after the CCAAC report is submitted to the Legislature.

2-d. Hazards research and monitoring

The Massachusetts Coastal Hazards Commission was formed in 2006 and tasked with addressing erosion, flooding, and sea level rise. The Commission initiated an inventory of publically owned or managed shoreline stabilization structures along the South Shore and then expanded the effort to the remaining coastal regions in 2007-2008. The inventory assessed the ability of seawalls and other coastal structures to resist major coastal storms and prevent damage due to flooding and erosion. Each structure was assigned condition and priority ratings based on potential to cause damage and risk to inshore structures and residences. The coastal infrastructure inventory was funded by the Commonwealth. The infrastructure inventory will be used to address immediate threats to public safety and develop long-term management plans for these structures. The StormSmart Coasts program (described below) also developed from one of the recommendations of the Commission.

2-e. Hazards education and outreach

CZM launched its StormSmart Coasts program in 2008 to assist Massachusetts coastal communities faced with chronic erosion and flooding as well as the impacts of climate change. To help communities address these challenges, CZM developed and compiled extensive technical, legal, planning, and regulatory information. This information was then distilled into user-friendly fact sheets and other tools, made available through the StormSmart Coasts website (www.mass.gov/czm/stormsmart). Then, in 2009, CZM began five StormSmart Coasts pilot projects with seven communities—Boston, Falmouth, Hull, Oak Bluffs, and the three-town team of Duxbury, Kingston, and Plymouth — to implement StormSmart Coasts tools. This network is enhanced through partnerships with regional, state, and federal agencies; conservation organizations; academia; and the private sector. CZM facilitates network meetings and regional workshops to directly connect local officials with the program. Two NOAA Coastal Management Fellows have assisted with development and implementation of StormSmart Coasts. State funds were used to print the series of fact sheets. Successful models will be transferred coast-wide to better serve

coastal communities in the Commonwealth.

3. (CM) Use the appropriate table below to report the number of communities in the coastal zone that use setbacks, buffers, or land use policies to direct development away from areas vulnerable to coastal hazards. If data is not available to report for this contextual measure, please describe below actions the CMP is taking to develop a mechanism to collect the requested data.

For CMPs that use numerically based setback or buffers to direct development away from hazardous areas report the following:

Contextual measure	Number of communities
Number of communities in the coastal zone required by state law or policy to implement setbacks, buffers, or other land use policies to direct develop away from hazardous areas.	78
Number of communities in the coastal zone that have setback, buffer, or other land use policies to direct develop away from hazardous areas that are more stringent than state mandated standards or that have policies where no state standards exist.	7 communities (Ipswich, Gloucester, Rockport, Marion, Barnstable, Dennis, and Chatham) in 3 counties (Essex, Barnstable, and Plymouth)

For CMPs that do not use state-established numerical setbacks or buffers to direct development away from hazardous areas, report the following:

Contextual measure	Number of communities
Number of communities in the coastal zone that are required to develop and implement land use policies to direct development away from hazardous areas that are approved by the state through local comprehensive management plans.	MA uses state-established numerical setbacks or buffers to direct development away from hazardous areas
Number of communities that have approved state comprehensive management plans that contain land use policies to direct development away from hazardous areas.	MA uses state-established numerical setbacks or buffers to direct development away from hazardous areas

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the CMP and partners (not limited to those items to be addressed through the Section 309 Strategy). If necessary, additional narrative can be provided below to describe major gaps or needs.

Gap or need description	Type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of priority (H,M,L)
Climate change adaptation strategies	Policy; regulatory	H
StormSmart Coasts phase 3 – local climate change adaption planning and guidance, including fact sheets, case studies (development and printing) (targeted assistance)	Capacity	H
Flood-hazard analyses and FIRM updates	Data	H
LIDAR data and inundation maps	Data	H

Gap or need description	Type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of priority (H,M,L)
Shorelines and change rates	Data	H
Risk and vulnerability assessments	Data	H
Sediment resources assessment	Data	M

Climate change—with its resulting acceleration of sea level rise, and potential increased frequency and intensity of storms—is and will continue to exacerbate coastal hazards and create new challenges for managers and decision-makers. In order to mitigate severe climate change threats to public safety, local and regional economies, marine and terrestrial habitats, and public and private infrastructure—new data, scientific analysis, technical assessments, and scenario planning is needed. In addition to key information such as high-resolution elevation data and improved flood-hazard and shoreline change mapping, planning and decision support products geared to state and local managers is a critical need. The StormSmart Coasts Program has laid a strong foundation for CZM to go to the next level of developing policies, testing innovative strategies, and expanding our resource management knowledge to better serve state and local governments in hazard mitigation and climate change adaptation efforts. To aid coastal communities as they prepare for and adapt to climate change, CZM considers the expansion of the StormSmart Coasts toolkit to include new, innovative, and alternative mapping, planning, and regulatory guidance and models integrated with the identification and assessment of climate change risk and vulnerabilities a high priority.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

High. Reducing risk from coastal hazards is a primary concern of the Commonwealth, especially with the intensification of such hazards on the coast caused by climate change. In addition, coastal communities have and will continue to shape the state's economy and way of life. Costly storm damages to homes and businesses, erosion of public beaches, and inundation of critical resource areas need to be addressed today.

2. Will the CMP develop one or more strategies for this enhancement area?

Yes. CZM continues to actively pursue proactive approaches to manage coastal hazards.

C. Public Access

Section 309 Enhancement Objective

Attain increased opportunities for public access, taking into account current and future public access needs, to coastal areas of recreational, historical, aesthetic, ecological, or cultural value.

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

1. Characterize threats and conflicts to creating and maintaining public access in the coastal zone:

Type of threat or conflict causing loss of access	**Degree of threat** (H,M,L)	**Describe trends or provide other statistics to characterize the threat and impact on access**	**Type(s) of access affected**
Private residential development (including conversion of public facilities to private)	M	No statistical data available; see item 2, below	Passive pedestrian enjoyment of urban waterfront walkways
Non-water dependent commercial/industrial uses of the waterfront (existing or conversion)	M (commercial) L (industrial)	See item 2, below, for commercial uses; industrial activities tend to be concentrated in harbor extremities away from areas of high access demand	Passive pedestrian enjoyment of urban waterfront walkways
Erosion	M	Storm damage to publicly owned recreational infrastructure tends to be localized, but recovery of peak capacity is becoming more difficult	N/A
Sea level rise/ Great Lake level change	M	None available; see item 2 below	N/A
Natural disasters	L	None available	N/A
National security	L	None available	N/A
Encroachment on public land	M	Various techniques to discourage access by owners of private properties containing historic rights-of-way is a significant problem in many ex-urban coastal communities; no statistics available	Mostly passive pedestrian use, but access is often diminished also for diving, non-motorized watercraft, etc.
Other (private ownership of intertidal flats)	H	More than 1000 miles of MA shoreline is legally "off-limits" to recreational strolling by the general public, since private property extends to the mean low water line under Colonial law	Active and passive pedestrian use by the general public; only fishing, fowling, and navigation is allowed

2. Are there new issues emerging in your state that are starting to affect public access or seem to have the potential to do so in the future?

Yes. Although Massachusetts has uniquely progressive development controls to promote public access along urban waterfronts, in practice the implementation of access-related regulations is in need of improvement to avoid excessive privatization of public spaces by nonwater-dependent projects (see Priority Needs and Information Gaps, below, for further discussion).

In both urban and ex-urban areas, an emerging new issue is the impact of climate change on public beaches and other waterfront recreation resources, for which erosion and other sustainability problems are likely to be exacerbated with rising sea level and increased frequency/severity of coastal storms. Although no statewide assessment of the magnitude of such impacts is currently available, the necessary tools for undertaking a vulnerability analysis are emerging in the form of improved capability to make detailed, site-specific projections of potential future submergence.

3. (CM) Use the table below to report the percent of the public that feels they have adequate access to the coast for recreation purposes, including the following. If data is not available to report for this contextual measure, please describe below actions the CMP is taking to develop a mechanism to collect the requested data.

Contextual measure	Survey data
Number of people that responded to a survey on recreational access	1,434
Number of people surveyed that responded that public access to the coast for recreation is adequate or better.	956 [1]
What type of survey was conducted (i.e. phone, mail, personal interview, etc.)?	Telephone interviews of at least 20 minute duration; representative sample of all Massachusetts residents 18 years of age or older.
What was the geographic coverage of the survey?	Statewide
In what year was the survey conducted?	1995
1. This figure was derived from data relating to overall levels of satisfaction with outdoor recreation activities at coastal beaches/shorelines. On a scale of 0-10, the statewide average rating was approx. 7.2, indicating moderate satisfaction. Regionally, the average score fell into the low satisfaction category (below 7) only in Metropolitan Boston, and high average satisfaction levels (above 8) were found only in the Cape & Islands region.	

The data from the table above was collected in a 1995 statewide survey of public demand for outdoor recreation, commissioned for the *1996-2001 State Comprehensive Outdoor Recreation Plan* (SCORP) prepared by the Division of Conservation Services (DCS) within EEA. Pursuant to federal requirements, this SCORP report is published every five years and traditionally has been relied on by CZM as the primary source of quantitative, scientifically valid data indicating satisfaction with coastal access in the Commonwealth. However, due to severe budgetary limitations at DCS, that agency has been unable to acquire new survey information during the last two 5-year report cycles, and communication with responsible personnel reveals that such updated

information is not likely to be collected for the next version as well (due in 2011). Although CZM is hopeful that the SCORP agency will resume its extensive survey efforts at that time, we feel it is prudent now (and under any similar circumstances in the future) to make interim arrangements to acquire more up-to-data information on this contextual measure, ideally through the use of professional polling services contracted directly to CZM. To that end we are seeking external funding for an access survey task. In the event such funding for formal survey research is not available, CZM will pursue alternative (though much less rigorous) means of periodically gauging public satisfaction with the current supply of shoreline access sites, such as web-based polling undertaken by in-house staff on a limited basis.

4. Briefly characterize the demand for coastal public access within the coastal zone, and the process for periodically assessing public demand.

As noted above, the most recent SCORP report incorporated the results of a 1995 survey showing that "coastal beaches and shoreline" continued to be the most popular recreational resources in the state, as they were at the time of the previous SCORP report. The survey data indicated that coastal recreation sites were visited at a median rate of 12 times per year by an estimated 61 percent of state residents, with even higher participation levels (70-83%) in evidence in the easterly regions of the state. Overall, visitation was projected to be 111 million person-trips per year, with the average one-way distance traveled being approximately 45 miles. At nearly twice the distance typically traveled to any other type of recreation area (except for more distant mountains), this datum was clearly indicative of a continuing strong desire among state residents to engage in shoreline recreation.

For this metric, more recent survey data is available from a report CZM commissioned in August 2005, entitled *Public Attitudes and Values Toward Massachusetts Ocean and Coastal Areas* (unpublished). Based on a telephone poll conducted by professional interviewers of 500 randomly selected adult residents of the state, the report indicated that participation rates in coastal recreation activity remains very high. Among the key findings was that, on a statewide basis, respondents expected to spend an average of 14 recreational days on the ocean or coast that summer, with respondents from coastal cities and towns reporting anticipated levels ranging from 20 recreational days (in the metro-Boston area) to a high of 28 in non-Boston coastal communities. Moreover, two activities stood out as the most important to respondents from all regions: swimming, jogging, and relaxing on the beach; and visiting tourist towns and historic places such as lighthouses and museums. At least 80% of respondents rated these activities as at least somewhat important in their overall leisure behavior

5. Please use the table below to provide data on public access availability. If information is not available, provide a qualitative description based on the best available information. If data is not available to report on the contextual measures, please also describe actions the CMP is taking to develop a mechanism to collect the requested data.

Types of public access	Current number(s)	Changes since last assessment (+/-)	Cite data source
(CM) Number of acres in the coastal zone that are available for public use (report both the total number of acres in the coastal zone and acres available for public access)	Total acres in coastal zone: 559,265 Total acres in coastal zone available for public access: 106,505 Total acres in the coastal zone of land with tidal frontage available for public access: 72,105 (Note that this figure is a subset of the total acres in coastal zone available for public access)	No comparable data reported in last assessment. Recent expansion of GIS capability has allowed us to begin updating our access-related database for the first time since 1990, in order to improve both the accuracy and completeness of coverage.	Massachusetts Office of Geographic and Environmental Information (MassGIS). Protected and Recreational OpenSpace – February 2010. "Coastal Public Access Sites." [ESRI shapefile]. Created by the Massachusetts Office of Coastal Zone Management, using ArcGIS 9.3.1., as a subset of the original dataset. June 19, 2010.
(CM) Miles of shoreline available for public access (report both the total miles of shoreline and miles available for public access)	Total miles of shoreline: 2,651 Total miles of shoreline available for public access: 748	No comparable data reported in last assessment.	Same as above
Number of State/County/Local parks and number of acres	Number of parks in coastal zone: 2,741 Acreage: 60,137 Number of parks within 100 meters of the coastline: 1,268 Acreage: 33,822	Same as above	Same as above
Number of public beach/shoreline access sites	Number of access sites within 100 meters of shoreline: 1,548	Same as above	Same as above

Types of public access	Current number(s)	Changes since last assessment (+/-)	Cite data source
Number of recreational boat (power or non-power) access sites	156	No significant change	*Massachusetts Saltwater Sport Fishing Guide*, Fish and Game Department, Division of Marine Fisheries (2009)
Number of designated scenic vistas or overlook points	No statewide information available	N/A	N/A
Number of State or locally designated perpendicular rights-of-way (i.e. street ends, easements)	720	No time series data available	*Compilation of Public Rights of Way Leading to the Shore,* MA DPW, Division of Waterways (1963)
Number of fishing access points (i.e. piers, jetties)	62	No significant change	*Massachusetts Saltwater Sport Fishing Guide*, Fish and Game Department, Division of Marine Fisheries (2009)
Number and miles of coastal trails/boardwalks	No statewide information available	N/A	N/A
Number of dune walkovers	No statewide information available	N/A	N/A
Percent of access sites that are ADA compliant access	No statewide information available	N/A	N/A
Percent and total miles of public beaches with water quality monitoring and public closure notice programs	Data not available in metrics indicated; state has 528 public or semi-public marine bathing beaches, all of which submit beach monitoring data on an annual basis and are subject to closure programs	Twenty additional marine beaches are now subject to monitoring/closure programs as compared to the number reported previously (508)	*Marine and Freshwater Beach Testing in Massachusetts Annual Report: 2008*, MA Dept. of Public Health, Bureau of Environmental Health (July 2009)
Average number of beach mile days closed due to water quality concerns	Closure data not available in metric indicated; 433 total postings due to test exceedances, and 33 postings for other reasons	178 additional postings compared that reported in 2004 (288)	Same as above

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

1. For each of the management categories below, indicate if the approach is employed by the state or territory and if significant changes have occurred since the last assessment:

Management categories	**Employed by state/territory** (Y or N)	**Significant changes since last assessment** (Y or N)	**If significant change, funding source**
Statutory, regulatory, or legal system changes that affect public access	Y	N	N/A
Acquisition programs or policies	Y	N	N/A
Comprehensive access management planning (including GIS data or database)	N	Y (a)	309
Operation and maintenance programs	Y	N	N/A
Alternative funding sources or techniques	N	N	N/A
Beach water quality monitoring and pollution source identification and remediation	Y	N	N/A
Public access within waterfront redevelopment programs	Y (at local level)	N	N/A
Public access education and outreach	Y	Y (a)	309
Other (please specify)	N	N	N/A

2. For significant changes since the 2005 assessment, characterize the change; specify whether it was a 309 or other CZM driven change, and specify the funding source; and characterize the outcomes and effectiveness of the changes.

2-a. GIS Database Development and Related Public Outreach

The principal access-related accomplishment at CZM in recent years has been to establish an electronic "State Register of Protected Coastal Accessways", to keep track of all shoreline access entitlements that have been secured for the public not only through outright public and quasi-public ownership of land, but also in the form of easements, rights-of-way, Chapter 91 license conditions, or other encumbrances on private shorefront property. The process of building the Register database began in 1995 with the completion of an inventory of all publicly accessible coastal properties owned by federal, state, and local governments and by non-profit conservation organizations from Newburyport to Hull. During 2005, fieldwork to collect information on such public access sites along the remainder of the coast accelerated with the hiring (using Section 309 resources) of a full-time contract employee.

CZM reached a major milestone in its Register-building efforts in 2006 with completion of the statewide inventory of publicly-owned properties; and in the following year we added many privately

owned sites on which nonwater-dependent development has resulted in the provision of pubic open spaces, as a condition of a Chapter 91 License issued by the DEP. All this information is now available on the *Online Locator of Coastal Public Access Sites* (http://maps.massgis.state.ma.us/czm_access_locator/viewer.htm, developed in cooperation with the MassGIS Program). In addition to maps showing how to get to each property, the *Locator* offers printable site descriptions including parking information, directions, photos, a list of facilities, and links to trail maps if available.

The most telling indicator of the effectiveness of the *Locator* project has been that as of this writing, members of the public-at-large have utilized this online service to produce a grand total of over 165,000 individual access maps, or approximately 117 a day since the *Locator* first went online.

3. Indicate if your state or territory has a printed public access guide or website. How current is the publication and/or how frequently is the website updated? Please list any regional or statewide public access guides or websites.

In fall of 2004, CZM published the second, expanded edition of The *Massachusetts Coast Guide: Access to Public Open Spaces along the Shoreline of Greater Boston Harbor and the North Shore.* The document includes 22 full-color maps showing the location of nearly 400 individual properties, together with brief descriptions of each site and appendix material listing both public transit and water transportation services. Most of the *Coast Guide* content also has been posted on the CZM website under the heading of "CoastGuide Online," found at http://www.mass.gov/czm/coastguide/online/index.htm.

A project to enhance the online version of the CoastGuide is now underway, in cooperation with the Urban Harbors Institute at the University of Massachusetts/Boston Harbor. Utilizing the services of GIS faculty and graduate students, the project takes advantage of the newly acquired Register data covering the coastal communities to the south of Boston Harbor, which allows for the preparation of a set of maps to the same cartographic standard as those displayed in both the hard copy and online versions of the *CoastGuide* (presently covering only the northern half of the Massachusetts coast). Upon completion these maps (together with associated site descriptions) will be uploaded to the website to complete the statewide coverage of "CoastGuide Online", and might ultimately lead to the publication of as statewide hard-copy as well.

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the CMP and partners (not limited to those items to be addressed through the Section 309 Strategy). If necessary, additional narrative can be provided below to describe major gaps or needs.

Gap or need description	Type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of priority (H,M,L)
Facilitating compliance with Facilities of Public Accommodation (FPA) requirements	Regulatory implementation	H
Acquiring inter-tidal strolling rights	Regulatory implementation	M

Facilitating Compliance with FPA Requirements

In recent decades, urban waterfronts nationwide have experienced "revitalization" in the form of intensive redevelopment for primarily private uses, such as housing and corporate offices. Typically such projects include walkways and related outdoor spaces for public enjoyment of the water's edge, as a requirement to obtain government permits under incentive zoning or other regulatory frameworks. Unfortunately, these ostensibly public exteriors often fail to serve as truly civic spaces, due to various forces that exert a limiting and/or intimidating influence on public utilization. Foremost among these are manipulative landscape treatments (plantings, elevations, street furniture) designed to confine pedestrian passage and discourage lingering; and exclusionary property management practices and unauthorized encroachment by customer-only enterprises, as documented in *Privately-Owned Public Spaces: The New York Experience (*Kayden, 2000*).*

Such problems have been encountered along the urban waterfronts of Massachusetts, especially in Boston Inner Harbor where state regulation of development on filled tidelands faces a major challenge in combating the forces of privatization. A key determinant of success in meeting this challenge lies in effective programming of the ground floor *interior* of waterfront buildings with Facilities of Public Accommodation (FPAs), in order to add destination value to the public open spaces and make the site a year-round locus for public activity. Unfortunately, effective implementation of indoor FPA requirements has been uneven, in part because of an over-reliance on retail and other market-driven uses and a corresponding lack of "match-making" that brings tenancy opportunities to the attention of civic and cultural organizations and incorporates their operational needs into the project design. A concerted effort is needed to address this current shortcoming in the FPA compliance process in order to achieve the primary access-related goals of the state tidelands regulation program.

