Massachusetts Coastal Infrastructure Inventory and Assessment Project
Massachusetts Department of Conservation and Recreation
Office of Waterways

North Coastal

Salisbury
Newburyport
Newbury
Rowley
Ipswich
Essex

July 6, 2009

Prepared for:

Massachusetts Department of Conservation and Recreation
Hingham, Massachusetts

Presented by:

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Franklin, Massachusetts

In Association With:

Waterfront Engineers
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- TOWN DOCUMENT LIST
  - Document Table

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  - Document Table
North Coastal

• MA DEP – CH 91 DOCUMENT LIST
  o Document Table
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• USACE – PERMIT DOCUMENT LIST
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• MA DCR – DOCUMENT LIST
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Section I

Coastal Hazards Infrastructure and Assessment Program

INTRODUCTION

PURPOSE

DEVELOPMENT OF MassGIS DATABASE ATTRIBUTES

DEVELOPMENT OF REPAIR / RECONSTRUCTION COSTS
Section I – Coastal Hazards Infrastructure and Assessment Program

INTRODUCTION

The Project and Client

The Commonwealth of Massachusetts has initiated a Coastal Hazards Commission (CHC) to identify the vulnerability of the state to coastal hazards. As one of five working groups working under the CHC, the 20-Yr Infrastructure Plan was to establish a prioritization for the repair of coastal structures. The focus areas of the Working Group include:

- Publicly owned infrastructure
- Infrastructure for which State is responsible
- Inventory of public hazards infrastructure
- Evaluation on conditions
- Development for a prioritization of work
- Estimation of capital and maintenance costs

The 20-Yr Infrastructure Working Group is led by Representative Frank Hynes with CZM as the lead State Agency overseeing the management of the project. The Massachusetts coastline has been broken up into 4 major regions consisting of the North Shore, Boston, South Coast, and the Cape and Islands. The South Shore (the Towns of Hull, Cohasset, Seekonk, Hingham, Plymouth, Kingston, Scituate and Duxbury) was previously evaluated by Bourne Consulting Engineering as a demonstration project in 2006.

Consultant Team

The consultant team that performed the demonstration project was led by Bourne Consulting Engineering (BCE) of Franklin, MA who was responsible for overall project management, specified areas of field assessments, and research. Assisting BCE was Applied Coastal Research and Engineering Inc. of Mashpee, MA, Childs Engineering Corporation, of Medfield, MA., and Waterfront Engineer LLC of Stratham, NH.

PURPOSE

Study Purpose

CZM seeks to identify the capacity of Massachusetts coastal structures to resist major coastal storms and prevent storm damage. In working toward this goal, CZM has initiated a program to perform an assessment of Commonwealth owned and/or maintained coastal structures. The first phase of this program was the performance of a demonstration project for coastal structures located on the South Shore. The demonstration project identified existing structures, their general conditions, ability to provide coastal protection and the probable cost for repairs. The information collected and developed has been incorporated into the MassGIS system to allow use for developing a 20 Year Coastal Infrastructure Plan.

The demonstration project served as a basis for the current statewide inventory assessment of all Commonwealth coastal structures and the needs for their maintenance and/or repair.
Goals of Study

The goals of the Massachusetts Coastal Infrastructure Inventory and Assessment Project include:

- To identify all the coastal structures the state either owns or has responsibility to maintain for the 4 regions included within the study
- Of the structures identified, determine the structure location and characteristics, the structure condition relative to providing coastal protection and the structure importance in relation to what it is protecting.
- To the degree possible, identify the structure elevation and the FIRMs mapping flood elevation and category.
- To the degree possible, identify structure owner and available documents from local, state and federal agencies.
- To establish an estimated cost to rehabilitate the coastal structures to provide the level of project established in the structure's original design.
- Provide the information in a format compatible for incorporation into the MassGIS system

Limit of Study

Due to the time constraints and the amount of effort necessary to collect, process and compile the information, the following are identified as limitations of the information presented:

- All property ownership was taken as presumed. No legal investigation of ownership was performed during the project. Property ownership is based on town assessor maps. Where structures were located outshore of assessor map defined property lines, it was assumed to be Town land unless other information indicated otherwise. Where structures were located outshore of Mean Low Water, property is assumed to be State owned.