Acquisition of Intertidal Strolling Rights

With respect to combating the growth in exclusionary practices along the privately owned segments of the shoreline, a major gap still exists in the state's capability to acquire new easements for public access along and to the shoreline. In 1991 the Massachusetts legislature enacted a law authorizing the Department of Conservation and Recreation (DCR) to acquire for the public, using the power of eminent domain, the right to walk from dawn to dusk within the intertidal portion of privately owned shorefront properties. Realizing the full potential of this "SeaPath" legislation depends to a large extent on the cost of obtaining the necessary easements, and several years ago DCR recognized the limitations of conventional appraisal techniques and sponsored preliminary research to develop a

special methodology for the valuation of intertidal strolling rights. Although instructive as a "first cut" at the problem, the results were inconclusive and the acquisition program has been suspended indefinitely as a result. A concerted effort is needed to breathe new life into this program.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

Medium. Nine out of ten Massachusetts residents live within an hour's drive of the coast, and visiting the shore is one of the most popular recreational activities in the Commonwealth. A major survey taken fifteen years ago revealed that Massachusetts residents were not satisfied with existing opportunities for coastal recreation. Approximately one-third of respondents pointed to a need for additional beach/shoreline facilities, consistent with the high need indicated generally for water-based facilities and for swimming areas in particular. A more recent (2005) public poll affirms that access-related attitudes and values have changed little since then. That survey documented the continuing popularity of beach recreation especially, and found that 45% of all respondents (both coastal and non-coastal) felt that offering shoreline recreation and vacation opportunities for Massachusetts families should be either the first or second most important goal of the state's coastal management efforts. Accordingly, public access enhancement remains a significant priority.

2. Will the CMP develop one or more strategies for this enhancement area?

Yes. Unfortunately, strong legal and political traditions still tend to exclude the public from extensive stretches of private shoreline, and with shoreline acquisition programs in dramatic decline, more effort is necessary for this enhancement area.

D. Marine Debris

Section 309 Enhancement Objective

Reducing marine debris entering the Nation's coastal and ocean environment by managing uses and activities that contribute to the entry of such debris.

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

1. In the table below, characterize the significance of marine/Great Lakes debris and its impact on the coastal zone. If information is not available to fill in the above table, provide a qualitative description of information requested, based on the best available information.

Source of marine debris	**Extent of source** (H,M,L)	**Type of impact** (aesthetic, resource damage, user conflicts, other)	**Significant changes since last assessment** (Y or N)	**If significant change, funding source**
Land Based – Beach/Shore Litter	M	Aesthetic, resource damage	N	N/A
Land Based – Dumping	L	Aesthetic, resource damage	N	N/A
Land Based – Storm Drains and Runoff	M	Aesthetic, resource damage	N	N/A
Land Based – Fishing Related (e.g. fishing line, gear)	L	Aesthetic, resource damage	N	N/A
Ocean Based – Fishing (Derelict Fishing Gear)	M	Resource damage	N	N/A
Ocean Based – Derelict Vessels	L	Aesthetic, user conflicts, resource damage	N	N/A
Ocean Based – Vessel Based (cruise ship, cargo ship, general vessel)	L	Aesthetic, resource damage	N	N/A
Hurricane/Storm	L	Aesthetic, resource damage	N	N/A

The primary data that Massachusetts gathers is through COASTSWEEP, Massachusetts' annual volunteer beach cleanup program, which is part of an international campaign organized by The Ocean Conservancy in Washington, DC. Participants all over the world collect marine debris and record the types of material they find. This information is then used by the Ocean Conservancy to help reduce future marine debris problems. Each fall, cleanups are held all along the Massachusetts coastline. Each spring the Ocean Conservancy publishes a report of the data from the previous year's cleanups. This report places the debris collected into activity categories that do not match up with the requested categories above. For the 2009 cleanups, 100,167 items were collected in

Massachusetts. The Shoreline and Recreational Activities category, which includes bottles, cans, food wrappers, etc., accounted for 53% of the items collected. Items from Ocean and Waterway Activities, which includes fishing gear, buoys, rope, etc., made up about 11% of items collected. Debris from Dumping Activities (on shore dumping of building and construction materials, drums, tires, cars/car parts, household trash, and appliances) and Medical and Personal Hygiene (materials, such as diapers, condoms, syringes, and tampon and tampon applicators, which are dumped into storm drains, sewer systems, and toilets) were each about 1% and Smoking Related Activities was 34%.

Other marine debris efforts in Massachusetts include the Boston Harbor Marine Debris Removal Program administered by the Boston Harbor Association, a nonprofit organization that promotes a clean and accessible harbor. This program has been ongoing since 2000. In 2009, more than 9,000 pieces of debris were collected from the inner harbor, including large timbers and pilings, construction debris, and smaller debris such as plastic bottles, paper, wrappers, and wood. Their collection effort is coupled with outreach and education to local businesses to stop litter and debris from entering the harbor.

Regarding derelict fishing gear, the Massachusetts Division of Marine Fisheries (DMF) has recently run two programs to (1) remove ghost lobster traps and (2) to remove illegal lobster traps from coastal waters. The first program is primarily used to reduce the incidence of bycatch in lost or abandoned traps. Current efforts are focused on mortality rates in these ghost traps. The second program addresses the seasonal gear restrictions in Cape Cod Bay to reduce entanglements with North Atlantic Right Whales. Single lobster pots are prohibited from January 1-May 15 in Cape Cod Bay. DMF partners with the Massachusetts Environmental Police and local fisherman to locate and remove single traps during this period—a critical time when Right Whales congregate in Cape Cod Bay. In 2008, nearly 500 noncompliant traps were pulled from Cape Cod Bay Critical Habitat. In one fisherman's case, more than 180 traps were seized for violating whale regulations and that fisherman's license was revoked.

No specific data is available for marine debris originating from stormwater, other fishing gear, derelict vessels, waste from vessels, or hurricanes. CZM makes an effort to prevent recreational vessel debris, however, through publication of the Massachusetts Clean Marina Guide (2001) in partnership with the recreational boating industry. The guide provides "best environmental practice" information for marina facilities, including a fact sheet that encourages proper handling of trash by boaters.

2. Provide a brief description of any significant changes in the above sources or emerging issues.

There were no significant changes.

3. Do you use beach clean-up data? If so, how do you use this information?

As stated above, CZM has Massachusetts beach cleanup data from the Ocean Conservancy. This cleanup data represent a single snapshot of the Massachusetts coastline at the time each cleanup was held and do not necessarily provide accurate representations of the marine debris issues in the Commonwealth.

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

1. For each of the management categories below, indicate if the approach is employed by the state or territory and if significant changes have occurred since the last assessment:

Management categories	**Employed by state/territory** (Y or N)	**Employed by local governments** (Y, N, Uncertain)	**Significant changes since last assessment** (Y or N)	**If significant change, funding source**
Recycling requirements	Y	Y	N	N/A
Littering reduction programs	Y	Uncertain	N	N/A
Wasteful packaging reduction programs	Y	Uncertain	N	N/A
Fishing gear management programs	Y	Uncertain	N	N/A
Marine debris concerns in harbor, port, marine, & waste management plans	N	Uncertain	N	N/A
Post-storm related debris programs or policies	Y	Uncertain	N	N/A
Derelict vessel removal programs or policies	Y	Uncertain	N	N/A
Research and monitoring	N	Uncertain	N	N/A
Marine debris education & outreach	Y	Uncertain	N	N/A

2. For significant changes since the 2005 assessment, characterize the change; specify whether it was a 309 or other CZM driven change, and specify the funding source; and characterize the outcomes and effectiveness of the changes.

There were no significant changes since the 2005 assessment.

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the CMP and partners (not limited to those items to be addressed through the Section 309 Strategy).

Gap or need description	**Type of gap or need** (regulatory, policy, data, training, capacity, communication & outreach)	**Level of priority** (H,M,L)
The major gap in addressing programmatic objectives for marine debris is lack of data. COASTSWEEP is conducted by volunteers once a year and the data collected is only a snapshot of the marine debris dynamics in Massachusetts.	Data	L

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

Low. State efforts have been focused primarily on educating the public on marine debris problems. A significant investment of resources would be required to observe any measurable changes. Given the limited availability of resources, when compared to the priorities of other 309 categories, any expenditure would quickly surpass the realized benefits. The priority level therefore remains low.

2. Will the CMP develop one or more strategies for this enhancement area?

No. The priority level for this enhancement area remains low; therefore, no Strategy is proposed.

E. Cumulative and Secondary Impacts

Section 309 Enhancement Objective

Development and adoption of procedures to assess, consider, and control cumulative and secondary impacts of coastal growth and development, including the collective effect on various individual uses or activities on coastal resources, such as coastal wetlands and fishery resources.

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

1. Identify areas in the coastal zone where rapid growth or changes in land use require improved management of cumulative and secondary impacts (CSI) since the last assessment. Provide the following information for each area:

Geographic area	**Type of growth or change in land use**	**Rate of growth or change in land use** (% change, average acres converted, H,M,L)	**Types of CSI**
Marine seafloor habitat in state and adjacent federal marine waters	Increased use of ocean area and seafloor for development, including placement of energy and communications infrastructure	Three 24", 10+-mile long natural gas pipelines placed in bottom of Massachusetts Bay in 10 years. Proposal for a 35-mile 100 volt cable through Massachusetts Bay	Temporary physical disturbance, permanent displacement, habitat loss and conversion, etc.
Shallow, coastal areas that serve as eelgrass habitat and suffer from cultural eutrophication and other stressors	Increased number of residential homes and commercial development and their associated onsite wastewater and storm water discharges Increased number and size of piers, docks, and moorings.	Six percent growth in Barnstable County (Cape Cod) from 2000-2006. Average loss of 3% eelgrass area per year since 1995 (30% total areal loss in 10 years)	Nitrogen enrichment resulting in enhanced algae growth and diminished photic zone, low dissolved oxygen, increased summer water column temperatures, physical disturbance, permanent displacement, shading, propeller scour, sediment drape
Coastal communities facing large land use changes	Conversion of undeveloped or agricultural land to mixed residential/commercial development	Over 20 years, thousands of acres of undeveloped land will be converted to residential and mixed uses development.	Much of these coastal waters are already threatened by excessive nitrogen loading from existing stormwater and wastewater discharges. The additional load from the expected development will exacerbate existing eutrophication and result in decreased estuarine habitat due to water quality degradation.

2. Identify sensitive resources in the coastal zone (e.g., wetlands, waterbodies, fish and wildlife habitats, critical habitat for threatened and endangered species) that require a greater degree of protection from the cumulative or secondary impacts of growth and development.

Sensitive resources	**CSI threats description**	**Level of threat** (H,M,L)
Benthic ocean habitats	Temporary physical disturbance, permanent displacement, habitat loss and conversion	H
Eelgrass beds and eelgrass habitat (i.e., where eelgrass used to grow but does not grow currently because of multiple factors)	Physical disturbance by dredging; permanent displacement by piers, pilings, moorings; shading by docks, piers, moored & docked vessels; propeller scour; sediment drape; blade coverage by invasive tunicates; low dissolved oxygen	H
Coastal embayments and estuaries	Cultural eutrophication resulting from: decreased vegetation/increased impervious surface in watershed, stormwater runoff, on-site septic system discharges, wastewater treatment facility discharges	H

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

1. For each of the management categories below, indicate if the approach is employed by the state and if significant changes have occurred since the last assessment:

Management Categories	**Employed by state/territory** (Y or N)	**Significant changes since last assessment** (Y or N)	**If significant change, funding source**
Regulations	Y	Y (a)	State funds, 306
Policies	Y	Y (b)	State funds, 306
Guidance	Y	Y (c)	State funds, 309
Management Plans	Y	Y (d)	309, state funds, others
Research, assessment, monitoring	Y	Y (e)	State funds, 309
Mapping	Y	Y (f)	309, state funds (capital and mitigation trust)
Education and Outreach	Y	Y (g)	309, state funds, 310
Other (please specify)			

2. For significant changes since the 2005 assessment, characterize the change; specify whether it was a 309 or other CZM driven change, and specify the funding source; and characterize the outcomes and effectiveness of the changes.

2-a. Regulations

DEP has required a new Regulated Impervious Area (RIA) General Stormwater Permit for activities that can reasonably be expected to result in the discharge of stormwater from certain privately

owned sites (> 5 acres) that contain impervious surfaces. The RIA General Stormwater Permit requires all permittees to implement pollution prevention and source control measures. Such measures reduce the amount of pollutants in stormwater without causing the permittee to incur the land and financial costs associated with the design and construction of structural BMPs. The RIA General Stormwater permit also requires that permittees comply with the National Pollutant Discharge Elimination System (NPDES) Construction General Permit, if applicable. In addition to these non-structural practices, the RIA General Stormwater Permit requires permittees to install low impact development (LID) techniques and structural stormwater BMPs in conjunction with projects for the development and redevelopment of impervious surfaces. There is also a new stormwater regulation (MS4 General Permit for North coastal Watersheds), jointly issued by US EPA and DEP, to monitor what flows from a municipality's pipes into local water sources, during dry and wet weather; inspect key manholes within five years to ensure they are not spreading pollutants; and draft plans to detect and deal with illicit pollution within one year. Furthermore, there are Total Maximum Daily Loads (TMDLs) that have been developed for waters impaired by bacteria and nutrients. Since 2005, bacteria TMDLs were developed for Mt. Hope Bay, Buzzards Bay, Cape Cod, the Islands, Taunton River, South Coastal, Boston Harbor, North Coastal, Merrimack, Parker, and Ipswich watersheds. Nitrogen TMDLs have been developed for Nantucket Harbor; Great Pond in Edgartown; Great, Green, and Bournes Ponds, and Popponesset Bay in Mashpee; Stage Harbor, Sulfur Springs, Taylor's Pond, Bassing Harbor, and Muddy Creek in Chatham; West Falmouth Harbor, Phinney's Harbor, Oyster Pond, and Little Pond in Falmouth; the Three Bays System in Barnstable; Waquoit Bay in Falmouth and Mashpee; and Pleasant Bay in Orleans, Harwich, Chatham, and Brewster. DEP is the lead for these regulatory changes with support from CZM.

2-b. Policies

Eelgrass monitoring and restoration guidelines were produced by DMF. CZM provided technical support and review for the guidelines. These guidelines are now being used by project proponents that need to replant eelgrass as part of their mitigation through state and federal permits and licenses.

2-c. Guidance

Through 309 as well as partner efforts, CZM conducted two workshops that were targeted to municipalities on how to develop stormwater utilities. The next step is to work with the Massachusetts Bays National Estuary Program to run a small grant program to help communities implement the Does It Make Sense assessments outlined in these workshops. DEP also updated (in 2006) its Clean Water Toolkit also known as the NPS Pollution Management Manual.

2-d. Management Plans

In 2009, CZM issued a comprehensive Ocean Management Plan to assist in the siting of marine infrastructure and protection of critical marine habitats and important marine water-dependent uses. This was supported in part by 309 funds (see *Ocean Resources* section).

2-e. Research, Assessment, Monitoring

In 2006, CZM conducted a study of stormwater BMPs installed between 2000 and 2004. It was determined that 32 % of the BMPs had slight functional impairment, 11% were substantially impaired, and 27% were not functioning as originally installed. A major reason for this problem was the lack of adequate maintenance. In response to this study, the RIA General Stormwater Permit (above) requires that the permittee properly operate and maintain all on-site LID techniques structural stormwater BMPs. This effort was supported by state funds in connection with work done on storm water utilities through 309.

2-f. Ocean Mapping

Since 2005, CZM has continued its seafloor mapping partnership with the US Geological Survey (USGS). The goal of the cooperative is to comprehensively map the bathymetry and surficial geology of the seafloor in Massachusetts. The program is a success story in partnership, funded by a combination of state, federal (USGS and National Oceanic and Atmospheric Administration), and private sector contributions, while effectively leveraging expertise and technology within state and federal agencies. See http://www.mass.gov/czm/seafloor/index.htm for a program overview and areas completed to date.

Work done in support of the Ocean Management Plan is to develop a model for assessing cumulative impacts in Massachusetts marine waters. This project is based on the application of a cumulative impacts model—developed at the National Center for Ecological Analysis and Synthesis, UC-Santa Barbara—that has been used elsewhere to help assess cumulative impacts. The project begins with an analysis of the impact of individual human activities on specific ocean habitats, and then combines these individual impacts for each designated habitat. The result is a model which generates a map that identifies, for the study area, differences in the cumulative effect of the assessed human activities. CZM has assisted in multiple aspects of this project, from overall project management to development of particular data layers for use in the cumulative impacts model. As described below, while initial progress has been positive, more work is necessary to refine the application for Massachusetts and adjacent federal waters.

2-g. Education and Outreach

In 2007, with support from 309, CZM's Coastal Nonpoint Source grant program, other partners, two municipalities (Medford and Franklin) and a watershed association (Charles River Watershed Association--CRWA) worked to help raise stormwater awareness and promote the benefits of an enhanced stormwater management budget. CRWA produced a report on recently developed municipal stormwater utilities (MSU). In the future, it will produce a description of three case studies where New England municipalities developed MSUs. It will also survey municipalities in the Charles River watershed to see how they currently finance stormwater infrastructure. The ultimate product from this work will be a toolkit for MSU development. Both municipalities assessed their abilities to generate revenue from a MSU, conducted a community-based social marketing survey, and developed a feasibility report.

Also, DMF did significant research on eelgrass transplant site selection and transplanting methods suitable in MA waters and produced technical guidance document. DMF was the lead on this eelgrass restoration effort with support from CZM.

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the CMP and partners (not limited to those items to be addressed through the Section 309 Strategy).

Gap or need description	**Type of gap or need** (regulatory, policy, data, training, capacity, communication/outreach)	**Level of priority** (H,M,L)
Focused hands-on assistance to coastal cities and towns on specific management, regulatory, or other actions to address defined CSI issue.	Regulatory, policy, training, capacity, communication and outreach	H
Improved understanding of the sources and effects of cumulative impacts and stress on the marine environment; geo-spatial data to integrate with existing and new habitat and human use data and information	Data	H

Priority needs and information gaps for the Cumulative and Secondary Impacts (CSI) enhancement are focused on data and technical assistance efforts to reduce the collective and indirect effects of human and other stressors on coastal and marine habitats. Local managers and decision-makers need more sustained technical and other assistance as well as resources to improve their tools and abilities to address the cumulative and secondary impacts of new and existing residential and commercial development in coastal communities as it relates to nitrogen management and protection and restoration of submerged aquatic vegetation—primarily in the form of eelgrass or Zostera marina beds—which provide many well-known ecological services including, but not limited to, sediment stabilization and nursery habitat for commercially and recreationally important fish and shellfish. Data, information and tools are also needed to develop and integrate sources of cumulative and secondary impact in the ocean environment and to identify those areas that are especially prone, vulnerable, or experiencing high levels of CSI.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

High. The cumulative and secondary impacts of new and existing residential and commercial development in coastal communities of Massachusetts is a major issue for the Commonwealth as it seeks protect threatened and degraded estuarine habitat and water quality. One of the key habitats that is especially prone to cumulative and secondary impacts is submerged aquatic vegetation—primarily in the form of eelgrass or *Zostera marina* beds—which provide many well-known ecological

services including, but not limited to, sediment stabilization and nursery habitat for commercially and recreationally important fish and shellfish.

As CZM and other state agencies proceed with implementation of the Ocean Management Plan and begin to plan for updates and/or amendments, information and data—with spatial focus—that characterize marine habitats and resources as well as human uses and other sources of stressors is critical. Emphasis is being placed on the development of tools which serve to integrate sources of cumulative and secondary impact in the ocean environment and to identify those areas that are especially prone, vulnerable, or experiencing high levels of CSI.