- The structure ownership was based on assessor maps and research at the local, state and federal levels. Where there was indication of public work on a structure on Town land or on private property, the structure was presumed to be Town owned. Where the structure was on state property, the structure was presumed to be state owned. Where ownership of the structure was not clear but was located on private property, the structure ownership was defined as unknown.

- The study included town and state owned structures as it was assumed that most town owned structures received state funding at some level for construction and/or maintenance.
  - Structures that were determined to be private were not included.
  - Undocumented structures considered to be on private land, but having the potential to have been publicly built and/or maintained, were identified as having an “unknown ownership”.

- The prioritizing of structures was based primarily on risk to general infrastructure and density of housing. Infrastructure included was buildings. The study did not consider all infrastructure issues including:
  - No consideration on utility impacts – water, electrical, sewer, gas
  - No consideration of roadway and bridge protection
  - Evacuation routes were not considered within the investigation
  - Location of Emergency Shelters were not included in priority assessments

- Research was performed at the local, state and federal levels. The local research was limited to location and documenting available coastal structure contract drawings. Research at DCR was restricted to available historic construction plans for coastal structures at the MA-DCR Waterways office in Hingham, MA, and MA-DCR Division of Urban Parks and Recreation in
Boston, MA. No investigation of state archives was performed. Research at MA DEP Chapter 91 and USACE was limited to recorded permits and licenses found in their files. No investigation was performed at the Registry of Deeds.

DEVELOPMENT OF MassGIS DATABASE ATTRIBUTES

The specific attributes that would be incorporated into the MassGIS system were developed based on the scope of work and the goals to be achieved. The following was established to standardize the data collection and presentation and to allow total flexibility for sorting by attributes in the final GIS database. The attributes identified below were input into a MS Access database which was used to manage the data from all eight communities within a single file.

Database Attributes
- Attribute Descriptions/Definitions

Structure Number: A unique structure number was given to each coastal structure. The number was based on existing numbering systems that include the State Department of Environmental Protection community number followed by the local community assessor’s parcel numbering system. The last three digits of the number represent the structure within the parcel. Where structures extend over several parcels, the structure is referenced to a parcel that is approximately in the center of the structure. Where Town assessor’s references include letters, those are also included within the structure number. Some communities have block numbering within their numbering system and these are included. Communities without block numbering still have the block numbering included but these are illustrated as all zeros for that specific segment.

Structures that are on Town property, which would otherwise not have a parcel number, are referenced to a parcel that is in the immediate vicinity of the coastal structure.

On this basis, the following is the general numbering convention:

CCC-MMM-BBB-PPP-SSS

Where:
CCC  DEP Community Number
MMM  Community Map Number
BBB  Block Number (000 if no block numbering system)
PPP  Community Parcel Number
SSS  Structure Number

Property Ownership: All property ownership was on a “presumed” basis as no legal verification of ownership was performed. The ownership of the property was classified under four basic areas which were private ownership (Private), Town ownership (Local), Commonwealth of Massachusetts ownership (State), federal government ownership (Federal) or unknown. Property ownership was based on Town assessor’s maps. Where the location was located above Mean Low Water, and not within a defined parcel, the property ownership was presumed to be the Town unless documentation was found to indicate otherwise. Where a structure was located offshore of Mean Low Water, the property ownership was presumed to be federal.

Structure Ownership: The ownership of all structures is presumed as no verification of ownership was performed. Ownership of the structure was determined by research into historic state and federal
permits and the entity indicated on the permits as the applicant. Where no other information was found, the following was utilized:

- Structures located on private land but appearing to be significant structures were identified as owned by the Town or as “Unknown”. Unknown was used were there was a question of local or private ownership.
- Structures on Town property were assumed to be owned by the Town
- Structures that were located off-shore were presumed to be federally owned
- Structures that were identified as being privately owned were eliminated from the database

**Basis of Ownership:** The basis of structure ownership was provided to give rationale to the structure ownership and identified the research resource that identified the ownership or the methodology otherwise used. The responses utilized were limited to the following:

- DPW – DPW Employee Interview
- DCR - Contract Drawings
- DEP – Ch 91 License
- USACE – Permits
- Property Ownership
- Offshore Structure

**Structure Owner's Name:** Ownerships names reflect the presumed owner of publicly owned structures. As this was for public structures only, the ownership was restricted to the community name, the state agency or the federal agency.