2. Will the CMP develop one or more strategies for this enhancement area?

Yes. One major strategy will be developed for this enhancement area. This project is necessary to better identify, understand, and manage the cumulative and secondary impacts on estuarine and marine habitats in state and adjacent federal ocean waters.

F. Special Area Management Planning

Section 309 Enhancement Objective

Preparing and implementing special area management plans for important coastal areas.

> *The Coastal Zone Management Act (CZMA) defines a Special Area Management Plan (SAMP) as "a comprehensive plan providing for natural resource protection and reasonable coastal-dependent economic growth containing a detailed and comprehensive statement of policies; standards and criteria to guide public and private uses of lands and waters; and mechanisms for timely implementation in specific geographic areas within the coastal zone. In addition, SAMPs provide for increased specificity in protecting natural resources, reasonable coastal-dependent economic growth, improved protection of life and property in hazardous areas, including those areas likely to be affected by land subsidence, sea level rise, or fluctuating water levels of the Great Lakes, and improved predictability in governmental decision making."*

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

1. Identify geographic areas in the coastal zone subject to use conflicts that can be addressed through special area management plans (SAMP). Also include areas where SAMP has already been developed, but new issues or conflicts have developed that are not addressed through the current plan.

Geographic Area	Major conflicts	Is this an emerging or a long-standing conflict?
Areas of Critical Environmental Concern	Protection of environmental resources in state-designated areas from potential development impacts to habitat, water quality	Long-standing
Designated Port Areas	Balancing the preservation of existing/historic infrastructure and land for water-dependent, industrial use with local land use planning, changing economies/industries	Long-standing
Ocean Planning Area	Protection of natural resources and existing human uses while achieving policy goals through allowing emerging human uses (e.g., renewable energy)	Emerging

Areas of Critical Environmental Concern Program

The Department of Conservation and Recreation (DCR) administers the Areas of Critical Environmental Concern (ACEC) program and coordinates closely with CZM regarding all coastal ACECs. The overall goal of the ACEC program is to preserve, restore, and enhance critical environmental resources in the state. Today there are 30 ACECs statewide (14 coastal) representing 268,000 acres (74,000 acres in coastal ACECs). CZM has continued to have a strong working relationship with the ACEC program in an effort to strengthen state agency coordination and support Special Area Management Planning. Since the 2005 assessment, budget cuts have reduced the staff of the ACEC program, and led to the elimination of the former Coastal ACEC Stewardship

Grant program. Despite these cuts, since the last 309 review, CZM and DCR staff worked together to produce an updated web-accessible guide to state regulations and programs related to ACECs. In addition to this outreach project, CZM continues to provide support regarding numerous projects in specific ACECs. These include regional planning and wetlands restoration in the Great Marsh (formally Parker River/Essex Bay) ACEC, revising the Pleasant Bay management plan in 2008 and assisting with various implementation tasks, and coordinating with the Neponset River Watershed Association on various tasks, including development of a watershed-based restoration plan.

Designated Port Areas

Massachusetts has designated areas in developed ports for the purposes of promoting and protecting marine industrial activities and certain supporting uses. These Designated Port Areas (DPAs) have been set aside in Gloucester Inner Harbor, Beverly Harbor, Salem Harbor, Lynn, Mystic River, East Boston, Chelsea Creek, South Boston, Weymouth Fore River, New Bedford-Fairhaven, and Mount Hope Bay. In general, the goal of state DPA policy is to preserve and enhance the capacity of these areas to accommodate water-dependent industrial uses; accordingly, certain inherently incompatible uses (such as residences and hotels) are not allowed in DPA areas subject to state permitting jurisdiction.

CZM administers the DPA program, providing technical and planning assistance to municipalities and property owners, reviewing DPA boundaries and updating official maps as necessary, and participating in DEP permitting activities through the Chapter 91 licensing program. In 2009, CZM convened a Technical Advisory Committee to review the DPA program and recommend changes, resulting in proposed amendments to the existing body of DPA-related regulations governing boundaries, approval of master plans, and licensing standards for development on tidelands. Promulgation of these amendments, together with associated adjustments to CZM Ports Policy No. 3 and publication of a complete set of modernized DPA maps, is expected by the end of 2010.

Financial assistance to DPAs, and port/harbor interests in general, is provided through the Seaport Advisory Council through its state bond-supported grant programs. In the past five years, Seaport Advisory Council funds (authorized by the 2008 Energy and Environmental Bond Bill) have been targeted for projects to improve port facilities in Fall River, New Bedford, Gloucester, Boston, and Salem. Seaport Advisory Council funds have also been used in support of DPA planning activities (see below). CZM also coordinates the state dredging team, which is in part a forum for reviewing and discussing technical aspects of dredging projects (including those intended to support the Commonwealth's maritime industry).

Massachusetts Ocean Management Plan

As described more fully in the Ocean Resources section, Massachusetts completed its Ocean Management Plan on December 31, 2009. The Oceans Act of 2008 mandated the development of this comprehensive plan that contains siting and performance standards for new development and for protection of certain natural resources in state waters. The Oceans Act also mandated a specific

geographic area of focus for the Ocean Management Plan and directed that the plan be implemented through existing state regulatory authorities. Therefore, CZM notes that the Ocean Management Plan has many features of a special area management plan, as the term is defined in the CZMA.

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

1. Identify below any special management areas in the coastal zone for which a SAMP is under development or a SAMP has been completed or revised since the last Assessment:

SAMP title	**Status** (new, revised, or in progress)	**Date approved or revised**
Ocean Management Plan	New	Plan promulgated December 31, 2009
Pleasant Bay ACEC	Revised	Management plan finalized March 2008
Neponset River ACEC	In progress	Ongoing development and implementation of watershed restoration plan
Designated Port Areas	In progress; revisions to DPA regulatory framework in process, and several DPA master plans reviewed and approved	• Salem DPA Master Plan approved June 2008 • East Boston Municipal Harbor Plan (which contained provisions related to the East Boston DPA) approved March 2009 • Gloucester DPA Master Plan approved December 2009 • New Bedford DPA Master Plan approved June 2010 • Lynn DPA Master Plan approved June 2010

2. For significant changes since the 2005 assessment, characterize the change; specify whether it was a 309 or other CZM driven change, and specify the funding source; and characterize the outcomes and effectiveness of the changes.

Ocean Plan

The Ocean Management Plan, described more fully in the Ocean Resources section of this assessment, was completed on December 31, 2009 following an 18-month, intensive plan development process. The Ocean Management Plan contains siting and performance standards for specific human uses allowed in ocean waters (cables, pipelines, sand extraction for beach nourishment, and renewable energy development) and identifies "special, sensitive, or unique life and habitats" for protection. The Ocean Management Plan will be implemented through existing state regulatory programs, including MEPA, Chapter 91, and Federal Consistency. Additionally, the Ocean Management Plan includes a prioritized list of science and data acquisition tasks necessary to

advance ocean management in Massachusetts in the future. 309 resources were utilized in support of this effort.

Areas of Critical Environmental Concern

Since the last assessment, budget reductions have continued to affect the ACEC program. Despite this continuing issue, significant work in certain coastal ACECs was completed, with CZM providing agency coordination, planning, resource identification and mapping, and assistance with resource management plan implementation. No 309 resources were utilized in this effort.

In 2008, in the Neponset River ACEC, the Lower Neponset River Citizens Advisory Committee (CAC) was convened to evaluate and provide guidance on ecological restoration alternatives, with particular attention to action related to two existing Neponset River dams. After a year-long process, the CAC identified the following goals: provide for cleanup of existing contamination in the existing impoundments from past industrial activities to protect human health and improve ecological conditions of the river and estuary; restore river function including fish passage for river herring and shad, protection of the rainbow smelt spawning habitat below the Baker Dam, and improve general ecological functions such as riverbank and water's edge habitat; recognize and enhance the experience of the human and natural history of the river; and increase recreation on and alongside the river through greater water passage via canoe or kayak. Current efforts are developing measures to implement these goals.

The Pleasant Bay ACEC was the focus of a March 2008 comprehensive management plan update. CZM staff participated in the development of the management plan, and CZM also paid for supporting studies related to help understand Bay circulation following the April 2007 barrier island breach, including mapping bathymetry and an assessment of sediment transport changes. CZM has been involved with the development of regulatory guidelines for docks and piers and hosted public forums centered on management issues in Pleasant Bay.

Designated Port Areas

Several DPA Master Plans were completed and approved since 2005, including Salem, Gloucester, New Bedford, and Lynn. Funding from the Seaport Advisory Council (state funds) were used to help municipalities complete these plans. CZM staff provided technical support to the communities for their DPA Master Plans. 309 resources were not utilized.

Additionally, CZM convened a DPA Technical Advisory Committee (TAC) which met several times throughout 2009 and 2010 to develop policy recommendations for the DPA program. The purpose of the TAC was to review the Commonwealth's DPA policies and tools to ensure they are up-to-date and to reflect a balance between preserving critical water-dependent industrial assets and providing municipal flexibility to pursue economic development. The DPA policy recommendations include revisions to the Chapter 91, Municipal Harbor Plan, and DPA Boundary regulations to activate the water's edge and watersheet and promote additional economic opportunities by allowing

new and expanded uses while ensuring the protection of current and future marine industrial opportunities. Specifically, the proposed changes would provide greater flexibility in the positioning of allowable non-maritime uses on the project site, allow recreational boating slips under limited circumstances, and clarify DPA boundary review criteria.

Taken together, the recent DPA master planning efforts and the work of the TAC have led CZM to consider other related needs for the DPA program, as further described below.

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the CMP and partners (not limited to those items to be addressed through the Section 309 Strategy).

Gap or need description	**Type of gap or need** (regulatory, policy, data, training, capacity, communication & outreach)	**Level of priority** (H,M,L)
Formally adopted guidelines to assist DPA property owners in expanding maritime uses and pursuing opportunities for compatible economic diversification, to better implement enforceable Ports Policy No. 3.	Data, capacity, outreach/ communication, and policy	H
Carry out boundary reviews in selected DPAs where there is cause to revisit compliance with applicable suitability criteria, to better implement enforceable Ports Policy No. 3.	Data, regulatory	H
ACEC management plan development and implementation	Data, capacity, training and outreach	L

Guidance for DPA Property Development

Sustaining investment in maritime infrastructure and operations poses ever-more-severe challenges, especially to fresh fish industries and small-scale port operations. In order to better contend with increasingly harsh economic conditions, DPA property owners increasingly seek to diversify use of their land and pier areas with non-maritime but compatible forms of development, particularly for commercial activities like restaurants, berthing for transient recreational boaters, and other tourism-related facilities. Since 1994, flexibility to accommodate such diversification has been integral to CZM port policy and reflected in DEP regulations governing tidelands development, and additional measures in that regard are soon to be promulgated (see TAC discussion, above). Experience has shown, however, that many DPA landowners and businesses are not sufficiently familiar with the regulatory regime to accurately assess the feasibility of various expansion scenarios; nor, in many cases, are they adequately informed as to the availability of government programs offering financial assistance and other types of economic incentive for diversification.

In recent years CZM has drafted a variety of internal documents for technical assistance in regulatory matters, on a case-by-case basis, and has commissioned a preliminary study that identified

a series of economic incentive programs that could provide financial assistance to port industries [see Urban Harbors Institute, *Study of Economic Incentives for Designated Port Areas in Massachusetts* (University of Massachusetts – Boston; 2004)]. All such documents need to be revisited and updated, particularly as port inventories described below are developed. Building on this foundation, the next step will be to integrate these disparate materials into a more comprehensive guidance document for formal adoption by the CZM Program, and for widespread dissemination within the port community through use of the CZM website and other appropriate means. Additionally, permitting and other incentive strategies should be considered in consultation and coordination with other traditional economic agencies of the Commonwealth.

Modification of Selected DPA Boundaries

Current CZM regulations (at 301 CMR 25.00) stipulate that CZM shall from time to time carry out reviews that apply set procedures and standards to determine whether particular areas of land or water shall be included or remain in an existing DPA. It has been apparent since the regulations were first established that several DPAs would benefit from a certain degree of "pruning" or other minor adjustment, and for this purpose an initial series of four reviews was carried out between 1994 and 2003 (two in Boston and one each in Gloucester and Plymouth). Other DPAs that are potential candidates for boundary modification are those in Beverly, Weymouth/Fore River, Fall River/Somerset, and – as a result of suitability questions raised in freshly-renewed harbor plans – Gloucester and New Bedford/Fairhaven. CZM needs to resume its boundary review activities in one or more of these remaining DPAs, with the number and sequence to be determined based on factual information gathered in the course of a comprehensive port inventory. The purpose of the inventory will be to develop a far greater knowledge base than currently exits about land use trends, maritime business operations, land- and water-side port infrastructure, and other relevant "on the ground" conditions in the respective DPAs. Apart from leading ultimately to program changes in the form of modified boundaries, this real-time information also will be instrumental in meeting the need for useful property development guidance (see above), which is most effective if prepared with frequent "reality checks" gleaned from direct interaction with the primary audience of DPA occupants and other reliable sources.

Finally, acquiring a deeper understanding of the current DPA build-out has a corollary benefit pertaining to the effects of climate change (such as sea-level rise and increased frequency and severity of storm events), which could have significant impacts on the Commonwealth's port resources. Although not likely to result in program change in the short-run, the inventory process will provide information critical to identification of appropriate adaptation strategies in the longer term. In that respect, it will provide significant support to EEA's Climate Change Adaptation Committee efforts as well as CZM's ongoing StormSmart Coasts initiative (see Coastal Hazards Strategy section). The resulting GIS database also would benefit municipalities and port authorities through the provision of technical assistance, mapping assistance, and permitting/design review recommendations.

ACEC Management Plan Development

Funding for the ACEC program continues to be a challenge and in 2009, DCR's program lost two of its three staff. In general, ACECs that are supported by local or regional associations with funded staff (such as the Pleasant Bay Resource Management Alliance and the Neponset River Watershed Association) have been more active in resource management planning and implementation of ACEC plans. CZM staffs continue to assist DCR's ACEC Program, be involved in outreach, planning, and related implementation tasks, and look for opportunities to support ACEC management plan development and implementation. For example, conversations have begun recently in the Parker River/Essex Bay ACEC regarding identification of water quality improvement projects in the Great Marsh and the recent restoration of Straits Pond, part of the Weir River ACEC.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

Medium. Special Area Management Planning remains somewhat less of a priority for 309 because progress has been made since the last assessment. However, the CZM program is interested in building on progress of the DPA and ocean planning programs in particular and therefore will consider Special Area Management Planning for continued 309 projects in those areas. By continuing to focus efforts on Special Area Management Planning, the success of these programs will be enhanced, and important policy issues addressed, if given adequate resources.

Regarding the DPA program, CZM's recent examination of regulatory issues and experience gained through the development and review of particular port planning activities have highlighted the need for additional program change work in two areas: communicating policy guidance and revisiting current designations. This work requires a more clear understanding of existing facilities and diversification opportunities in DPAs, and would include consideration of additional types of economic development assistance for DPA property owners and the potential effect of future sea level rise on existing infrastructure.

With regard to the ACEC program, CZM's long-standing partnership with DCR and direct involvement in ACEC guidance and management plan development and implementation are strengths that should be continued. In a time of limited funds, however, CZM can only participate in selected ACEC activities as they occur, though opportunities to support ACEC program enhancement will be appropriately pursued. Thus, at the present time no specific 309 enhancement project is proposed.

Finally, as mentioned previously, the Ocean Management Plan in many respects is a special area management plan. The Ocean Resources section describes the Ocean Management Plan in more detail.

2. Will the CMP develop one or more strategies for this enhancement area?

Yes. Developing a strategy to address each of the identified gaps in the DPA program is a key step to continuing the successes of the program and will build on the work of the recent TAC. CZM is well-positioned to implement a project to address these gaps through the various efforts of the last several years.

G. Ocean Resources

Section 309 Enhancement Objective

Planning for the use of ocean resources.

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objectives

1. Massachusetts ocean resources and uses, threats /conflicts, degree of threat and anticipated threat(s).

Resource or Use	Threat or Conflict	Degree of Threat	Anticipated Threat or Conflict
Estuarine and marine habitats	Human activities including physical alterations (e.g., cable and pipeline development, offshore construction, dredging and dredged material disposal, sand and gravel mining, and fishing techniques) along with the degradation of water quality alter seafloor and water column habitats. Climate change effects potentially greater but not known.	H	Growing number of proposals to develop the ocean environment for energy generation and distribution, other infrastructure, extraction of suitable sand/cobble, and bottom-tending mobile fishing gear. Impacts vary in their permanence, significance, and nature depending on types of habitats affected and the nature of the development activity/ Climate change effects anticipated to increase.
Endangered species	Right and humpback whale populations are at critically low levels. Several other federally- and state-listed species found in ocean areas in Massachusetts (roseate, Arctic, and least terns; Leach's Storm-Petrel; various sea turtle species; piping plover; fin and sei whales) are threatened by climate change, natural variability, and potential effects of certain types of human development. There is no thorough assessment of populations of other marine creatures that may be threatened /endangered.	H	Navigation, fishing operations and certain types of offshore development pose threats to the survival of right whale and other species. Climate change will have impact on listed species and their habitat, but that impact is not known. Impacts to endangered species vary depending on the type of human development.

Resource or Use	Threat or Conflict	Degree of Threat	Anticipated Threat or Conflict
Harmful algal blooms (HABs) and pathogens	The extent and magnitude of HABs threatens shellfisheries, overall environmental quality, and human health.	H	Monitoring and predicting HABs important to predict timing/extent/duration of bloom to help address potential human health issues. The frequency and size of outbreaks, and resulting economic impacts, may increase without management plans.
Seagrass (see *Cumulative and Secondary Impacts* section for more information)	Water quality degradation and physical impacts decrease the abundance and quality of seagrass beds.	H	Continuation of current threats.
Biological diversity	Declining biodiversity from individual activities (fishing, coastal development, pollution, exotic species) and the cumulative effect of those activities; natural variability; climate change.	M	Unknown status of biological diversity limits the assessment of threats/conflicts.
Sand and gravel extraction	Shoreline erosion requires management options to protect property, including the investigation to extract material from the ocean floor.	H	Conflict between extraction and fisheries and conservation will intensify as sea levels rise and coastal hazards issues are enhanced.
Energy generation facilities (related to wind and tidal energy) and related infrastructure	Depending on nature of development, such facilities result in temporary impacts related to construction: water quality, displacement of existing human uses, displacement of species, habitat impacts. Permanent impacts may also result from such facilities to habitat, water quality, and permanent impacts to human uses (e.g. resulting from closure areas).	H	Continued policy interest in developing renewable energy projects in marine waters. Potential conflicts with existing human uses and environmental impacts from such projects.
Water quality/nutrients	Large volumes (~ 25 million gallons / day) of treated wastewater are discharged into coastal waters, and combined sewer overflows and individual septic systems pollute coastal waters. Parts of southeastern Massachusetts and Cape Cod have severe eutrophication issues, largely the result of groundwater impacts from septic systems.	H	Continued development in coastal watersheds will result in potential for continued wastewater impacts to coastal water quality and habitats.

Resource or Use	Threat or Conflict	Degree of Threat	Anticipated Threat or Conflict
Coastal land development	Watershed and shoreline construction results in direct, indirect, and cumulative impacts to ocean resources.	M	Continued development and redevelopment may result in continued impacts (direct, indirect, and cumulative) to ocean resources.
Dredging and dredged material management	Temporary water quality impacts, impacts to habitat, species resulting from dredging/disposal balanced with need to maintain/improve port infrastructure, shipping.	M	Continuation of current threats and conflicts.
Invasive species	Nonindigenous species threaten public, socio-economic, and ecological health of coastal waters and related uses.	M	New invasions and range expansion of established populations threaten native species and habitats.
Seawater extraction and discharge	Entrainment and impingement and discharge of warm water (power plants) and hypersaline water (desalination plants) impact coastal and ocean resources.	M	Future proposals for desalination plants and desire to increase energy production will exacerbate existing impacts.
Oil and gas	The current federal moratorium on oil and gas development, together with the absolute prohibition on drilling or removal of any gases or oils in MA waters, currently protects ocean resources from this use.	L	A national moratorium was declared on May 30, 2010 for six months and it is not known if the moratorium will be extended for the North Atlantic; only potential source of oil and gas known to date is on George's Bank.
Ecotourism and recreation	Whale watching, charter fishing, environmental excursions and personal watercraft use may impact the ocean environment. Increasing development of the ocean environment will also escalate use conflicts.	L	Increased demand for such activities may expand potential impacts.
Aquaculture	Shellfish aquaculture continues in shallow/nearshore areas; very limited activity in deeper water. Siting of operations may result in conflicts with existing uses/navigation.	L	Potential conflicts between conservation, aquaculture and fishing.

2. Changes in the resources or relative threat to the resources since 2005 assessment.

Since the 2005 assessment, several issue areas continue to be important considerations, and many were the focus of attention in the recently completed Massachusetts Ocean Management Plan. These issues include protection of ocean habitats and species, including listed species; wastewater disposal; fisheries; energy generation and distribution facilities (mainly related to electricity transmission cables, natural gas, and wind energy, but also including tidal energy); and the balancing

of trade-offs between existing human uses (commercial and recreational fishing, commerce, and other types of recreational activity) and emerging human uses (related to renewable energy, aquaculture, e.g.). Emerging issues, many also identified in the Ocean Management Plan, include climate change and its potential impacts to many ocean resources, habitats, and species; the potential increase in pressure to extract sand and gravel for beach nourishment in response to sea level rise and other coastal hazards issues; and the need to further understand and map the spatial patterns of human uses of marine resources.

The following is a brief overview of the major changes in resources and particular threats to ocean resources.

Estuarine and marine habitat and species

In several ways, the Massachusetts Ocean Management Plan recognized the importance and vulnerability of estuarine and marine habitats and species. For example, the Ocean Management Plan designated "hard/complex seafloor" as a resource type warranting protection from certain types of development, in part because of the consideration of the threats to such benthic habitat areas from cables or pipelines (i.e., construction impacts related to blasting, or permanent habitat impacts from placement of cover).

The Ocean Management Plan includes identification and protection of certain areas of "special, sensitive, or unique resources" pursuant to the Oceans Act. These areas include:

1. Core habitat for North Atlantic Right Whales, fin , and humpback whales
2. Roseate and "special concern" (Arctic, Least, and Common) tern core habitat
3. Long-tailed Duck core habitat
4. Leach's Storm Petrel important nesting habitat
5. Colonial waterbirds important nesting habitat
6. Eelgrass
7. Intertidal flats
8. Important fish resource areas

CZM continues to implement a strategy to map seafloor habitats with the cooperative mapping agreement with the USGS. The collaborative started in 2003, and has resulted in high-resolution mapping of seafloor geology (bathymetry and substrate type) for more than half of state waters. This survey work has been completed for state waters from the northern border south to approximately the Cape Cod Canal, and also portions of Buzzards Bay and Vineyard Sound. CZM is working to incorporate this seafloor mapping into a habitat classification system, a priority activity in the Science Framework prepared as part of the Ocean Management Plan. Additionally, in cooperation with the Massachusetts Ocean Partnership, CZM has contracted with modelers at the University of Massachusetts-Dartmouth to develop high resolution physical oceanographic data to inform habitat classifications. Through the development and implementation of habitat classification, and with the management framework in place because of the Massachusetts Ocean Management Plan, CZM's

goal is to further understand (and be able to map) the habitats in its marine waters. With subsequent understanding of the potential for impacts from human activities, appropriate management measures would then be developed.

Energy generation facilities and related infrastructure

Projects in the last five years that have been permitted include two offshore liquefied natural gas ports in federal waters and their related pipelines in Massachusetts Bay. Proposed projects include the Cape Wind project in Nantucket Sound, a proposed wind energy project offshore Hull, a tidal energy project in Muskeget Channel between Martha's Vineyard and Nantucket, and a wind energy project also in Muskeget Channel. Additionally, the Massachusetts Ocean Management Plan designates two areas for commercial-scale wind energy development: one south of Martha's Vineyard, in the vicinity of Nomans Land Island, and one south of Cuttyhunk at the tip of the Elizabeth Islands. Finally, an electricity transmission cable project is in the planning stages that would extend from Wiscasset, Maine south to Boston. Energy generation and related infrastructure will continue to be a priority issue in Massachusetts. (See Energy Facility Siting section of this Assessment for further information).

The management measures and spatial components of the Massachusetts Ocean Management Plan are based on minimizing conflicts with existing human uses and with minimizing impacts to marine resources. Consequently, the Ocean Management Plan attempts to address potential threats to particularly vulnerable resources and human activities resulting from renewable energy development in a proactive manner. Further work is necessary (as proposed in the Ocean Management Plan) to further refine these characterizations of impact and conflict and, consequently, to refine the plan's management measures.

Sand and Gravel extraction for beach nourishment

Coastal property is threatened by increasing frequency of storms and sea level rise, and inappropriately located or constructed development exacerbates issues associated with naturally eroding shorelines and response to sea level rise. One of the options to address such issues has been the use of offshore sand and gravel for beach nourishment. A proposal to extract material from Massachusetts Bay for use in Winthrop (northern part of Boston Harbor) was denied by the US Army Corps of Engineers because of concerns related to habitat impacts. A proposal on Nantucket to extract material was recently halted resulting from a negative vote at town meeting. However, because sea levels are anticipated to rise and coastal hazards issues are anticipated to continue to increase, there may be proposals in additional areas, especially where public infrastructure is at risk and other potential options of addressing coastal hazards are too expensive, too risky, or would result in greater environmental impact. Consequently, this policy issue will likely include consideration of the trade-offs between addressing coastal hazards and the potential for impacts to marine resources and human uses in the ocean.

Fishery resources

Fishery resources in New England remain under great pressure from overexploitation and habitat degradation. For the region, the recently adopted Amendment 16 to the Northeast Multispecies Fishery Management Plan (which regulates Northeast groundfish) represents a significant shift in fisheries management with its expansion of the use of fishing sectors. DMF also continued to manage state fishery resources, and published statewide maps of shellfish habitat (with CZM technical/financial assistance). Although the Massachusetts Ocean Management Plan did not, by law, address fisheries management, development of the plan's management measures included consideration of fish resources and commercial fishing.

Water quality/nutrients

Water quality concerns continue to be a threat to species and habitats, particularly in the nearshore area. Portions of Cape Cod have significant eutrophication issues, and certain communities are discussing the potential for new treatment facilities to help address the impacts from septic systems. Stormwater continues to be an issue in many of the urbanized areas, and recently the US EPA issued a new Phase 2 municipal stormwater general permit for northern Massachusetts.

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

1. Ocean management programs and initiatives developed since 2005 assessment.

Management categories	Employed by state	Significant change since 2005 assessment	If significant change, funding source
Statewide comprehensive Ocean Management Plan	Y	Y (a)	309, state funds
Regional comprehensive ocean management program	Y	Y (b)	309, state funds
Regional sediment or dredge material management plan	N	N	N/A
Intra-governmental coordination mechanisms for ocean management	Y	Y (a)	309, state funds
Single-purpose statutes related to ocean resources	Y	N	N/A
Comprehensive ocean management statute	Y	Y (a)	309, state funds
Ocean resources mapping or information system	Y	Y (c)	309; state funds (capital and mitigation trust)
Habitat research, assessment and monitoring	Y	Y (d)	309, Seaport Bond, NOAA's CSC, state funds (mitigation trust)

Management categories	Employed by state	Significant change since 2005 assessment	If significant change, funding source
Public education and outreach efforts	Y	Y (e)	State funds, cooperative agreement with MA Ocean Partnership
Aquatic invasive species management	Y	Y (f)	USFWS
Nutrient Management	Y	Y (g)	State funds, EPA funds, municipal funds

2. For significant changes since the 2005 assessment, characterize the change; specify whether it was a 309 or other CZM driven change, and specify the funding source; and characterize the outcomes and effectiveness of the changes.

2-a. Passage of the Oceans Act; Promulgation of the Massachusetts Ocean Management Plan; Intragovernmental Coordination

On May 28, 2008, Governor Deval Patrick signed the Oceans Act of 2008. This ground-breaking legislation required EEA to develop a comprehensive Ocean Management Plan, with a draft plan by June 30, 2009, and a final plan promulgated by December 31, 2009. The Oceans Act directed that the Ocean Management Plan address the following 15 specific requirements:

> (i) set forth the commonwealth's goals, siting priorities and standards for ensuring effective stewardship of its ocean waters held in trust for the benefit of the public; and (ii) adhere to sound management practices, taking into account the existing natural, social, cultural, historic and economic characteristics of the planning areas; (iii) preserve and protect the public trust; (iv) reflect the importance of the waters of the commonwealth to its citizens who derive livelihoods and recreational benefits from fishing; (v) value biodiversity and ecosystem health; (vi) identify and protect special, sensitive or unique estuarine and marine life and habitats; (vii) address climate change and sea-level rise; (viii) respect the interdependence of ecosystems; (ix) coordinate uses that include international, federal, state and local jurisdictions; (x) foster sustainable uses that capitalize on economic opportunity without significant detriment to the ecology or natural beauty of the ocean; (xi) preserve and enhance public access; (xii) support the infrastructure necessary to sustain the economy and quality of life for the citizens of the commonwealth; (xiii) encourage public participation in decision-making; (xiv) adapt to evolving knowledge and understanding of the ocean environment; and (xv) identify appropriate locations and performance standards for activities, uses and facilities allowed under the Ocean Sanctuaries Act, including but not limited to renewable energy facilities, aquaculture, sand mining for beach nourishment, cables, pipelines.

In addition, the Oceans Act:

- Directs that the ocean plan be implemented through existing state review procedures, with all licenses, permits, and leases required to be consistent to the maximum extent practicable with the ocean plan;
- Requires that the ocean plan be revised and publicly reviewed at least every five years;

- Establishes commercial and recreational fishing as allowed uses subject to the jurisdiction of the Division of Marine Fisheries; and
- Allows appropriate-scaled renewable energy development.

EEA, staffed by CZM and other agencies, led the development of the Ocean Management Plan. The basic purpose of the Ocean Management Plan is to translate the policy direction and specific requirements of the Oceans Act into a management plan. On December 31, 2009, EEA promulgated the Ocean Management Plan. The Ocean Management Plan combines elements of both designated-area and performance standard-based management by establishing three categories of management area: Prohibited, Renewable Energy, and Multi-Use. Under this approach, special, sensitive or unique natural resources and important existing water-dependent uses are provided enhanced protection in the siting, development, and operation of new uses, facilities, and activities. Renewable energy facilities are screened through strict compatibility criteria, and—for commercial-scale wind projects—facilities are allowed only in designated areas. The majority of state waters in the planning area remain open to uses, activities and facilities as allowed under the Ocean Sanctuaries Act, which preserves opportunity for new and emerging uses and flexibility for future changes based on new data and technologies and social values that will change over time.

Importantly, the Ocean Management Plan also includes a series of management and performance indicators, designed to enhance future review of the effectiveness of plan implementation (as well as helping to identify emerging issues or concerns). Finally, the Ocean Management Plan includes a "Science Framework"—a prioritized list of science and data acquisition tasks to enable the Ocean Management Plan to evolve.

2-b. Regional Ocean Resources Planning Efforts

CZM participates in regional governance efforts, including ocean and fisheries resources planning efforts, particularly through the Northeast Regional Ocean Council (NROC). CZM had a leadership role on NROC and also staffed its work groups. CZM coordinated NROC comments on the federal marine spatial planning framework and helped in the development and implementation of NROC workshops to discuss the framework. Additionally, CZM, with support from 309 funding, actively participated in meetings of the Gulf of Maine Council on the Marine Environment, Gerry E. Studds Stellwagen National Marine Sanctuary, and Northeast Regional Association of Coastal Ocean Observing Systems. Finally, CZM actively participated in the federal policy development for ocean planning led by the Council on Environmental Quality by presenting to the Ocean Policy Task Force in Washington D.C. and leading NROC preparation for implementation of the federal policy.

2-c. Ocean Resources Mapping and Information System

To facilitate the development of the Ocean Management Plan, CZM characterized and mapped ocean-based human uses and marine habitats and species. Over 90 new data layers were developed, and this information was made available through the Massachusetts Ocean Resource Information System (MORIS), initially created through CZM and NOAA funds, to allow rapid access to ocean

and coastal information and data through an interactive, searchable web mapping service. Through implementation of the Science Framework, CZM will be updating and revising its maps of human uses and marine habitats/species. As described below, CZM has an ongoing cooperative relationship with the US Geological Survey to produce high resolution seafloor mapping throughout the state.

2-d. Habitat Mapping and Research

CZM continued to implement its strategy to coordinate seafloor mapping throughout the state (developed through NOAA's CSC fellowship program). The CZM partnership with USGS continued to be an effective vehicle for developing basic data needed for habitat classification of benthic environs. CZM conducted a pilot project to examine the benefits and drawbacks of particular aspects of habitat classification in a continuing effort to refine the classification system. CZM is working with physical oceanographic modelers from the University of Massachusetts-Dartmouth to obtain high resolution model output of various water column parameters that will also be incorporated into future habitat classification work.

2-e. Public Education and Outreach

As part of the development of the Ocean Management Plan, CZM organized and conducted an extensive public outreach process. This extensive effort included 18 listening sessions at plan commencement, workshops, meetings, five formal public hearings to review draft Ocean Management Plan, hundreds of individual stakeholder meetings. CZM also developed an Ocean Management Plan web site used to solicit comments, provide online access to materials.

Other outreach and public education efforts included development of a web site for habitat mapping, several efforts related to aquatic invasive species management, and nutrient management.

2-f. Aquatic Invasive Species Management

Several new initiatives and resources for aquatic invasive species management (AIS) have been developed since the last assessment period. In 2007, a draft Early Detection and Rapid Response (EDRR) plan for aquatic invasive species was produced by CZM staff and the Massachusetts Aquatic Invasive Species Working Group. To support the EDRR plan, a species evaluation procedure was developed to evaluate risk of new and invading species, and a reporting network of experts was established. In 2006, CZM established the Marine Invader Monitoring and Information Collaborative (MIMIC) to serve as a regional early detection, education, and monitoring network for marine invasive species. MIMIC consists of trained volunteers, scientists, and state and federal agency workers who monitor for non-native marine species throughout New England. In support of the program, an identification guide featuring 20 priority marine invasive species was developed in partnership with Salem Sound Coastwatch. In addition, CZM published Monitoring Marine Invasive Species: Guidance and Protocols for Volunteer Monitoring Groups in 2008 to serve as a guidance document and standardized monitoring protocol for MIMIC and others interested in monitoring for marine invaders. To date, over 100 citizen scientists have been trained to monitor for marine invasive species at 65 sites in Maine, New Hampshire, Massachusetts, and Rhode Island.

Data collected from the MIMIC program is stored on the Marine Invader Tracking and Information System; an online database hosted by MIT Sea Grant, and can be also be viewed through CZM's Massachusetts Ocean Resource Information System (MORIS).

2-g. Nutrient Management

The Massachusetts Estuaries Project (MEP), administered by DEP, and funded by EPA, state funds, and municipalities, was established in 2001 to protect and restore 89 estuaries in southern/southeast Massachusetts. The primary goal of the MEP is to establish nitrogen Total Maximum Daily Loads (TMDLs) for each estuary. For each estuary, the MEP determines watershed boundaries, identifies nitrogen sources and estimates loads, characterizes existing water quality, and then applies water quality models to establish nitrogen loading targets to meet state water quality and habitat protection goals. See the *Cumulative and Secondary Impacts* section for more information.

CZM staff has been assisting DEP in this effort by reviewing TMDL reports and evaluating the accuracy of watershed nitrogen loading efforts. In addition, CZM is helping DEP in assisting municipalities to develop strategies to comply with proposed and adopted TMDL nitrogen limits. In a study that was completed in 2008, three estuaries on Cape Cod representing a wide range of conditions, were used as case studies to identify the best locations for wastewater collection and treatment/disposal methods. This pilot study was aimed to promote a regional, watershed-based inventory of nitrogen sources, and to ultimately integrate solutions into existing permitting programs for surface and ground water discharges. CZM staff has also been assisting communities on Cape Cod to develop Comprehensive Wastewater Management Plans. These plans provide a long-term approach to meeting nutrient management goals, and allow communities to plan for the high capital costs associated with implementing these plans.

Priority Needs and Information Gaps

Identify major needs or major gaps (regulatory, policy, data, training, capacity, communications and outreach) in addressing each of the enhancement area objectives that could be addressed through the CMP and partners (not limited to those items to be addressed through the Section 309 Strategy).

Gap or need description	Type of gap or need	Level of priority
Address science and data priorities (outlined in Ocean Management Plan science framework) and consequent revisions to Ocean Management Plan	Data, policy, communication, capacity	H
Develop greater understanding of potential climate change effects on ocean resources and development of appropriate management/policy response	Data, policy, capacity, communication	H
Develop greater understanding of potential future need for, and policy and natural resource issues associated with, offshore sand and gravel extraction for beach nourishment	Data, policy/regulatory, capacity, communication	H
Participation in regional ocean governance/planning efforts	Capacity, data, policy	H

Address science and data priorities in the Ocean Management Plan Science Framework

The Ocean Management Plan includes prioritized science and data research tasks that will help ocean management in Massachusetts evolve. These tasks were developed in part by considering the desired state of ocean management in Massachusetts in five years. These priority tasks include:

1. *Refine fish resource special, sensitive, or unique areas.* The Ocean Management Plan approach to mapping fisheries resources could be revised to enable higher spatial resolution of the resulting analysis.
2. *Classify benthic and pelagic habitats.* This is a long-standing goal of CZM that seeks to leverage existing partnerships with USGS, University of Massachusetts-Dartmouth, and others to classify marine habitats.
3. *Develop new spatial and economic data on recreational uses.* The Ocean Management Plan contains mapped information related to recreational uses, but there is a need to develop such data in a more rigorous, statistically defensible manner.
4. *Develop new spatial and economic data on commercial fishing.* Characterizing commercial fishing activity is a critical part of the Ocean Management Plan's approach to managing allowable development activity, and additional information is necessary to more fully understand potential areas of conflict between such development and commercial fishing.
5. *Understand cumulative impacts and ocean resource vulnerability.* Initial study of ocean resources indicates that some areas may be more vulnerable to cumulative impacts than others. Additional research is necessary to more fully understand the nature, extent, and magnitude of such impacts. See also the Cumulative and Secondary Impacts section.
6. *Monitor climate change.* Potential effects related to climate change are not well understood, although some effects such as changes in species assemblages in certain areas have already been documented.
7. *Develop and implement a performance evaluation framework.* The Oceans Act requires that the Ocean Management Plan be reviewed at least once every five years. To enhance the utility of such a review, and to help identify specific amendments that could be necessary, a plan performance evaluation framework will be implemented.
8. *Develop a data network for sharing information.* Much of the data developed for the Ocean Management Plan draws from sources whose utility would be improved through development of a data network.

CZM is coordinating with the Massachusetts Ocean Partnership to address priorities 3, 4, 5, 7, and 8, and priority 1 is a short-term interagency effort anticipated to be complete by late 2010. Additional work is needed to continue the habitat classification (priority 2), particularly to continue to develop the habitat classification model; incorporate physical oceanographic data into the model; develop and implement ground-truthing protocols; and further understand the species and communities which occupy particular habitats. Priority 6, related to climate change, is discussed more fully below.