**Earliest Structure Record:** The year of the oldest document located for the structure. The information is determined from the document research performed on the structure from local, state and federal agencies. If no documents could be found than this entry is denoted as "Unknown". Where documentation of the structure could be found, the date from the oldest document was utilized.

**Primary Structure / Secondary Structure:** Many of the coastal structures consisted of combined structures which were rated separately. It was typically found that one structure was significantly more predominant (Ex. Bulkhead/Seawall) and was therefore identified as the Primary Structure while a smaller structure might exist in front (ex. Revetment) of it. The type, height and material of each structure are identified separately. The condition of each structure was based on the Primary Structure. Where there was no secondary structure, the fields were left blank.

**Structure Type:** The structure type was categorized into five basic coastal structure categories which were Bulkhead/Seawall, Revetment, Coastal Beach, Coastal Dune, and Jetty/Groin.

**Structure Material:** The identification of the coastal structure’s material of construction was performed and represents the primary material. Stone structures consisted of both mortared and non-mortared conditions.

**Structure Height:** Each type of structure was categorized by its visible height in feet which was broken into four specific ranges which are:

- < 5 feet
- 5 to 10 feet
- 10 to 15 feet
- >15 feet

**Structure Condition:** A preliminary assessment of the condition for each structure was performed by the field teams. This was by visual observation only and no detailed investigation was performed. The condition assessments were based on a predefined five level rating system that ranged from Rating A for Excellent Condition to Rating F for Critical Condition. A detailed listing of the conditions and their definitions can be seen in Exhibit A.
Priority Rating: In order to account for the need for protection at any one site, a five level priority rating system was established. This allowed for consideration of public infrastructure protection, density of residential housing for development of structure overall importance for coastal protection. The ratings range from Level 1 for no infrastructure or residence protection to Level 5 for critical inshore infrastructure protection and/or high density residential. The detailed listing and definitions for the priority categories can be seen in Exhibit B.

Structure Repair / Reconstruction Cost: A preliminary estimation of construction costs to maintain or repair structures was made based on the preliminary field assessment of the structures. A Repair Cost Matrix was developed based on structure type, condition, height and material and can be seen in Exhibit C. Once each structure's type, height, and material classifications were determined, the cost per foot for the structure was determine from the Repair Cost Matrix and multiplied by the length of the structure to obtain the estimated repair/restoration cost. The cost matrix repair costs include a 20 percent construction cost contingency as well as 10 percent costs for engineering and permitting.

Structure Length: The length of each structure is provided and utilized in the development of the repair/reconstruction costs. The lengths are given to the nearest foot and taken as the linear distance along the structure, as determined by the GPS location, which takes into account structure angles and curvature.

Structure Elevation: The elevation of structures was determined in feet from existing information where available. The datum used is NAVD 88 and elevations are to the nearest foot. From a previous study much of the south shore coastal structures had elevations defined based on LIDAR mapping data. Where available structure documentation with elevations was found, in areas with no LIDAR data, the information was included within the structure information. Where there was no LIDAR information or existing documentation, the item has been left blank.

LIDAR (Light Detection and Ranging) is technology that is currently being used for high-resolution topographic mapping by mounting a LIDAR sensor, integrated with Global Positioning System (GPS) and inertial measurement unit (IMU) technology, to the bottom of aircraft and measuring the pulse return rate to determine surface elevations.

FEMA Zone and Elevation: For each structure the FEMA Flood Insurance Rate Maps (FIRM) were researched for their Flood Zone designation and their Base Flood Elevation from the most recent FIRM maps for the specific Town. The elevations are provided in feet on the same datum as the FIRM maps (NGVD) with no adjustments or conversions.

Structure Comments: The engineering team provided a brief description and comment on the structure at the time of the field assessments which is provided in support of the condition rating that was given for the structure.

Pictures: At the time of the field assessments, digital photographs were taken to provide a general overview of the structure. The number of pictures was limited to a maximum of six. The first photograph for each structure is shown on the Structure Assessment Form. The list of all photographs is provided on the form.

Town Documents: Town documents represent the structure information that could be found in the Town’s DPW/Engineering Department records. Where particular records could be found, a table of document information was developed and included within the database with limited descriptions.
MA - DCR Documents: MA-DCR documents represent the structure information that could be found within DCR – Waterways office in Hingham. Where particular records could be found, a table of document information was developed and included within the database with limited descriptions.

MA - DEP Chp. 91 Licenses: MA-DEP Chapter 91 license documents represent the structure information that could be found within MA-DEP Chp 91 records in Boston. Where particular records could be found, they were scanned as pdf files and attached to the structure through the GIS database information. In addition, a table of license document information was developed and included within the database with limited descriptions.

USACE Permits: USACE Permits represent the structure information that could be found within the Army Corp of Engineers regulatory office in Concord, MA. Where particular records could be found, they were scanned as pdf files and attached to the structure through the GIS database information. In addition, a table of license document information was developed and included within the database with limited descriptions.

DEVELOPMENT OF REPAIR / RECONSTRUCTION COSTS

A matrix to be used within the database has been developed to assess likely rehabilitation/repair costs to restore the coastal structures to their original design condition. No attempt was made to assess the level of exposure and associated level of protection that might be required to meet current design standards for these structures. These costs are only an estimation to bring these structures back to their original design intent based on 2006 construction costs.

The development of the cost matrix is based on the following:

Structure Condition Ratings. – The condition of the coastal structures was determined in the field by the survey crew which was led by an engineer with waterfront structure assessment and design experience. The definitions of the rating criteria utilized for the assessments are presented elsewhere.

The cost implications for each rating condition are as follows:

- **A Rating**  Structures not requiring any maintenance, repair or rehabilitation cost and would not be expected to experience damage if subject to a major coastal storm event.

- **B Rating**  Structures requiring limited or no repair and would be expected to experience only minor damage if subject to a major coastal storm event. The value of these maintenance costs is assumed to be 10 percent of the construction cost.

- **C Rating**  Structures requiring moderate to significant level of repair or reconstruction and would be expected to experience significant damage if subject to a major coastal storm event. The structure is presumed to be effective under a major storm event. The value of the repair costs is assumed to be 50 percent of the construction cost.

- **D Rating**  Structures requiring significant level of rehabilitation or total reconstruction and would be expected to experience significant damage or possibly fail if subject to a major coastal storm event. The value of the repair costs is assumed to be 100 percent of the construction cost.
• F Rating - Structures requiring complete reconstruction and would expect to provide little or no protection from a major coastal storm event. The value of the repair costs is assumed to be 100 percent of the construction cost plus a cost for removal/disposal of the original structure.

Height of Structure - Height of a structure is a major factor in the structure cost and therefore was identified as a significant factor is assessing rehabilitation/repair construction costs. The structures were broken down into four major categories which were:

- < 5' Structures that were less than five feet in height
- 5'-10' Structures five to 10 feet in height
- 10'-15' Structures over 10 feet to 15 feet in height
- > 15' Structures greater than 15 feet in height – assumed 20 feet typical

Length of Structure - Length is based on field GPS location with measurements rounded to the nearest foot.

Bulkhead / Seawall Structures - These structures are assumed to be constructed out of concrete, steel, stone or wood with each having its own criteria for establishing costs. For each structure type the following was assumed:

• Concrete Seawalls – These walls were assumed to be gravity structures with the volume per cubic yard estimate that varied from $350 to $630 per cubic yard depending on the structure height. Values for excavation and demolition of existing structure were also included.