Changes to the Ocean Management Plan and incorporation into CZM program enforceable policies

The Oceans Act requires the Ocean Management Plan to be reviewed at least once every five years; thus, the Legislature intended that the Ocean Management Plan evolve over time. The Ocean

Management Plan formalized this intention in part through the development of the plan's Science Framework. The prioritization of specific items in the Science Framework included consideration of those tasks likely to result in changes to the Ocean Management Plan itself. As elements of the Science Framework are addressed, therefore, there will be a need to develop amendments to the Ocean Management Plan. The Oceans Act also requires the Ocean Management Plan to be to formally adopted into the state's Coastal Management Program. CZM has begun discussions with OCRM on this issue to determine information needs. Additionally, since the Ocean Management Plan is intended to evolve, future changes to the plan may also result in the need for updates to the CZM Program.

Understanding potential climate change effects on ocean resources and development of appropriate management measures

As discussed in the Science Framework, existing information regarding the potential effects of climate change on ocean resources is inadequate, although the potential effects are thought to be great. Additional monitoring and modeling data is necessary to help understand the potential effects of climate change, which may include the potential for shifts in habitats, species occurrence/abundance and behavioral patterns, alterations in physical or chemical oceanographic processes (such as acidification), or other impacts. Developing this understanding could lead to the development of appropriate management or policy measures (i.e., through the identification of particular habitats or species increasingly vulnerable to impact and the need to provide additional protective measures).

Develop greater understanding of potential future need for, and policy and natural resource issues associated with, offshore sand and gravel extraction for beach nourishment

As described previously, sea level rise and other coastal hazards issues are likely to increase the pressure for the use of offshore sand and gravel extraction for beach nourishment. Understanding the nature of such pressure, and the associated policy issues (natural resource protection vs. protection of property or infrastructure, e.g.) of this activity will be key to considering potential responses, through modifications to the Ocean Management Plan or through other avenues.

Participation in regional ocean governance/planning efforts

The national framework for ocean planning that CEQ has released proposes that regional ocean management plans be developed with state and federal agency leadership, likely through existing regional organizations such as NROC. The experience in developing the Massachusetts Ocean Management Plan provides a clear example of the significant resources (staff, data, etc.) that will be necessary for such an effort.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

High. Ocean resources supported the colonization of Massachusetts and this nation and continue to support productive maritime industries, coastal communities and marine life. New approaches to manage ocean resources have been developed through the Ocean Management Plan, but continuing and emerging threats and conflicts remain. Reliable data is needed to support science-based policies and comprehensive management strategies that balance human use and protection of the ocean environment.

2. Will the CMP develop one or more strategies for this enhancement area?

Yes. This enhancement area is a priority for the Commonwealth, and CZM is uniquely situated to address the needs identified in this assessment.

H. Energy and Government Facility Siting

Section 309 Enhancement Objectives

Adoption of procedures and enforceable policies to help facilitate the siting of energy facilities and Government facilities and energy-related activities and Government activities which may be of greater than local significance.

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

1. In the table below, characterize the types of energy facilities in your coastal zone (e.g., oil and gas, Liquefied Natural Gas (LNG), wind, wave, Ocean Thermal Energy Conversion (OTEC), etc.) based on best available data.

Type of Energy Facility	**Exists in CZ** (# or Y/N)	**Proposed in CZ** (# or Y/N)	**Interest in CZ** (# or Y/N)	**Significant changes since last assessment** (Y or N)
Oil and gas facilities	17 [1]	N	N	N
Pipelines	4	1	N	Y
Electric transmission cables	3	N	1	Y
LNG	1 [2]	1	N	Y
Wind	N	2	2	Y
Wave	N	N	1	N
Tidal	N	3	0	Y
Current (ocean, lake, river)	N	N	N	N
OTEC	N	N	N	N
Solar	N	N	N	N
Other (please specify) Telecommunications Cables	1	1	N	N

[1.] Includes both electric generation plants and fossil fuel import/storage facilities.
[2.] Does not include two offshore LNG facilities in federal waters (see pipelines).

2. Please describe any significant changes in the types or number of energy facilities sited, or proposed to be sited, in the coastal zone since the previous assessment.

Pipelines

Since the completion of the last assessment, several new energy facilities and associated infrastructure have been constructed or proposed. Two new natural gas pipelines have been constructed. In addition to the existing Algonquin HubLine pipeline, Excelerate Energy completed the construction and commissioning of the 16 mile long Northeast Gateway natural gas pipeline

lateral. This pipeline supports the Northeast Gateway Deepwater Port, located approximately 13 miles south of Gloucester, Massachusetts.

The second pipeline constructed since the previous assessment was the 13 mile long Neptune natural gas pipeline lateral. The lateral connects the Neptune Deepwater Port, owned and operated by GDF Suez and located approximately 10 miles off the coast of Gloucester, with the Algonquin HubLine. Construction of the pipeline and deepwater port was completed in November of 2009 and is scheduled for commissioning in April, 2010.

Electric Transmission Cables

In addition to the two existing electric transmission cables, Transmission Developers, Inc. is developing a proposal for the installation of two 160 mile long, 6 inch diameter high voltage direct current cables. The cables, identified as the Maine Express, are proposed to connect Wiscasset, Maine to Boston, MA. The cable, proposed to provide power from "trapped" renewable energy generators in Maine, will enter MA waters northeast of Cape Ann and make landfall in Boston.

LNG

A new LNG facility is proposed for the Fall River, Massachusetts area. The facility proposed consists of a large "offshore" berthing station located in Mount Hope Bay and a cryogenic sub-sea pipeline linking the berth to an onshore storage tank. At the present time, the project faces significant permitting issues and is currently under review.

Wind

Renewable energy has seen a significant increase in interest since the previous assessment. Several wind power projects have either completed the state permitting process or are in the process of proposal generation. The Cape Wind Energy project, to be constructed in Nantucket Sound, has completed the state permitting process (for interconnecting cables in state waters) and is in the final phase of Minerals Management Service review (of the turbines and other structures in federal waters). A decision is expected by April, 2010. The proposed project consists of 130 turbines, with a maximum overall height of 417 feet. Total installed generating capacity for the project is estimated to be 454 megawatts, with an average annual power output of approximately 183 megawatts. The wind park will be connected to shore via a 12.5 mile transmission cable system (approximately 7.6 miles within the Massachusetts coastal zone), making landfall in Yarmouth, Massachusetts.

A second project, located in Hull, Massachusetts, would consist of a municipal project incorporating one to four turbines approximately 1.5 miles from shore. The four turbines are proposed to develop 15 megawatts of electricity and when combined with the two existing land based turbines would provide 100% of the town's power. The project is located entirely in the coastal zone.

A project recently showing interest in locating near Massachusetts is the Offshore Megawatt wind project. Preliminary information indicates that the project would be located 10 miles southwest of

Nomans Island (off the coast of Martha's Vineyard) in federal waters. The location of the transmission cable landfall has not yet been determined, but would presumably pass through the Massachusetts coastal zone. As of this time the project, which is in the initial information development stage, would employ 120 3.6 megawatt turbines to develop approximately 450 megawatts of energy.

On May 31, 2006, Patriot Renewables LLC filed and Environmental Notification Form to construct between 90 and 120 wind turbines in three locations within Buzzards Bay. The project proposed the creation of the 300 megawatt South Coast Offshore Wind Project. The three sites are located entirely in state waters within the confines of Buzzards Bay and the underwater cables would make landfall in the Town of Fairhaven. The project was determined to be prohibited under the Ocean Sanctuaries Act when originally proposed, and remains prohibited because it is not within a Wind Energy Area designated by the Ocean Management Plan promulgated on December 31, 2009. Being unable to obtain the necessary state permits for the original proposal, development of a modified project is apparently under consideration.

Land based wind turbines have also been a part of coastal energy developments since the previous assessment. In April 2006, a wind turbine was constructed at the Massachusetts Maritime Academy in the Town of Bourne, MA. The project consists of a single 2/3 megawatt facility which was projected to save the Academy $300,000 annually in electric costs. The Town of Falmouth is investigating the placement of a wind turbine at its wastewater facility in West Falmouth to power the facility and to earn the town additional revenue in selling excess power production. By May of 2006, Hull Wind 2, located in the town of Hull was commissioned. This project consists of a single Vestas V80 turbine, rated at 1.8 Megawatts. In its first year it is reported to have produced 4,088,000 kilowatt hours (KWh's).

Tidal

Despite the apparent dearth of sites with tidal flows suitable for energy production in Massachusetts, several projects have expressed interest in locating in the coastal zone. The town of Edgartown is in the process of developing the Muskeget Channel Tidal Energy Project. This project is proposed to install a number of horizontal helical Gorlov-type turbines that float from moorings. The pilot project, to be installed in the channel between Martha's Vineyard and Nantucket, is estimated to produce 1.5 megawatts.

In 2007, the Massachusetts Tidal Energy Company was issued a preliminary permit to allow for the investigation of project feasibility by the Federal Energy Regulatory Commission (FERC). The project would consist of 50 to 150 Tidal In Stream Energy Conversion (TISEC) devices with an estimated annual generation of 8.76 gigawatt-hours per unit per year.

Also in 2007, FERC granted Natural Currents Energy Services, LLC a preliminary permit to study the feasibility of the Cape Cod Canal Tidal Energy Project. This project would place one or more

generating units in the Cape Cod Canal, with an estimated average annual generation of 3 gigawatt hours per year. This project has run into severe permitting issues as it may interfere with ship traffic within the canal, as determined by the U.S. Army Corps of Engineers.

3. Does the state have estimates of existing in-state capacity and demand for natural gas and electric generation? Does the state have projections of future capacity? Please discuss.

Natural Gas

Massachusetts receives the majority of its natural gas supplies from North American sources U.S. and Canada) via pipelines, with additional sources transported via ship coming primarily from Trinidad. According to the Energy Information Administration's *Natural Gas Annual 2007*, Massachusetts had a total supply capacity of approximately 509,000 million cubic feet in 2007. This is an 8% increase over the 2005 supply. Supply has the potential to be significantly enhanced by bringing both the Northeast Gateway and Neptune offshore LNG facilities on-line. Demand for 2007 was approximately 409,000 million cubic feet, an 8% increase over 2005. The Natural Gas Association's *2009 Statistical Guide* estimates that demand in the region will grow at the rate of approximately 0.7% annually through 2035.

Electric Generation

Massachusetts represents approximately 45% of New England's population and 46% of the total electricity consumption for the area. The state relies on both in-state resources and imports of power over the region's transmission system. In 2009, the generating capacity in the state was 13,260 megawatts, with an actual peak demand of 11,890 megawatts. ISO New England projects a 1.2% annual growth in overall demand over the next decade.

4. Does the state have any specific programs for alternative energy development? If yes, please describe including any numerical objectives for the development of alternative energy sources. Please also specify any offshore or coastal components of these programs.

In 2008, the legislature enacted two landmark laws to boost renewable energy in Massachusetts: 1) the Green Communities Act, which mandates that by 2020, 15% of our electric load be served by renewable energy, and 2) the Global Warming Solutions Act, which requires steep, economy-wide reductions in greenhouse gas emissions. To implement these mandates, the legislature and the Patrick Administration have put together numerous financial incentives to spur the growth of renewable energy, and the Patrick Administration is championing legislation to make the process for permitting onshore wind powered facilities more predictable and less lengthy.

Also in 2008, as part of an omnibus Oceans Act the legislature amended the Massachusetts Ocean Sanctuaries Act (OSA) to more effectively balance state/regional/national interests in renewable energy production with ocean protection goals. Developed pursuant to that legislation, the recently promulgated Massachusetts Ocean Management Plan establishes a framework for the potential of offshore marine renewable energy development. (See below for further discussion).

This push for additional renewable energy complements other efforts to reduce greenhouse gases, such as the tripling of funds devoted to improving energy efficiency, and the expansion of programs that support solar energy development. However, these initiatives by themselves will not be sufficient to meet the renewable energy and greenhouse gas reductions mandated by the new legislation. Development of new renewable energy facilities is needed, and a concerted effort in cooperation with federal agencies is underway to tap the enormous potential of "deep water" wind farm development beyond state waters (see Ocean Resources Assessment).

Wind Energy

The state's Global Warming Solutions Act requires that greenhouse gas emissions be reduced 80 percent from 1990 levels economy-wide by 2050, and calls on EEA to set a 2020 target between 10 and 25 percent below 1990 levels and develop a plan for achieving that reduction. Governor Patrick has called for 2,000 MW of wind power by 2020 in Massachusetts or adjacent state and federal waters. To put this 2,000 MW goal in proper perspective, it should be noted that the Commonwealth currently has approximately 15 MW of installed capacity. Offshore wind resources offer the prospect of considerable renewable energy, free of harmful emissions, and if developed with care and forethought, are compatible with other ocean uses and resources. It is a potentially inexhaustible resource that, in many cases, is available in close proximity to regions with the highest electricity demand, minimizing the need for costly new transmission lines. A recent analysis of potential renewable energy generation capacity in Massachusetts by Navigant Consulting identified the theoretical generation capacity from offshore wind energy facilities at 19,000 MW. After factoring for avian and marine mammal habitats, other marine resources, view sheds and shipping routes, the Navigant study identified the technical generation capacity from offshore wind energy facilities at 6,270 MW.

Recent developments in furthering the development of wind energy generation include the establishment of the Marine Renewable Energy Center (MREC) at the University of Massachusetts Dartmouth School of Marine Science and Technology, created to develop in-ocean test sites for energy conversion devices and accelerate the commercialization of new technologies. MREC is currently funding wind (shallow, transition and deep-water) and tidal resource assessment and environmental survey work in Edgartown and Nantucket within a proposed National Offshore Renewable Energy Innovation Zone that would support full scale testing of wave and wind energy devices. The specific delineation of the zone is currently under review by the Minerals Management Service.

Tidal and Wave Energy

Although current available technology does not support commercial-scale projects, technological advancements may support the possibility of tidal energy development in limited areas. In general, a peak tidal velocity of 4 knots appears to be the minimum for an economically viable, utility scale project. The literature cites only three known locations that are currently documented to have tidal velocities that approach 3 knots, including Muskeget Channel between Nantucket and Martha's

Vineyard, Vineyard Sound between Naushon Island and Norton Point, within the Cape Cod Canal and to the southeast of Nantucket Island. However, recent information collected by UMass-Dartmouth in Muskeget Channel identifies current velocity in the channel exceeds 4 knots per second and demonstrates potential commercial viability.

The prospect for wave energy development in Massachusetts is limited. However, non-utility-scale projects have been proposed, and at least one demonstration project has recently been in operation on the North Shore. As with tidal energy, technological advancements may support the possibility of wave energy development in limited areas.

5. If there have been any significant changes in the types or number of government facilities sited in the coastal zone since the previous assessment, please describe.

No known significant changes have occurred and CZM is unaware of any plans to site additional government facilities in the coastal zone. The authorities presently available to CZM to address the siting of these facilities are not anticipated to require significant program enhancement in the near-term. However, a longer-term anticipated issue is the impact of climate change on all types of public infrastructure, for which flood hazards and other sustainability problems are likely to be exacerbated with rising sea level and increased frequency/severity of coastal storms. Although no statewide assessment of the magnitude of such impacts has been attempted, local flood hazard mitigation plans required by FEMA typically contain useful information regarding the location/elevation of critical facilities. As the capability to make detailed, site-specific projections of potential future submergence continues to improve, the necessary tools for undertaking a comprehensive vulnerability analysis will become available.

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

1. Does the state have enforceable policies specifically related to energy facilities? If yes, please provide a brief summary, including a summary of any energy policies that are applicable to only a certain type of energy facility.

Yes, at present two enforceable policies speak directly to energy-related development.

- Energy Policy #1 states as follows: *For coastally dependent energy facilities, assess siting in alternative coastal locations. For non-coastally dependent energy facilities, assess siting in areas outside of the coastal zone. Weigh the environmental and safety impacts of locating proposed energy facilities at alternative sites.*
- Ocean Resources Policy #2 states as follows: *Extraction of marine minerals (other than sand and gravel) will be considered in areas of state jurisdiction, except where prohibited by the Massachusetts Ocean Sanctuaries Act (MOSA), where and when the protection of fisheries, air and marine water quality, marine resources, navigation, and recreation can be assured.*

2. Please indicate if the following management categories are employed by the State or Territory and if there have been significant changes since the last assessment:

Management categories	**Employed by state/territory** (Y or N)	**Significant changes since last assessment** (Y or N)	**If significant change, funding source**
Statutes or regulations	Y	Y (a)	State funds, 309
Policies	Y	N	N/A
Program guidance	N	N	N/A
Comprehensive siting plan (including SAMPs)	Y (for offshore wind facilities only)	Y (b)	State funds, 309
Mapping or GIS	Y	N	N/A
Research, assessment or monitoring	Y	Y (c)	State funds (mitigation trust), 309
Education and outreach	N	N	N/A
Other (please specify)	N	N	N/A

3. For significant changes since the 2005 assessment, characterize the change; specify whether it was a 309 or other CZM driven change, and specify the funding source; and characterize the outcomes and effectiveness of the changes.

3-a. Statutes or Regulations

Chapter 114 of the Acts of 2008 (Oceans Act) created an exception to the previously absolute prohibition on offshore or floating electric generating stations within designated ocean sanctuaries, by authorizing the development of appropriate-scale renewable energy facilities in the event such facilities are consistent with a comprehensive Ocean Management Plan promulgated by the EEA Secretary [a parallel change to the waterways regulations has lifted a similar categorical prohibition on offshore wind energy facilities].

3-b. Comprehensive Siting Plan

On December 31, 2009, the Secretary of Energy and Environmental affairs promulgated a comprehensive Ocean Management Plan that designates two specific Wind Energy Areas for development of commercial-scale wind farms in state ocean sanctuaries, while extending the prohibition such facilities to all other waters within the harbor planning area (including those not within an ocean sanctuary). Further, the plan allows for the "community-scale" development of up to 100 offshore turbines within designated Multi-Use Areas, allocated in accordance with a cap established for various sub-regions and in a manner to be determined by the appropriate regional planning agency.

3-c. Research, Assessment, or Monitoring

Since the previous assessment was completed, the proponents of the Algonquin HubLine natural gas pipeline completed the analysis of their construction-related impacts. The water quality certificate issued by the state required the project to not significantly affect the sediments or biota in the project footprint. After five years of monitoring, the Commonwealth determined that there was

ongoing impact and a settlement was agreed upon to provide for mitigation for the impacts. Mitigation funds were allocated to restore impacted eelgrass and to begin a comprehensive seafloor mapping effort so that the Commonwealth can better avoid these impacts in the future. The resources were used to capitalize the nascent Ocean Use Trust Fund required by the 2008 Oceans Act. The results of this monitoring program have helped to shape the monitoring programs required for subsequent projects in the coastal zone. These programs were applied to the Northeast Gateway and Neptune natural gas pipelines which have initiated their three-year benthic monitoring plans. The monitoring, which is required through the DEP 401 permitting process, is an important component of the Commonwealth's management strategy.

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the CMP and partners (not limited to those items to be addressed through the Section 309 Strategy).

Gap or need description	**Type of gap or need** (regulatory, policy, data, training, capacity, communication & outreach)	**Level of priority** (H,M,L)
Revisions to energy siting provisions of Ocean Management Plan	Regulatory/Policy/Data/Capacity	H

The Massachusetts Ocean Management Plan is the state's first effort in developing a comprehensive siting and development plan for coastal waters. The plan was formulated partially in response to the greatly increased interest in offshore energy facility siting. The second generation of the plan will incorporate information to be developed in the next five years. This information will include:

1. Monitoring and updating changes in technology and capabilities as it relates to siting offshore wind, tidal, and wave energy production facilities;
2. Ground truthing of physical, chemical, and biological resources in the coastal zone;
3. Identifying possible cable routes from energy facilities located in federal waters to landfall in state waters;
4. Evaluation of the ability of the existing energy infrastructure to absorb new offshore energy supplies;
5. Evaluate regulatory requirements pertaining to subsea pipelines and the determination of public necessity and convenience as it relates to the Ocean Sanctuaries Act;
6. The incorporation of the revised Ocean Management Plan into the Massachusetts Coastal Management Program as a revised legal authority.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

Medium. With the promulgation of a comprehensive Ocean Management Plan governing the siting of offshore renewable energy facilities, a significant gap in the state's overall legal framework

for managing development of energy facilities in the coastal zone has been filled. As described above, filling in the data gaps/needs identified in the Science Framework which may affect the siting of energy and government facilities in the coastal zone is a priority task of the Ocean Management Plan. CZM also has an increased role in siting decisions through the Ocean Management Plan, particularly in the offshore energy arena, and will continue to develop that capability.