• Stone Seawalls - These walls were treated the same as concrete seawalls and assumed to be gravity structures with the volume of the structure based on the bottom width being one-half of the structure height. Costs of construction were based on a per cubic yard volume per cubic yard depending on the structure height. Values for excavation and demolition of existing structure were also included.

• Steel Bulkheads - Steel bulkheads were presumed to be constructed with steel sheet piling. Tie back systems were presumed for structures 10 feet or greater in height. Shorter walls were assumed to have a cantilever design. The total depth of sheeting was presumed to be two times the exposed height. The cost for construction varied from $40 to $60 per square foot plus the cost of excavation and demolition.

• Timber Bulkheads - Timber bulkheads were presumed to be constructed with timber piles at eight foot on center, horizontal wales and vertical four inch sheathing. The unit costs for installed materials used were $1,500 per pile and $7.50 per bfn.

Revetment Structures – Revetment structures were presumed to be constructed of dry placed (no concrete) stone with a two on one slope and a horizontal toe and crown equal to the thickness layer established for each height condition. The total thickness of the revetment layers varied from six to ten feet with the cost of armor and under-layer stone assumed to be $50 per ton and the crushed stone base to be $15 per ton.
Groins and Jetties – Groins and jetties were assumed to be the same materials and construction as the revetment structures but would have two sides and therefore double the quantities.

Coastal Beaches – Costs for restoration of Coastal beaches presumed the placement of beach renourishment sands at a 1-on-20 slope over the existing beach conditions. The cost for deposition of sand assumed relatively close source of material and utilized $20 per cubic yard for the material installed.

Coastal Dunes – Restoration of coastal dunes assumed a cross section of renourished sand with a one-on-four slope on one side of a 25 foot width at the defined dune height. The cost for deposition of sand assumed relatively close source of material and utilized $20 per cubic yard for the material installed.

Contingency – A contingency of 20 percent was added to all costs to reflect the unknowns associated with this level of rehabilitation/repair estimating.

Engineering and Regulatory Approvals – A ten percent increase to the cost matrix prices was assessed to represent the engineering design and regulatory approval requirements for the restoration of these structures.
## EXHIBIT A

### Structure Condition Table – 5 Level Rating System

<table>
<thead>
<tr>
<th>Preliminary Condition Assessment</th>
<th>Definition Based Upon Perceived Immediacy of Action and Potential to Cause Damage if Not Corrected</th>
<th>Level of Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Excellent</td>
<td>Like new condition. Structure expected to withstand major coastal storm without damage. Stable landform (beach, dune or bank). Adequate system exists to provide protection from major coastal storm</td>
<td>None</td>
</tr>
<tr>
<td>B Good</td>
<td>Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure</td>
<td>Minor</td>
</tr>
<tr>
<td>C Fair</td>
<td>Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life</td>
<td>Moderate</td>
</tr>
<tr>
<td>D Poor</td>
<td>Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.</td>
<td>Major</td>
</tr>
<tr>
<td>F Critical</td>
<td>Conditions of structure/landform may warrant emergency stabilization as failure may result in potential loss of property and/or life. Landform eroded, loss of integrity Structure exhibits critical levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure provides little or no protection from a major coastal storm. Actions taken to totally reconstruct structure to regain full capacity. Landform stability is severely compromised, rate of erosion/material loss may be increasing, and landform does not provide adequate protection from a major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.</td>
<td>Immediate</td>
</tr>
</tbody>
</table>
EXHIBIT B

Priority Rating System - 5 Level Rating System

<table>
<thead>
<tr>
<th>Preliminary Priority Level Assessment</th>
<th>Level Based Upon Perceived Immediacy of Action and Presence of Potential Risk to Inshore Structures if Not Corrected</th>
<th>Level of Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>None No Inshore Structures or Residential Dwelling Units Present</td>
<td>Long Term Planning Considerations</td>
</tr>
<tr>
<td>II</td>
<td>Low Priority Inshore Structures Present with Limited potential for Significant Infrastructure Damage</td>
<td>Future Project Consideration</td>
</tr>
<tr>
<td>III</td>
<td>Moderate Priority Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (&lt;1 dwelling impacted / 100 feet of shoreline)</td>
<td>Consider for Active Project Improvement Listing</td>
</tr>
<tr>
<td>IV</td>
<td>High Priority High Value Inshore Structures with Potential for Infrastructure Damage and/or Moderate Density Residential Dwellings (1-10 dwellings impacted / 100 feet of shoreline)</td>
<td>Consider for Next Project Construction Listing</td>
</tr>
<tr>
<td>V</td>
<td>Immediate / Highest Priority Critical Inshore Structures Present with Potential for Infrastructure Damage and/or High Density Residential Dwellings Conditions of structure may warrant emergency stabilization as failure may result in potential loss of property and/or life. (&gt;10 dwellings impacted / 100 feet of shoreline)</td>
<td>Consider For Immediate Action Due to Public Safety and Welfare Issues</td>
</tr>
</tbody>
</table>
## EXHIBIT C

**REPAIR / REHABILITATION COSTING DATA**

Cost per linear foot of structure

<table>
<thead>
<tr>
<th>STRUCTURE TYPE</th>
<th>STRUCTURE MATERIALS</th>
<th>STRUCTURE HEIGHT</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>BULKHEAD/SEAWALL</td>
<td>CONCRETE</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$84</td>
<td>$425</td>
<td>$650</td>
<td>$693</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$152</td>
<td>$759</td>
<td>$1,518</td>
<td>$1,782</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$251</td>
<td>$1,254</td>
<td>$2,508</td>
<td>$2,970</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$396</td>
<td>$1,980</td>
<td>$3,960</td>
<td>$4,752</td>
</tr>
<tr>
<td></td>
<td>STEEL</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$54</td>
<td>$273</td>
<td>$546</td>
<td>$660</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$165</td>
<td>$825</td>
<td>$1,650</td>
<td>$1,848</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$251</td>
<td>$1,254</td>
<td>$2,508</td>
<td>$2,772</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$343</td>
<td>$1,716</td>
<td>$3,432</td>
<td>$3,795</td>
</tr>
<tr>
<td></td>
<td>STONE</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$84</td>
<td>$425</td>
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<td>$693</td>
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<td>$3,960</td>
<td>$4,752</td>
</tr>
<tr>
<td></td>
<td>WOOD</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$86</td>
<td>$431</td>
<td>$882</td>
<td>$994</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$127</td>
<td>$632</td>
<td>$1,265</td>
<td>$1,463</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$161</td>
<td>$804</td>
<td>$1,608</td>
<td>$1,872</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$202</td>
<td>$1,008</td>
<td>$2,017</td>
<td>$2,380</td>
</tr>
<tr>
<td>COASTAL BEACH</td>
<td>SAND</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$26</td>
<td>$132</td>
<td>$204</td>
<td>$254</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$127</td>
<td>$634</td>
<td>$1,267</td>
<td>$1,267</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$224</td>
<td>$1,122</td>
<td>$2,444</td>
<td>$2,444</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$396</td>
<td>$1,980</td>
<td>$3,990</td>
<td>$3,990</td>
</tr>
<tr>
<td>COASTAL DUNE</td>
<td>SAND</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$18</td>
<td>$63</td>
<td>$186</td>
<td>$186</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$48</td>
<td>$238</td>
<td>$476</td>
<td>$476</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$79</td>
<td>$395</td>
<td>$790</td>
<td>$790</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$132</td>
<td>$650</td>
<td>$1,320</td>
<td>$1,320</td>
</tr>
<tr>
<td>REVETMENT</td>
<td>STONE</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$66</td>
<td>$333</td>
<td>$664</td>
<td>$730</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$120</td>
<td>$601</td>
<td>$1,201</td>
<td>$1,300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$157</td>
<td>$781</td>
<td>$1,584</td>
<td>$1,686</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$247</td>
<td>$1,234</td>
<td>$2,468</td>
<td>$2,666</td>
</tr>
<tr>
<td>GROIN</td>
<td>STONE</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$132</td>
<td>$684</td>
<td>$1,328</td>
<td>$1,460</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$240</td>
<td>$1,201</td>
<td>$2,402</td>
<td>$2,600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$314</td>
<td>$1,564</td>
<td>$3,128</td>
<td>$3,302</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$494</td>
<td>$2,468</td>
<td>$4,937</td>
<td>$5,333</td>
</tr>
</tbody>
</table>