2. Will the CMP develop one or more strategies for this enhancement area?

Yes. The rapidly changing state of technological development as it relates to offshore energy (wind, tidal, wave) demands that strategies for dealing with these changes be developed. As stated earlier, these strategies must evaluate siting, resource impacts, and regulatory adaptations to accommodate and guide the increased interest in providing renewable energy to the state.

I. Aquaculture

Section 309 Enhancement Objective

Adoption of procedures and policies to evaluate and facilitate the siting of public and private aquaculture facilities in the coastal zone, which will enable the State to formulate, administer, and implement strategic plans for marine aquaculture.

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

1. Generally characterize the private and public aquaculture facilities currently operating in your state or territory

Type of existing aquaculture facility	Describe recent trends	Describe associated impacts or use conflicts
Shellfish	In the years 2001-2007, shellfish aquaculture occurred in 17 to 20 coastal communities. Six species of shellfish were grown. The growers produced 42,831 bushels in 2001 valued at approximately 3.6 million dollars. In 2007, production increased to almost 74,000 bushels that were harvested at a value over 6.2 million dollars. Over time production has consolidated with over 90 percent of the crop being American oyster and little neck quahogs and production from the state coming predominately from 3 communities Wellfleet, Duxbury and Barnstable.	Impacts to water quality are the one of the major threats to the industry. Large precipitation events causing road run-off and sewage/septic overflows impact water quality. Land development and marina and mooring field expansions adversely impact water quality. Marina and mooring field expansion compete directly with aquaculture for limited inshore space. Recent outbreaks of red tides have sometimes delayed harvest preventing growers from capitalizing on the best market prices. The crop has to be monitored for the constant threat from disease and the impacts of invasive species.

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for enhanced objective.

1. For each of the management categories below, indicate if the approach is employed by the state or territory and if significant changes have occurred since the last assessment.

Management categories	Employed by state/territory (Y or N)	Significant changes since last assessment (Y or N)	If significant change, funding source
Aquaculture regulations	Y	Y (a)	State funds

Management categories	Employed by state/territory (Y or N)	Significant changes since last assessment (Y or N)	If significant change, funding source
Aquaculture policies	Y	N	N/A
Aquaculture program guidance	Y	N	N/A
Research, assessment, monitoring	Y	N	N/A
Mapping	Y	N	N/A
Aquaculture education & outreach	Y	N	N/A
Other (please specify)	N	N	N/A

2. For significant changes since the 2005 assessment, characterize the change; specify whether it was a 309 or other CZM driven change, and specify the funding source; and characterize the outcomes and effectiveness of the changes.

2-a. Aquaculture Regulations

Promulgated in 2007 by DMF, the purpose of the Massachusetts aquaculture regulations [322 CMR 15.00] is to establish a procedural and legal framework for marine aquaculture, including the possession, propagation, culture, sale and disposition of living marine organisms. The purposes of the regulations are to regulate the possession, transport, and sale of marine organisms for purposes of aquaculture; to establish operational guidelines for aquaculture facilities; to establish aquaculture license categories and procedures; and to provide a code of conduct for responsible marine aquaculture in the territorial waters of Massachusetts. It is intended that this regulation will facilitate the development of a viable marine aquaculture industry, while protecting wild populations of marine organisms and their natural habitat from degradation or introduction of invasive aquatic species, parasites or diseases. CZM was not involved in this effort.

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the CMP and partners (not limited to those items to be addressed through the Section 309 Strategy). If necessary, additional narrative can be provided below to describe major gaps or needs.

Gap or need description	Type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of priority (H,M,L)
Disease Monitoring	Data	M
Project Review	Regulatory	M

As the industry consolidates its growing efforts into two species of shellfish, little neck quahogs and American oyster, monitoring of diseases affecting these species and its occurrence in the environs becomes a priority crop protection mechanism. There are many shellfish disease transmission vectors for example the use of uncertified seed stock and movement of live shellfish from know

disease harboring environments. Monitoring the use of the shellfish from disease prone areas, monitoring the occurrence of known diseases affecting these species and the distribution of the information resulting from this monitoring to state and local resource managers and shellfish farmers is critical to the protection of their crop.

An essential ingredient of shellfish aquaculture is clean overlying waters. Project review by shellfish biologist that know the implications and impacts of projects on water quality is essential to keep aquaculture water clean and free from alteration that cause water quality degradation.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

Low. Shellfish aquaculture that occurs in Massachusetts is a maturing industry that is consolidating on two species and largely concentrated in three coastal communities. Broadening the industry into additional species or geographical extent is difficult due to expenses, existing uses and water quality issues.

2. Will the CMP develop one or more strategies for this enhancement area?

No. The priority level for this enhancement area remains low; therefore, no Strategy is proposed.

IV. Strategy

A. Wetlands

As described in the Assessment, one of the high priority needs and information gaps for the Wetlands enhancement area includes an improved understanding and quantification of the effects of sea level rise on coastal habitats in order to improve implementation of CZM policies and their underlying legal authorities including Wetlands Protection Act and regulations.

Project 1: Estuarine Wetlands Habitats at Risk from Sea Level Rise

Issue Area(s)

The proposed strategy or implementation activities will primarily support the priority Wetlands enhancement area. It will also further efforts under the Coastal Hazards enhancement area.

Program Change Description

The proposed strategy will result in, or implement, the following type(s) of program changes*:*

- New or revised guidelines, procedures and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government and other agencies that will result in meaningful improvements in coastal resource management.

This project will develop procedures on the use of existing wetland resource area, land use, land cover, topographic, and other data within predictive models and mapping tools to identify those coastal and estuarine wetland habitats that are most at risk from the effects of sea level rise. The information generated by this procedural guidance will improve implementation of CZM Habitat Policies (#1 and 2) and Coastal Hazards Policies (#1, 2, 3 and 4) and their underlying legal authorities including especially Wetlands Protection Act and regulations.

These guidelines will enable CZM and its networked agencies to improve implementation of policies and performance standards to better interpret threats from sea level rise and to protect critical coastal wetlands through the identification of specific locations where losses or changes in habitat type and extent are predicted to occur. The information from this model will be formally adopted as procedural guidance by CZM and used by CZM and other state agencies and local Conservation Commissions to assist their regulatory decision making.

Need(s) and Gap(s) Addressed

The assessment identifies a data and information gap pertaining to the improved understanding of the potential effects of sea level rise on coastal wetlands habitat loss and changes. This project will directly address that need by increasing the knowledge base and predictive capacity and developing procedural guidance for examining potential impacts and identifying those habitats most at risk.

Benefit(s) to Coastal Management

A major impediment towards effectively addressing the threats of sea level rise on estuarine habitats is our ability to more accurately identify the resources at risk and to understand the possible effects on and changes to these different habitat types. This project will provide the model and the data to better predict anticipated changes and, in turn, support enhanced interpretation of CZM policies and networked authorities as well as related planning and management efforts. For example, by identifying locations where there are no barriers or constraints posed by existing natural and built conditions to the natural landward migration of critical estuarine wetlands habitats in response to sea level rise, regulatory decision makers during review of permits or requests for authorization can use this information to inform such actions as:

- a finding that the buffer zone contributes to specific statutory interests such as flood control, storm damage prevention, protection of fisheries, and protection of wildlife habitat;
- interpretation and implementation of specific performance standards to prevent adverse impacts to wetlands resources areas; and
- establishment of conditions that limit area of development/work, preservation of natural vegetation, and other design limits or modifications.

Similarly, the information generated through this project will also support other important management efforts such as identification of priority restoration areas or sites for land acquisition or easement actions.

Likelihood of Success

The likelihood of success is high. With the delivery of the Northeast LIDAR data, most of the data will exist and be readily accessible and useable, and there are strong capabilities to fill any data gaps. CZM and its partners have high caliber wetlands and GIS personnel with extensive estuarine ecosystem and regulatory experience. By using a selected pilot area to develop the procedures and methodologies, we ensure that this project will be feasible, manageable, and that adequate time and resources are planned for. The increasing recognition of the threats of a rising sea to critical coastal habitats has led to widespread concern among government agencies, local officials, and citizens regarding a relatively urgent need to explore, identify, and begin implementation of options for adaptation. This project provides the necessary predictive tool to provide the critical information that is needed to support better implementation of policies and authorities as well as planning and management. CZM will work with partners to develop specific approaches for implementation efforts.

Work Plan

Tasks for this project of Wetlands Strategy are:

1. Acquisition and compilation of data

A project study area for the development of a pilot sea level rise risk assessment model for estuarine habitats will be selected based on availability of data and information; partners and local community

interest and participation; extent of estuarine habitat; and range of developed land use. The data required to develop this model include: (1) high resolution elevation, (2) water (or tide height) elevation, (3) habitat types and extent, (4) land use and land cover, (5) infrastructure, and (6) relative sea level rise rates.

For the elevation, Light Detection and Ranging (lidar) data—such as that generated by various surveys, including the 2010 data from the survey supported by American Reinvestment and Recovery Act (ARRA) funds with "buy-ups" from the state and federal agencies—will serve as the basis for the terrestrial elevation component. For the tide height data, the Coastal Oceanographic Applications and Services of Tides and Lakes within NOAA's Center for Operational Oceanographic Products and Services (CO-OPS) will be approached as a partner for their advice and ideally assistance in establishing water-level stations with local benchmarks. Funds are included for the installation and referencing to geodetic datum of up to 5 pressure transducer type water level loggers. For the habitat type and extent, existing mapping efforts (DEP Wetlands Conservancy and USFWS National Wetlands Inventory) will be combined with recent imagery and lidar data to produce as accurate maps as possible. The location of bulkheads and other structural restrictions to marsh migration will be identified using aerial photographs and then field verified. Relative sea level rise rates and scenarios will be obtained from CO-OPS stations, other available data sources that may include marsh accretion rates, and relevant current literature.

2. Methodology and Model Development

Data layers will be combined and analyzed to identify and rank current conditions in terms of coastal wetlands vulnerability to sea-level rise and ability to respond by accreting vertically and upslope to keep pace with increasing sea level. Next, using current relative sea level rise rates and predictions for future rise, scenarios will be run for various time sequences (e.g., ~ 10, 20, 50, and 100 years). The model output will show graphically the baseline run of a mean tidal cycle and then show changes predicted from the various time sequences, which would include many possibilities: inter-tidal areas becoming sub-tidal, upland areas becoming inter-tidal, areas where landward migration is possible and areas where barriers (both natural and human) prevent landward migration, and possibly changes in habitat type (high marsh becomes low marsh).

3. Map Products

Maps will be developed from the model and will be made available to local and state officials in an appropriate format, hard copy, CD, or both. The map data will also be imported into the Massachusetts Ocean Resources Information System to allow the public to access and use the data. This approach will allow for any future improvements and/or changes to the maps.

4. Procedural Guidance

A guidance document will be developed that details the procedures and methods in a step-by-step format. The guidance will also explain the types of outputs possible and provide recommendations as to best types of maps and information for different applications. The document will report the

process and outcomes of the project.

4. Communication and technology transfer
Working with partners, CZM staff will conduct outreach on the use of the technical guidance and maps for regulatory and other purposes. At a minimum, a regional workshop for state and local officials will be provided. For greatest effectiveness and to aid in the local use of the information, one-on-one technical assistance will be provided directly to wetland resource area decision-makers during map distribution in coordination with efforts of CZM's StormSmart Coasts program.

Total Years: 5
Total Budget: $333,000
Final Outcome(s) and Products: Developed model with output capability, maps, scenarios

Year: 1
Description of activities: Data acquisition and compilation; start methodology and model development
Outcome(s): Data compiled; methodology and model underway
Budget: $78,000

Year: 2-3
Description of activities: Run model and develop maps and information outputs; method and model adjustments
Outcome(s): Methodology and model operational; maps and information output identifying and ranking coastal wetlands vulnerability to relative sea-level rise
Budget: $156,000 ($78,000/year)

Year: 4
Description of activities: Development of procedural guidance document that details process to identify at-risk habitats and endorses effective adaptation practices and approaches.
Outcome(s): Guidance document completed
Budget: $57,000

Year: 5
Description of Activities:, workshops for local officials, and hands-on technical assistance.
Outcome: Final guidance document formally adopted by CZM; wetland resource decision-makers understand the mapped products and begin to incorporate sea level rise information into habitat protection efforts.
Budget: $42,000

Fiscal and Technical Needs

Fiscal Needs: 309 resources are anticipated to be sufficient.

Technical Needs: CZM would seek technical assistance and collaboration with NOAA (CO-OPS) or other similar expertise on tide measurement and reference datum.

B. Coastal Hazards

As described in the Assessment, one of the high priority needs and information gaps for the Coastal Hazards enhancement area includes an improved understanding and quantification of the effects of climate change, particularly sea level rise, on coastal hazard impacts to natural resources and communities. This enhancement strategy includes a project developed to improve the state's management efforts in the coastal hazards enhancement area through the development of formal guidelines and procedures. The project expands CZM's nationally recognized StormSmart Coasts toolkit to include new procedures to analyze risk and vulnerability to climate change impacts on the coast and develops guidance on current and innovative techniques to reduce coastal hazards risk and impacts by improving implementation of policies and authorities, including regulations, performance standards, and best management practices.

Project 1: Expanding StormSmart Coasts: Assessing and Reducing Risk from Climate Change on the Coast

Issue Area

The proposed strategy or implementation activities will support the priority Coastal Hazards enhancement area.

Program Change Description

The proposed strategy will result in, or implement, the following type(s) of program changes*:*

- New or revised guidelines, procedures and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government and other agencies that will result in meaningful improvements in coastal resource management.

As described above, there are specific information needs and policy gaps that affect the Commonwealth's ability to preserve and restore the protective functions of natural shoreline features such as beaches, dunes and wetlands, to prevent development in hazard prone areas, and to manage existing development in these at-risk areas. The program change under this strategy will be the development of new guidance and procedures for implementing coastal program policies and legal authorities to protect sensitive coastal resources and their ability to provide storm damage and flood control protection to landward areas and to manage development in high-risk and hazard-prone areas with consideration to the changes in coastal conditions (e.g., sea level, erosion rates, flood and surge zones) driven by climate change. The project described below will address these needs by generating new procedures and guidelines to enhance implementation of Coastal Hazards Policies (#1, 2, 3 and 4) and networked authorities such as Wetlands Protection Act regulations and building code standards, which in turn will result in meaningful improvement in coastal hazard management.

Need(s) and Gap(s) Addressed

The 78 coastal communities in Massachusetts are vulnerable to the damaging impacts of major storms, along more than 1,500 miles of varied coastline. These storms have devastating consequences, potentially resulting in loss of life, extensive property damage, destruction of public infrastructure, and environmental impacts—all compounded by a changing climate. During the planning and implementation of the first two phases of StormSmart Coasts, it became evident that additional shoreline change, flooding, storm damage, inundation and other technical data together with an exploration of management approaches is needed to more effectively implement existing authorities and address the challenges anticipated with climate change and sea level rise. By filling the key science and technology gaps—such as improved mapping of high-risk areas including floodplains, storm surge zones, and high erosion areas—the Commonwealth will better understand the risks and vulnerabilities associated with climate change, and therefore, can improve its ability to provide "actionable" strategies and approaches for coastal decision makers.

Benefit(s) to Coastal Management

An expanded StormSmart Coasts toolkit will bring much-needed information and guidance to state and local officials engaged in regulatory decision making as well as hazard mitigation and response planning. Addressing key knowledge and technological gaps to identify and predict risk to both the built environment and natural resource areas is a priority. By conducting risk and vulnerability assessments, policies and management actions can be adapted to changing conditions.

Likelihood of Success

In 2008, the Massachusetts legislature passed the state's Global Warming Solutions Act. As per Act requirements, the Secretary of EEA convened a Climate Change Adaptation Advisory Committee in 2009 "to analyze strategies for adapting to the predicted impacts of climate change in the Commonwealth." The Coastal Zone and Ocean Subcommittee recommended further, detailed examination of regulatory and other options to reduce risk to coastal infrastructure and resources through existing and new authorities and approaches. CZM has demonstrated a high rate of success working and partnering with local, state, and federal agencies to conduct such work. Through StormSmart Coasts, CZM has advanced efforts to improve management of coastal shorelines and floodplains through regulatory, planning, mapping, and outreach tools to reduce storm impacts to public safety and economic, recreation, and natural resources. Furthermore, the core of our CZ program is our regional coordinators who build trust and maintain momentum in the coastal cities and towns. As a result, we are considered a part of the community – a support system that looks out for their best interests. Currently, our agency has taken the lead in state government to address municipal and state coastal climate change adaptation challenges. We are aggressive in responding to this critical coastal concern.

Work Plan

Tasks for this project of the Coastal Hazards strategy are:

1. Acquisition and compilation of data and information

The primary data and information required to assess current and future risk due to coastal hazards include: shorelines and change rates, shoreline stabilization structures, flood profiles and zones, extreme surge estimates, local storm damage claims and reports, and areas of inundation due to sea-level rise. The state inventory of publically owned or managed shoreline stabilization structures that was completed in 2008 will be used with the most recent shoreline change rates and flood zones to assess erosion and flood risk to inshore structures and residences. A 2008-2009 shoreline and updated rates of change will be added to the MA Shoreline Change Project in 2010-2011 through an agreement with the U.S. Geological Survey. The location and extent of coastal storm damage will be informed by National Flood Insurance Program claims as well as state and local storm team reports that have been entered into *StormReporter*, CZM's online storm damage observation form and database. Sea level inundation and higher storm surges will be estimated using the 2010 LIDAR data as described in the Wetlands project. In addition to data coverage, development patterns and local partners will determine the extent of the risk and vulnerability assessment.

2. Risk and vulnerability assessment; development of map and visualization products

Data layers will be combined and analyzed to identify and rank current risk and vulnerability to the following coastal hazards: inundation, storm surge, and erosion. Using current relative sea level rise rates and predictions for future rise, scenarios will be run for various time sequences (e.g., 20, 50, and 100 years). Maps will be developed from the model and will be made available to local and state officials in an appropriate format, hard copy, CD, or both. The map data will also be imported into the Massachusetts Ocean Resources Information System to allow the public to access and use the data. This approach will allow for any future improvements and/or changes to the maps.

3. Analysis of current and innovative practices, approaches, and standards; recommendations for implementation within existing authorities

Assess local application of current practices and approaches such as beach nourishment, beach scraping, bank and dune armoring or restoration, and other coastal engineering solutions such geo-tubes and groins, and analyze and evaluate new practices and approaches such as green infrastructure, shoreline rolling easements including the transfer of development rights for relocation of development, and others. Develop recommendations for implementation through state and local policies and regulatory authorities.

4. Adaptation guidelines

Develop guidance for local officials and regional planners that details the procedures and methods in a step-by-step format to examine certain aspects of risk and vulnerability in coastal settings and presents guidelines for implementing effective adaptation practices and approaches. The document will report the process and outcomes of the project.

5. Communication and technology transfer

Working with partners, CZM staff will conduct outreach on the use of the technical guidance and

maps for regulatory and other purposes. At a minimum, a regional workshop for state and local officials will be provided. For greatest effectiveness and to aid in the local use of the information, one-on-one technical assistance will be provided directly to wetland resource area decision-makers during map distribution in coordination with efforts of CZM's StormSmart Coasts program.

Total Years: 5
Total Budget: $382,000
Final Outcome(s) and Products: Coastal hazards risk assessments with climate impact scenarios; technical procedures including critical data, information and mapping components; best practice approaches guidance; modernized and improved CZM information systems with key data and assessments; recommendations for implementing effective adaptation practices and approaches through enforceable policies and networked regulations and land use tools; workshop(s) and hands-on technical assistance.