**NOTE:** Repair / Rehabilitation Costs include 10% for engineering and regulatory approvals and 20% construction contingency.
Section II

Salisbury
Section II – Community Findings – Town of Salisbury

COMMUNITY DESCRIPTION

The Town of Salisbury consists of a land area of 15.43 square miles out of a total area of 17.84 square miles and had a population of 7,827 in the 2000 census. The Town is located on the North Shore of Massachusetts and its location can be seen on this report’s cover. The estimated length of shoreline that is directly exposed to open ocean waves is 4 miles with the remaining shoreline semi-protected by offshore structures or landforms. The Town is protected from major coastal storms by both natural and man-made shoreline structures that require maintenance to insure the long term protection of its coastline. The man-made and publicly owned structures that protect the Town were investigated for their ability to provide adequate protection from major coastal storms. Structures have been identified as publicly owned, including coastal dunes and beaches, based on evidence of investment of public funds made to create/enhance/maintain these structures. The assessment did not include floating or pile supported structures as they are assumed not to provide any significant coastal protection from major storm events.

STRUCTURE INVENTORY

Within the Town of Salisbury, there were 12 structures which had public or unknown ownership which provide significant coastal protection. The location of the structures can be seen in Sheets 1 through Sheet 4 in Section II-B of this report. The structures were categorized by their type and by their structural condition based on a preliminary field assessment. The distribution of structures by type and condition can be seen in the following table:

<table>
<thead>
<tr>
<th>Primary Structure Type</th>
<th>Total Structures</th>
<th>Structure Condition Rating</th>
<th>Total Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>Bulkhead / Seawall</td>
<td>2</td>
<td>2</td>
<td>2315</td>
</tr>
<tr>
<td>Revetment</td>
<td>2</td>
<td>2</td>
<td>735</td>
</tr>
<tr>
<td>Breakwater</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Groin / Jetty</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Coastal Dune</td>
<td>2</td>
<td>2</td>
<td>185</td>
</tr>
<tr>
<td>Coastal Beach</td>
<td></td>
<td>7</td>
<td>1</td>
</tr>
</tbody>
</table>

Within the above table, the total length of each type of structure is also provided. The structures are listed by the type which is providing the primary coastal protection. Many sites have multiple structure types at the same location (i.e. revetment in front of seawall). These secondary structures, although not identified within these tables, are included in the development of repair/rehabilitation costs.

The development of repair costs has been included by structure type and by condition. In the Town of Salisbury’s case there are a total of 10 structures which would require approximately $1.8 million to bring all the coastal structures to “A” Rating. Most critical will be the structures in the “D” and “F” classifications as those are assumed to undergo some level of damage or failure during the next major coastal storm event. To reconstruct these structures, identified in the preliminary survey as being in poor condition, an estimated $561,680 would be required to upgrade the Town’s coastal protection.
### STRUCTURE REPAIR / RECONSTRUCTION COST - Town of Salisbury

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkhead / Seawall</td>
<td>2</td>
<td>$661,135</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$661,135</td>
</tr>
<tr>
<td>Revetment</td>
<td>2</td>
<td>$96,234</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$96,234</td>
</tr>
<tr>
<td>Breakwater</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groin / Jetty</td>
<td>3</td>
<td>$29,380</td>
<td>$320,892</td>
<td></td>
<td></td>
<td></td>
<td>$350,252</td>
</tr>
<tr>
<td>Coastal Dune</td>
<td>3</td>
<td>$45,030</td>
<td>$94,010</td>
<td>$561,680</td>
<td></td>
<td></td>
<td>$700,720</td>
</tr>
<tr>
<td>Coastal Beach</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td>$831,759</td>
<td>$414,902</td>
<td>$561,680</td>
<td></td>
<td></td>
<td><strong>$1,808,341</strong></td>
</tr>
</tbody>
</table>