Year: 1-2
Description of activities: Data acquisition and compilation; risk and vulnerability assessments; analysis of current and innovative practices, approaches, and standards and recommendations for implementation within existing authorities.
Outcome(s): Data compiled; risk and vulnerability assessment methodology, maps and results completed; existing and innovative measures inventoried
Budget: $92,000/year

Year: 3-4
Description of activities: Develop guidance that details hazard risk assessment procedures and methods and endorses effective adaptation practices and approaches.
Outcome(s): Guidance document completed
Budget: $78,000/year

Year: 5
Description of Activities: Communication and technology transfer; workshop(s) for hazard decision-makers and hands-on technical assistance.
Outcome: Final guidelines document formally adopted by CZM; coastal hazards decision-makers understand assessments and products and begin to incorporate into hazard risk reduction efforts.
Budget: $42,000

Fiscal and Technical Needs

Fiscal Needs: 309 resources are anticipated to be supplemented by additional support from other federal or state sources or with regional planning agencies.

Technical Needs: CZM will seek additional expertise in climate change impact forecasts, land use planning, and coastal engineering.

C. Public Access

The access enhancement strategy for 2010 consists of a project to continue CZM's longstanding efforts to promote the creation of "coastal trails" as a complement to the state's ongoing (though now very limited) coastal land acquisition programs. CZM believes that substantial expansion of coastal access can be achieved in ways do not require public ownership of waterfront land or spending on recreational facilities. The alternative is to strategically acquire easements and other new rights-of-way across private shorefront properties in order to knit together a series of otherwise isolated existing pathways into a well-connected pedestrian network, with points of origination located at public recreation sites or at locations where parking or public transportation is available. The authority to do so is an established part of CZM's existing program policies, particularly under M.G.L. c.132A, secs. 1&3 (SeaPath Program) and M.G.L c.91 (Waterways Regulation Program). CZM's role in this coastal access program has been to provide technical assistance to other state agencies and municipalities who work to expand shorefront trail facilities, both by acquisition of public property rights and by regulating private development of waterfront sites to ensure the water's edge will be available for public use and enjoyment.

Project 1: Improve Application of FPA Requirements

Issue Area(s)

The proposed strategy or implementation activities will support the priority Public Access enhancement area.

Program Change Description

The proposed strategy will result in, or implement, the following type(s) of program changes*:*

- New or revised guidelines, procedures and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government and other agencies that will result in meaningful improvements in coastal resource management.

The proposed project will result in the formal adoption of guidelines for interpretation and application of enforceable Public Access Policy #1 (as updated in the pending CZM Policy Guide) to more completely reflect the substantive provisions of implementing regulations for the Public Waterfront Act (M.G.L. Chapter 91 or "c. 91"). As discussed in the Assessment section, although Massachusetts has progressive laws and regulations to promote public access, improvement is needed in the implementation of these existing legal authorities. The c.91 regulations were incorporated into the Coastal Program in 1991 and include numerous provisions governing public access benefits to be provided by projects seeking a license to develop on both flowed and filled tidelands. Large extents of such tidelands exist in the Boston Harbor area, and it is here that development pressure is greatest and challenges to effective application of these public access requirements are most acute. Although the Assessment section discusses difficulties relating to the

provision of both exterior and interior access facilities, this project will focus on requirements for year-round facilities of public accommodation required within the ground-floor spaces of new nonwater -dependent buildings with harbor frontage. The goals of the project are: (1) to assess the effectiveness of current regulatory practice and underlying policy and (2) take appropriate steps to improve implementation of public access-related benefits.

The public access improvement project will include the following components: (1) compile existing documentation; (2) conduct analysis and perform field inspections; and (3) develop and adopt guidelines for improved application of existing regulatory requirements and/or appropriate elaboration or clarification of underlying policy. The data collection effort will include the compilation of existing licenses, permits, and other applicable documentation from available sources including the CZM program files, DEP's Waterways Regulation Program files and other sources as necessary. We will also assemble existing public access studies done by The Boston Harbor Association, Boston Redevelopment Authority, Worcester Polytechnic Institute and others as appropriate. Field visits will be performed as necessary to verify the status of as-built interior public access requirements. After collecting all available data, an electronic database will be created to record and track interior public access requirements.

A thorough analysis of the existing regulatory requirements and verification of the as-built conditions will help determine project compliance. In our review, however, we are hoping to do more than just determine whether or not projects are meeting their interior public access requirements. We also want to determine the reasons why projects may not be meeting this requirement. Finally, we intend to explore the need to develop organizational capacity to create a Facilities of Public Accommodation clearinghouse that would help match civic/cultural users with interior waterfront space. Overall, this assessment should reveal trends or recurring issues that will enable us to adopt guidelines for improved regulatory practice and/or policy interpretations that will more effectively serve the public's interest.

Need(s) and Gap(s) Addressed

The project will address a long-standing implementation and compliance issues relating to the provision of interior public access in Boston Harbor. The need for the project is great and the timing is appropriate given the present economic climate and current amount of development interest along the waterfront.

Benefit(s) to Coastal Management

The anticipated benefit of the FPA project is to improve implementation of existing regulation to provide more meaningful interior public access. Additionally, by addressing interior public access issues, there will be an opportunity to address connectivity to existing exterior open spaces. More effective implementation of public access requirements will lead to improved pedestrian connections that will improve the public's experience of and accessibility to the waterfront.

Likelihood of Success

Support for the project would come from both the regulators and regulated community who acknowledge the need to address this issue. Harbor advocacy organizations, such as The Boston Harbor Association and the Conservation Law Foundation in particular, are actively involved in projects and planning efforts along the waterfront. These organizations have played an active role in promoting interior public access in private developments along Boston Harbor, and are expected to endorse this project and be actively involved.

Work Plan

Total Years: 2
Total Budget: $99,000
Final Outcome(s) and Products: Formally adopted regulatory and/or policy guidelines for improved implementation of interior FPA requirements, based on a comprehensive inventory of permit documentation relating to Boston Harbor waterfront projects under M.G.L. c.91 since 1984. "White Paper" report to assess factors determining compliance and to identify potential measures for improvement.

Year: 1
Description of activities: Conduct inventory of interior public access requirements in Boston Harbor by performing research and field investigations. Review of existing permit and plan requirements against as-built conditions.
Outcome(s): Creation of electronic database and hard-copy library that inventories interior public access requirements. Relevant licenses, permits, plans, etc. will be scanned and converted into an electronic format. Prepare draft "white paper" for discussion of potential measures to improve regulatory practice and/or underlying policy.
Budget: $57,000

Year: 2
Description of activities: Update public access database as needed. Carry out targeted public outreach to obtain feedback on white paper. Prepare recommended guidelines document for vetting within CZM, EEA, and DEP.
Outcome(s): Adopted guidelines for improved regulatory practice and/or policy interpretations.
Budget: $42,000

Fiscal and Technical Needs

Fiscal Needs: 309 resources are anticipated to be sufficient.

Technical Needs: CZM staff currently have sufficient technical knowledge and skills necessary to carry out the proposed project in-house.

D. Cumulative and Secondary Impacts

The Cumulative and Secondary Impacts (CSI) enhancement strategy for 2010 consists of a project that seeks to enhance the Massachusetts Ocean Management Plan by developing tools which serve to integrate sources of cumulative and secondary impact in the ocean environment and to identify those areas that are especially prone, vulnerable, or experiencing high levels of CSI. Based on this information, updates or amendments to the Massachusetts Ocean Management Plan will be made to refine the delineation and management of designated "special, sensitive or unique" natural resources.

Project 1: Incorporating marine habitat mapping into cumulative effects analysis

Issue Areas

The proposed strategy will support the priority Cumulative and Secondary Impacts enhancement area. It will also further efforts under the Ocean/Great Lakes Resources and Special Area Management Planning enhancement areas.

Program Change Description

The proposed strategy will result in, or implement, the following type(s) of program changes*:*

- New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding

The proposed strategy seeks to improve management and protection of marine habitat (e.g., "special, sensitive, or unique estuarine and marine life and habitat" as defined on the Ocean Act and Massachusetts Ocean Management Plan) through the development and utilization of innovative tools to identify, measure, and map cumulative impacts. The strategy proposed here would refine the "special, sensitive, or unique" (SSU) areas, identify new data sources, and ultimately produce more accurate and detailed habitat maps and SSU delineations that incorporate the understanding of cumulative effects. These improvements will be the basis for subsequent map and performance standards updates or amendments to the Massachusetts Ocean Plan and coastal program change.

Need(s) and Gap(s) Addressed

As described in the Assessment, development of the Massachusetts Ocean Management Plan included consideration of a cumulative effects model designed by the National Center for Ecological Analysis and Synthesis (NCEAS). This model combines maps of marine habitats with an assessment of the vulnerability of these habitats to produce maps indicating spatial differences in cumulative effect. The strategy described below will develop the information and data analysis methods necessary to understand the mechanics of this model, refine the marine habitat maps and information as model inputs, and re-run the model to produce updated and higher resolution cumulative effects assessment and maps.

The Ocean Management Plan identifies consideration of cumulative effects, as well as development

of high resolution marine habitat maps, as priority topics in the Science Framework. A particular component of this effort, the development of marine habitat maps, is a long-standing CZM priority, as evidenced by previous 309 Assessment and Strategy documents and the Seafloor Mapping Cooperative begun with the US Geological Survey in 2003 (which extends through 2013). CZM has acquired much of the knowledge (from theory to application of specific data sets) necessary to develop marine habitat maps.

Benefit(s) to Coastal Management

Consideration of cumulative effects is a difficult topic to address in the marine environment, and application of the NCEAS model will assist CZM and the Commonwealth in efforts to understand and apply consideration of cumulative effects to resource management decision-making. Creating and ground-truthing the seafloor habitat maps will allow coastal decision-makers and managers to determine the spatial and temporal extent of marine habitats in Massachusetts waters to apply in the cumulative effects model, as well as for other management uses. Finally, this strategy will help the Commonwealth address the Ocean Act's requirement to identify "special, sensitive, or unique" habitats. The strategy proposed here would refine these areas, identify new data sources, and ultimately produce more accurate and detailed habitat maps and understanding of cumulative effects that can be used for coastal management and could be the basis for subsequent updates to the Massachusetts Ocean Plan and coastal program change.

Likelihood of Success

As described previously, the Science Framework portion of the Massachusetts Ocean Management Plan identifies both consideration of cumulative effects and development of habitat maps as priority items for pursuit during the next five years. CZM is generally familiar with the NCEAS cumulative effects model as a result of the development of the Ocean Management Plan; developing the necessary understanding of the model to facilitate its future application should not be difficult.

The seafloor mapping work proposed through this project builds upon the Seafloor Mapping Program partnership between CZM and U.S. Geological Survey (USGS) that began in 2003. The partnership has delivered high resolution bathymetric and surficial sediment data for roughly 50% of Massachusetts' seafloor and will continue through a Joint Funding Agreement through 2013. As described previously, development of habitat maps is a fundamental aspect of the model, and this has been a long-standing CZM priority. CZM is building upon this work to develop new cooperative relationships, working closely with, and sometimes using the services of, researchers from Woods Hole Oceanographic Institution (e.g., using videographic methods for seafloor characterization and data collected in Massachusetts), USGS (e.g., physiographic zone delineation, benthic shear stress analysis), the Massachusetts Ocean Partnership, UMass Dartmouth (e.g., a model providing oceanographic information through 15-year hydrodynamic hindcast), and others. CZM intends to implement a form of NOAA's Coastal and Marine Ecological Classification Standard (CMECS) to help us catalog the various seafloor habitats and ensure that a common "language" is used to describe these habitats.

Work Plan

Total Years: 5
Total Budget: $397,000
Final Outcome(s) and Products: New data and information characterizing marine habitat and stressors; updated habitat classification and maps; improved understanding of cumulative effects on marine habitat and species; and revised Ocean Management Plan maps and performance standards for SSU resources.

Year: 1
Description of activities: Develop operational understanding of cumulative impacts model; to facilitate its future application; assess model's current identification and treatment of marine habitats, analysis of vulnerability, and outputs indicating spatial differences in cumulative effect; begin development of additional data inputs.
Outcome: Level of CZM understanding of the cumulative effects model that is sufficient to enable CZM staff to use the model internally and to revise the model with updated habitat map information.
Budget: $78,000

Years: 2–3
Description of activities: Development of additional data materials (topography, backscatter intensity, and physiographic zone delineation; physical oceanographic processes; benthic shear stress models; and ocean color/light penetration data/model results); analysis, integration, and production of habitat classification maps; ground-truthing of mapped habitat types for select areas.
Outcome: New data and information characterizing marine habitat and stressors; revised habitat maps suitable for use in the cumulative effects model.
Budget: $184,000 ($92,000/year)

Years: 4
Description of activities: Incorporate revised marine habitat maps into cumulative effects model; re-application of cumulative effects model through solicitation of expert opinion regarding habitat vulnerability to particular human activities; incorporation of other updated data as appropriate (e.g., regarding spatial footprint of human activities); refinement of SSU resource delineations through improved understanding of vulnerability and stressors; development of new performance standards as necessary/appropriate.
Outcome: Updated NCEAS model results indicating spatial extent of cumulative effects; refined SSU resource area maps; draft performance standards.
Budget: $78,000

Year: 5
Description of activities: Implementation of Ocean Management Plan updates/amendments, public review process, Ocean Advisory Commission/Science Advisory Council process; incorporation of Ocean Management Plan amendments into CZM program

Outcome(s): Ocean management plan amendments completed; ocean management plan updates/amendments included as part of approved coastal program
Budget: $57,000

Fiscal and Technical Needs

Fiscal Needs: 309 resources are anticipated to be supplemented by additional support from other federal, state, or NGO sources.

Technical Needs: CZM's technical and policy capacities would be supported by other states, federal agencies, and regional organizations.

Note: The Ocean Resources section describes the fiscal and technical needs necessary to update the Ocean Management Plan, as well as a description of the related tasks and budgetary detail.

E. Special Area Management Planning

As described in the Assessment, CZM has identified two particular DPA-related issues in this area for which an enhancement strategy will be developed. The Designated Port Area program has been the subject of extensive review in recent years, and CZM will build upon that work to address the primary gaps remaining in that program. The proposed project in this program area is described below.

Project 1: Designated Port Area Inventory and Outreach

Issue Area(s)

The proposed strategy or implementation activities will support the priority Special Area Management Planning enhancement area.

Program Change Description

The proposed strategy will result in, or implement, the following type(s) of program changes*:*

- New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding that will improve a State's ability to achieve one or more of the enhancement objectives.
- New or revised guidelines, procedures and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government and other agencies that will result in meaningful improvements in coastal resource management.

The proposed project will result in appropriate modifications to official DPA boundaries in one or more port cities, with the number and sequence of boundary reviews to be based on information assembled through a comprehensive inventory of DPA infrastructure, uses, and other port resources. DPA boundaries are codified in state regulation and any change thereto is a rulemaking exercise that results in revisions to underlying authorities of the CZM Program (specifically, 301 CMR 25.00). A second key outcome of the project will be the preparation and dissemination of guidance materials on options for flexibility within existing regulatory standards and economic incentives that encourage compatible use diversification on DPA properties, an important element of enforceable CZM Ports Policy #3. Such materials will be formally adopted by CZM and published on the CZM website and other appropriate media.

Corresponding to these anticipated program changes, the 309 enhancement project will consist of the following two tasks that will be carried out more or less concurrently.

Task A: Inventory of DPA Assets and Associated Review of DPA Designations

As discussed in the Assessment section, although it is widely recognized that Massachusetts' port facilities are critical to the Commonwealth's economy, there is currently no comprehensive inventory that documents the physical condition and operational characteristics of the existing Designated Port Areas. The goal of this task is to provide a better understanding of current uses, infrastructure, and other port resources which will enable CZM, at a minimum, to revisit selected DPA designations as well as to develop targeted outreach materials providing development guidance to DPA occupants (see also Task B, below). In addition to these immediate program changes, the project will provide a solid base of information in support of future policy and regulatory updates to the existing Designated Port Area program, and will be helpful to DPA municipalities where land use planning should be consistent with DPA interests and other state coastal policies (such as consideration of port-related consequences of climate change).

The task will begin with a review of similar inventory projects completed by other states (such as Rhode Island, California and Florida) to help refine the proposed data collection methodology. This will be followed by field testing of the methodology in two port cities: New Bedford and Gloucester. This initial (pilot) phase of work will include the compilation of existing information on land use trends, types of industries, vacancy rates, deep water access, and characteristics of landside and waterside infrastructure. The primary source of parcel-level data will be extensive contact with DPA property owners, to supplement the basic descriptive information ordinarily available from city assessing departments. Additional parcel-level data will be obtained from the Massachusetts Geographic Information System (MassGIS) and other sources as necessary. Additional related data sources may include recent Municipal Harbor Plans/DPA plans; the Massachusetts Technology Collaborative's recent report titled *Port and Infrastructure Analysis for Offshore Wind Energy Development*, which analyzed the existing condition of port infrastructure; and model results and LIDAR-based map products, generated by UMass-Boston and the City of Boston under CZM's StormSmart Coasts initiative which enable preliminary assessment of potential vulnerability to the effects of climate change (e.g. sea level rise and storm inundation). Most if not all information compiled for the inventory will be incorporated into CZM's centralized GIS database, the Massachusetts Ocean Resources Information System (MORIS).

As a key part of the inventory, CZM will compile information relating to the multiple criteria set forth in the DPA designation regulations (at 301 CMR 25.00). concerning the suitability of land and water areas to accommodate water-dependent industrial use. These metrics include adequate water depth and navigational access, existing maritime infrastructure such as piers and wharves, access to established transportation networks, and appropriate land use patterns. Upon examination of this information on an area-wide basis, CZM will establish priorities for modifying existing boundaries and will initiate formal proceedings to that effect in selected DPA communities. Any revised DPA designations resulting from this process will be submitted to OCRM as a program change, as appropriate.

Task B: Development of Guidance Documents on Regulatory Flexibility and Economic Incentives

As discussed in the Assessment section, investment in maritime infrastructure and operations will continue to pose a challenge in the coming years, especially to private operators. Large-scale, publicly owned or -supported maritime organizations typically have greater access to investment capital and professional planning/permitting resources to undertake costly rehabilitation of port infrastructure (e.g., Massport properties in Boston). Similarly, these entities have the ability to provide upgraded maritime facilities, subsidized lease arrangements and are often able to assist with on-going maintenance obligations such as dredging and seawall repairs. By contrast, private DPA landowners typically do not have this level of technical and financial support. Recognizing the hardships faced by such private businesses, the goals of this aspect of the strategy for DPA program enhancement are to improve CZM's capability to provide technical assistance on regulatory matters and to facilitate participation in existing economic incentive programs of other agencies (and consider the need for new incentives). This will ensure that all of the Commonwealth's port users have access to adequate resources to promote vibrant working waterfronts and will help these industries maintain their port infrastructure.

In past years CZM has taken three initial steps to provide greater technical assistance to private property owners in a DPA. The completed steps include: 1) commissioning a study of public sector economic incentive programs that currently offer financial assistance to maritime businesses; 2) preparing a fact sheet entitled "Waterways Regulations Governing DPA Development" that summarizes the various types of use diversification projects that are eligible for state licensing under M.G.L c.91, and includes a detailed technical appendix for computing the extent to which "supporting" commercial and industrial uses are allowable on a given DPA property; and 3) carrying out a pilot project of direct consultation with several maritime business owners in the Gloucester DPA who have a strong interest in diversifying the use mix on their waterfront properties. Approximately $66,000 of direct 309 funding was utilized during FY 2003-2005 in support of this initial work.

The next logical step in the progression of CZM's technical assistance effort is to update these existing materials and subject them to further vetting, both internally and with appropriate staff at DEP and then within the larger community of port users. The resulting materials will then be synthesized into a detailed reference manual to assist port operators in better understanding both the array of financial assistance programs and the regulatory opportunities/constraints affecting diversification projects to improve the overall economic vitality of their maritime ventures. This core guidance document would be produced both in hard copy and web-ready electronic format, and would also provide relevant context in the form of a concise overview of DPA policy and programmatic objectives. The final step would be to widely publicize the availability of the guidance document, beginning with a presentation at the first available meeting of the Seaport Council to garner the attention of a wide variety of port operators and officials in several communities. Beyond that, a mass mailing to all DPA property owners who contributed to or were otherwise identified through the inventory effort will be employed to reach an even wider audience.

It should be noted that the information gathered in the DPA Inventory component of this project (see Task A, above) will help inform the examination of technical and financial assistance issues by identifying the needs of specific port users. Additionally, with respect to economic incentives, CZM will conduct outreach with a diverse group of state and municipal agencies, such as the Boston Redevelopment Authority, New Bedford Harbor Development Commission, Seaport Advisory Council, and the Massachusetts Office of Business Development to discuss potential incentive programs at both the state and local levels. This review of prospective financial incentives will use as its starting point the findings of the 2004 report done by the Urban Harbors Institute at UMass Boston titled *Study of Economic Incentives for Designated Port Areas in Massachusetts*.

Need(s) and Gap(s) Addressed

The proposed strategy will directly address the two priority needs for enhancing the DPA Program, as identified in the Assessment section. With respect to the proposed inventory of DPA assets in particular, such an inventory has not been completed in many years, except for in certain municipal harbor plans, and never as a stand-alone product.

Benefit(s) to Coastal Management

This project will result in program changes centered on an improved information base and expanded outreach tools for the DPA program, and ultimately may lead to potential program changes regarding DPA incentives, boundaries, and/or regulations. This project will also result in planning-level information to help consider potential impacts resulting from climate change.

Likelihood of Success

This project has been an internal CZM goal for some time so the likelihood of success is high. CZM has recently been focusing on regulatory aspects of the DPA program, as described in the Assessment, and this strategy would build on this work. This project will also benefit from the active engagement of directly related local and state agencies as well as individual maritime businesses and property owners.

Work Plan

Total Years: 3
Total Budget: $177,000
Final Outcome(s) and Products: comprehensive inventory of DPA assets; modified DPA boundaries; formally adopted guidance document on regulatory flexibility and financial assistance for DPA development

Year: 1
Description of activities: Assess approaches to developing inventory methodology; develop inventory methodology; complete inventory in two pilot communities; map (using GIS) inventory results;

overlay inundation model results; update information on regulatory flexibility and economic incentives and draft integrated version of guidance document
Outcome(s): Completed inventory (database and GIS data) for pilot communities; complete draft of guidance document
Budget: $57,000

Year: 2
Description of activities: Expand inventory to cover all DPAs; obtain internal and external feedback on guidance document; develop options for providing additional incentives, discuss with local/state partners.
Outcome(s): Formal adoption of guidance document; completion of DPA inventory and "loading" into MORIS
Budget: $78,000

Year: 3
Description of Activities: Install guidance document on CZM web site and publicize availability of technical assistance; carry out DPA boundary reviews according to priorities established as a result of inventory work
Outcomes: Expanded DPA page on website; modification of selected DPA boundaries
Budget: $42,000

Fiscal and Technical Needs

Fiscal Needs: 309 resources are anticipated to be sufficient.

Technical Needs: CZM staff currently have sufficient technical knowledge and skills to carry out the majority of the proposed project in-house, although outside GIS consultant services may be necessary to some degree.

F. Ocean Resources

As described in the Assessment above, Ocean Resources continues to be a high priority enhancement area for CZM in several different contexts. From a regional context, CZM will continue to be involved in the Northeast Regional Ocean Council (NROC) and its efforts on coastal and marine spatial planning pursuant to the National Ocean Policy Framework. CZM will also continue to address program and policy issues related to sand and gravel extraction for beach nourishment and climate change effects on marine resources. CZM will also administer the Massachusetts Ocean Management Plan, including further development of plan updates and amendments stemming from these efforts.

Project 1: Advancing Coastal and Marine Spatial Planning in the Northeast Region

Issue Area(s)

The proposed strategy or implementation activities will support the priority Ocean Resources enhancement area. It will also further efforts under the Coastal Hazards, Cumulative and Secondary Impacts, Special Area Management Planning, and Energy Facility Siting enhancement areas.

Program Change Description

The proposed strategy will result in, or implement, the following type(s) of program changes:

- New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding.

The Marine Spatial Planning Framework prepared by the CEQ Ocean Policy Task Force envisions that states will sign Memoranda of Agreement to participate in the development of regional ocean plans. Massachusetts will participate in such regional ocean planning and partnerships through the Northeast Regional Ocean Council and a to-be-developed Regional Planning Body. Based on the preliminary work by NROC in developing a regional Coastal and Marine Spatial Planning (CMSP) process and because of the need to ensure compatibility between the regional and state ocean planning and policy efforts, the Northeast CMSP process will necessitate changes to the Massachusetts Ocean Management Plan. Such changes to the Massachusetts Ocean Management Plan would be submitted to OCRM as routine program change(s). In addition, NROC priority areas include other subjects (such as coastal hazards) that are also CZM priorities. Consequently, CZM will continue to participate in NROC to help address multiple issues.

Need(s) and Gap(s) Addressed

As described in the Assessment, CZM is actively working with NROC and the Gulf of Maine Council on regional ocean management issues. NROC will play a key role in the implementation of the CEQ's Interim Framework for Effective Coastal and Marine Spatial Planning. Massachusetts' participation in this regional ocean planning and policy initiative—and the associated workload—is anticipated to increase. A particular, unique need for CZM is to ensure that any such activity on a

regional, Northeast and/or Gulf of Maine-wide level is consistent with state efforts such as the Massachusetts Ocean Management Plan and will result in updates and/or amendments to the Massachusetts Ocean Management Plan. CZM will also be involved in the implementation of regional ocean plans, since—once developed—such plans may be implemented through CZM programs such as federal consistency.

Benefit(s) to Coastal Management

Participation in regional ocean governance activities has been a priority for CZM for several years in recognition of the regional nature of certain ocean resource issues and the benefit in coordinating with regional partners. The new National Ocean Policy recognizes the benefits of regional coordination and planning. Coordination of future regional ocean planning efforts with the Massachusetts Ocean Management Plan will be necessary to maximize consistency (and reduce potential conflict) between the two efforts. Finally, implementation of the CEQ Interim Framework is likely to be a national priority initiative for the foreseeable future .

Likelihood of Success

In general, ocean resource management remains a priority issue for CZM. CZM's long-standing history of active participation in regional forums, such as the Gulf of Maine Council since 1989, illustrates Massachusetts' dedication and commitment to regional governance mechanisms, anticipating success in continued efforts. With the recent completion of the Massachusetts Ocean Management Plan CZM is uniquely positioned to bring "lessons learned" to any such regional effort.

Work Plan

Several CZM staff are involved in NROC and will continue to play key roles in this regional body to ensure that the Commonwealth's perspectives are addressed in regional issues. The work plan below reflects current NROC thinking that development of a regional ocean plan will take approximately three years and once developed will need to be implemented through a partnership of the states and federal governments. As the development of the whole Northeast regional ocean planning framework is in its early stages, CZM may find it necessary to submit an amended 309 Strategy to ensure that appropriate projects and resources were available to support CZM staff efforts. This work plan includes budget information for ongoing NROC coordination.

Total Years: 5
Total Budget: $390,000
Final Outcome(s) and Products: Development and implementation of NROC CMSP framework; revised Massachusetts Ocean Management Plan and requisite program change; enhanced coordination, synchronization, and implementation of CZM policies and other state and federal ocean management activities.

Year: 1-3
Description of activities: Participation in NROC CMSP effort; development of regional ocean

management framework; planning process; and implementation of NROC work plans.
Outcome(s): CZM participates in and leads, as appropriate, development of regional Northeast CMSP effort; CZM assists in implementation of NROC work plans
Budget: $234,000 ($78,000/year)

Year: 4
Description of activities: Participation in NROC; implementation of NROC work plans; identification and development of necessary updates and/or amendments to or interpretive guidance of Massachusetts Ocean Management Plan and related enforceable policies.
Outcome(s): CZM participates in and leads, as appropriate, development of regional ocean management plan; CZM assists in implementation of NROC work plans; process started for amendments/updates/guidance to Massachusetts Ocean Management Plan and routine program change.
Budget: $78,000

Year: 5
Description of activities: Participation in NROC, implementation of regional ocean management plan and NROC work plans
Outcome(s): CZM participates in implementation of regional ocean management plan and NROC work plans; Massachusetts Ocean Management Plan amended/updated; coastal program change completed.
Budget: $78,000

Fiscal and Technical Needs

Fiscal Needs: 309 resources are anticipated to be complemented by other state and federal resources as well as resources from regional partners.

Technical Needs: CZM's technical and policy capacities would be supported by other states, federal agencies, and regional organizations.

Project 2: Ocean Management Plan and CZM Program Updates

Issue Area(s)

The proposed strategy or implementation activities will support the priority Ocean Resources enhancement area. It will also further efforts under the Coastal Hazards, Cumulative and Secondary Impacts, Special Area Management Planning, and Energy Facility Siting enhancement areas.

Program Change Description

The proposed strategy will result in, or implement, the following type(s) of program change:

- New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding.

The Oceans Act of 2008 required the development of the Ocean Management Plan and made changes to the existing Ocean Sanctuaries Act. Work is currently underway on regulatory revisions and implementing science framework priorities. In addition, future updates and amendments to the Ocean Management Plan (as required by the Oceans Act) are anticipated. This strategy covers those revisions including submittal of required documentation to OCRM to formally adopt such amendments into the CZM program.

Need(s) and Gap(s) Addressed

As described in the Assessment, the Oceans Act requires the Ocean Management Plan to be reviewed at least once every five years, envisioning that the Ocean Management Plan would evolve to incorporate science and data advances (for example, those underway to implement Science Framework priorities—see the Assessment). As elements of the Science Framework are completed, CZM will need to amend the Ocean Management Plan to incorporate the results of these studies. Additionally, the Oceans Act also requires that CZM formally adopt the Ocean Management Plan into the CZM program, which may result in revisions to CZM's enforceable policies. Additional CZM program changes may result from changes to other state regulatory programs (Chapter 91, the 401 Water Quality Certification program, MEPA) which are being developed to implement the Ocean Management Plan.

Benefit(s) to Coastal Management

The proposed program change will enable the implementation of the Ocean Management Plan through incorporation into CZM's federally approved Coastal Program. It will also enable CZM to incorporate future Ocean Management Plan changes as a result of completed science and data acquisition tasks (in response to the Ocean Management Plan's Science Framework).

Likelihood of Success

On behalf of EEA, CZM led the development of the recently promulgated Ocean Management Plan and has demonstrated the expertise and capacity to CZM to execute such endeavors. CZM is required by the Oceans Act to incorporate the Ocean Management Plan into the Massachusetts Coastal Program. CZM has been coordinating with OCRM on necessary aspects of incorporating the Ocean Management Plan into the Coastal Program. As described in the Ocean Management Plan, CZM also has primary responsibility for drafting future changes to the Ocean Management Plan, and for overseeing the implementation of the Science Framework.

Work Plan

Total Years: 5
Total Budget: $362,000
Final Outcome(s) and Products: Amended/revised Ocean Management Plan; amended Coastal Program incorporating Ocean Management Plan

Year: 1
Description of activities: Incorporation of Ocean Management Plan into Coastal Program
Outcome(s): Ocean management plan formally adopted as part of Coastal Program
Budget: $57,000

Year(s): 2
Description of activities: Implementation of data collection/research addressing priority issues in Science Framework
Outcome(s): Development of ocean plan-related data and map products
Budget: $92,000

Year(s): 3-4
Description of activities: Implementation of Ocean Management Plan amendment process-development of plan amendment material, public review process, Ocean Advisory Commission/Science Advisory Council process
Outcome(s): Ocean management plan amendments completed
Budget: $156,000 ($78,000/year)

Year: 5
Description of activities: Incorporation of Ocean Management Plan amendments into CZM program
Outcome(s): Ocean management plan amendments formally incorporated into CZM program
Budget: $57,000

Fiscal and Technical Needs

Fiscal Needs: 309 resources are anticipated to be complemented by other state and federal resources as well as resource from regional partners.

Technical Needs: CZM's technical and policy capacities would be supported by other states, federal agencies, and regional organizations.

Project 3: Development of CZM Guidance for Offshore Sand and Gravel Extraction

Issue Area(s)

The proposed strategy or implementation activities will support the priority Ocean Resources enhancement area. It will also further efforts under the Coastal Hazards and Cumulative and Secondary Impacts enhancement areas.

Program Change Description

The proposed strategy will result in, or implement, the following type(s) of program changes:

- New or revised guidelines, procedures and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to

applicants, local government and other agencies that will result in meaningful improvements in coastal resource management.

This strategy is intended to develop appropriate information to help inform the development of formal guidance regarding offshore sand and gravel extraction for beach nourishment. Such guidance would provide explanation and implementation support for the MA Ocean Management Plan, the application of CZM enforceable policies (including especially Coastal Hazards #1-3 and Ocean Resources #3), and the application of existing state regulatory programs. It is anticipated that this guidance would be developed as a companion or amendment(s) to the existing guidance documents: *Beach Nourishment: MassDEP's Guide to Best Management Practices for Projects in Massachusetts* and *CZM's Guidelines for Barrier Beach Management in Massachusetts*.

Need(s) and Gap(s) Addressed

As described in the Assessment, sea level rise and other coastal hazards issues will increase the interest in use of offshore sand and gravel extraction for beach nourishment and shoreline stabilization. Better understanding the nature of the current and potential needs, and the associated policy issues (balancing natural resource protection with protection of property or infrastructure, e.g.) will be key to considering potential responses through modifications to the Ocean Management Plan or through other avenues. Developing an information base to enhance understanding of these issues is the first step toward developing a potential response, and that is what this strategy is proposing. This strategy will include staff work to characterize the potential need for offshore sand and gravel (e.g., by mapping erosion-prone shorelines and the types of infrastructure at risk using existing information) and by developing an information base describing potential natural resource issues and offshore habitat vulnerabilities associated with sediment types and in particular locations. This strategy will also consider the potential implications related to sea level rise.

Benefit(s) to Coastal Management

Offshore sand and gravel extraction for beach nourishment includes various policy issues which would benefit from focused examination, as demonstrated in the couple of recent instances where such a project has been proposed. The Commonwealth does not currently have a specific policy related to such a project, although there are recent efforts that relate in indirect ways (e.g., the Ocean Management Plan, the 2007 recommendations of the Coastal Hazards Commission). Development of guidance to assist potential proponents, state agency staff, and other interested parties will be well-supported and informed by development of a strong information base.

Likelihood of Success

Because of the complexity of this issue, a measured approach beginning with development of an information base is the most appropriate way forward and will maximize the potential for success. Erosion—and the potential exacerbation resulting from sea level rise—is likely to continue to be front-page news, and pressure to look for new solutions, including offshore sand and gravel extraction, is likely to continue to grow. Developing a targeted response that incorporates best

available information and builds off of other recent efforts will provide a reasonable response.

Work Plan

Total Years: 4
Total Budget: $270,000
Final Outcome(s) and Products: Information base: mapping, issue overview, policy options

Year(s): 1-2
Description of activities: Develop maps of erosion-prone shorelines and combine with maps identifying characteristics such as presence of public/private infrastructure; identification of sand and gravel resources and potential borrow areas; summary of potential habitat impacts; summary of regulatory issues
Outcome(s): Resource maps and related documentation of existing regulatory issues serving as an information foundation
Budget: $156,000 ($78,000/year)

Year(s): 3-4
Description of activities: Based on information developed in Years 1-2, develop written guidance regarding offshore sand and gravel extraction as companion or amendment to the existing guidelines document. Submit to OCRM for program change approval.
Outcome(s): Beach nourishment with offshore materials guidance document
Budget: $114,000 ($57,000/year)

Fiscal and Technical Needs

Fiscal Needs: 309 resources are anticipated to be sufficient.

Technical Needs: CZM staff currently have sufficient technical knowledge and skills necessary to carry out the proposed project in-house.

G. Energy & Government Facility Siting

The strategy involves an activity (data acquisition to fill a need/gap) that is designed to enhance the ongoing implementation and updating of Massachusetts Ocean Management Plan as it relates to the siting of offshore energy facilities. The data will address the technological advancements and limitations of offshore renewable energy projects during the reasonably foreseeable future.

Project 1: Updated assessment of potential siting areas for ocean-based energy facilities

Issue Area(s)

The proposed strategy or implementation activities will support the priority Energy & Government Facility Siting enhancement area. It will also further efforts under the Ocean Resources enhancement area.

Program Change Description

The proposed strategy will result in, or implement, the following type(s) of program changes:

- New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding that will improve a State's ability to achieve one or more of the enhancement objectives

The proposed project will lead to appropriate revisions to the renewable energy siting provisions of the Massachusetts Ocean Management Plan. A previous study, "Inventory of Existing and Proposed Offshore Energy Facilities and Associated Infrastructure", was commissioned by CZM and completed in 2006 by TRC Environmental Corporation. The report was instrumental in informing the energy aspect of the Massachusetts Ocean Management Plan. Updating and refining this database will enhance and inform the implementation of policies and responses to the pressures presented by the increased need for new energy facilities. This project will contribute to updates/amendments of the next iteration of the Ocean Plan.

Need(s) and Gap(s) Addressed

As identified in the Assessment, the rapidly changing state offshore renewable energy technologies requires that a thorough periodic review of the siting requirements be undertaken to help inform the ocean planning and regulatory review processes.

Benefit(s) to Coastal Management

Energy facility siting has been important for CZM and with the recent efforts to develop and promulgate the Ocean Management Plan, it continues to be a priority. The anticipated benefits of this strategy include an increased understanding of existing and proposed energy facilities and associated infrastructure, but more importantly a projection of increased site availability allowed by technological advances. Identification of possible cable routes from facilities sited in both state and

federal waters to coastal landfall locations would also be a significant benefit, along with a better understanding of the ability of existing infrastructure to absorb potential new energy supplies. The effort will lead to improved management of the coastal zone and response to future energy related projects. The data generated by the strategy will be incorporated into the Massachusetts Ocean Resource Information System (MORIS), an online mapping tool created by CZM and the MassGIS. MORIS can be used by both state agencies and the public to search and display spatial data pertaining to the Massachusetts coastal zone.

Likelihood of Success

The siting of coastally dependant energy related projects is a high priority for CZM as evidenced by the adoption of the Ocean Management Plan. Participation by the various stakeholders in this process was a central feature of the plan and is on-going. This effort will continue, as CZM is tasked with the primary responsibility of initiating data acquisition and incorporating this data into future versions of the plan and associated policy/regulatory revisions. The preparation of updates, amendments, and the second generation Plan requires that this information be updated and incorporated.

Work Plan

Total Years: 3
Total Budget: $192,000
Final Outcome(s) and Products: Report of current/proposed/projected energy facility inventory containing appropriate GIS polygons and meta-data, followed by appropriate changes to the renewable energy siting provisions of the Ocean Management Plan.

Year: 1
Description of activities: Develop an updated inventory of existing and proposed energy facilities and associated infrastructure both in state waters and adjacent federal waters; identify foreseeable technological advances related to siting facilities (e.g. depth and efficiency limitations); prepare GIS polygons (and meta-data) of existing, proposed, and reasonably foreseeable potential siting locations (adjusted for non-compatible uses), and incorporate into MORIS.
Outcome(s): see above
Budget: $78,000

Year(s): 2
Description of activities: Implementation of Ocean Management Plan amendment process-development of plan amendment material;
Outcome(s): Ocean management plan amendments completed
Budget: $57,000

Year: 3
Description of activities: Incorporation of Ocean Management Plan amendments into CZM program
Outcome(s): Ocean management plan amendments formally incorporated into CZM program

Budget: $57,000

Fiscal and Technical Needs

Fiscal Needs: 309 resources are anticipated to be sufficient.

Technical Needs: CZM will seek the services of an outside contractor to assist in this project.