Based on the limited research within the scope of this project research, the presumed ownership of the structures was established on an initial basis and would be subject to more intense review in future tasks. Structures identified as being owned privately were excluded from further consideration. Although ownership of the land on which the structure was located was a factor, the structure ownership was treated as a separate issue from land ownership. For the Town of Salisbury the breakdown of structures by assumed ownership is as follows:

### STRUCTURE OWNERSHIP / REPAIR COST - Town of Salisbury

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town Owned</td>
<td>1</td>
<td>$100,980</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$100,980</td>
</tr>
<tr>
<td>Commonwealth of MA</td>
<td>11</td>
<td>$730,779</td>
<td>$414,902</td>
<td>$561,680</td>
<td></td>
<td></td>
<td>$1,707,351</td>
</tr>
<tr>
<td>Federal Government</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown Ownership</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td>$831,759</td>
<td>$414,902</td>
<td>$561,680</td>
<td></td>
<td></td>
<td><strong>$1,808,341</strong></td>
</tr>
</tbody>
</table>

The identification of presumed ownership was not based on the investigation of legal documents but relied on property ownership and from construction and regulatory documents that were found. A more detailed investigation of legal documents and agreements would be required where structure ownership is disputed. A more detailed identification of structure type, length, condition and location can be found in Section II-B which contains Structure Assessment Reports for each individual structure found.

### SUMMARY

The enclosed reports and associated documents reflects the Town of Salisbury’s coastal structure information that will eventually be input into a state-wide GIS database and will be accessible through MassGIS. This data, when compiled state-wide, will be critical in the development of both short term and long term planning for maintaining and improving Massachusetts coastal protection.

This database will also provide relatively quick access to identify available documentation for these structures as well as the ability to be updated as coastal structure improvements are made.
Section II - Salisbury

Part B

Structure Assessment Reports
**CZM Coastal Infrastructure Inventory and Assessment**

**Structure Assessment Form**

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>First Street</td>
<td>7/23/2007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Based On Comment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Earliest Structure Record:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salisbury</td>
<td>1948</td>
<td>$100,980.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length:</th>
<th>Top Elevation:</th>
<th>FIRM Map Zone:</th>
<th>FIRM Map Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>255 Feet</td>
<td>Feet NAVD 88</td>
<td>A2</td>
<td>9 Feet NGVD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkhead/Seawall</td>
<td>Stone</td>
<td>Over 15 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
</tr>
</thead>
</table>

**Structure Summary:**

A mortared granite block seawall in generally good condition, though the top of the wall cantilevers out beyond toe of wall.

**Condition Rating**
- **Rating**: Good
- **Level of Action**: Minor
- **Description**: Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure/landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent/limit future deterioration and extend life of structure.

**Priority Rating**
- **Rating**: Low Priority
- **Action**: Future Project Consideration
- **Description**: Inshore Structures Present with Limited potential for Significant Infrastructure Damage

**Structure Images:**
- 065-007-000-010-100-PHO1A.JPG
- 065-007-000-010-100-PHO1B.JPG
- 065-007-000-010-100-PHO1C.JPG
- 065-007-000-010-100-PHO1D.JPG

**Structure Documents:**
- USACE | April 2001 | Permit Plan - Town | 065-007-000-010-100-COE1A
- MA-DCR | March 2002 | Town Pier Facility | 065-007-000-010-100-DCR1A
- DEP | October 26 | Plan Accompanying | 065-007-000-010-100-LIC1A

Prepared By: Bourne Consulting Engineering
Structure Assessment Form

Property Owner: MHD

Location: Gillis Bridge

Date: 3/13/2009

Presumed Structure Owner: State

Based On Comment:

Owner Name: State

Earliest Structure Record: Unknown

Estimated Reconstruction/Repair Cost: $33,772.00

<table>
<thead>
<tr>
<th>Length: 215 Feet</th>
<th>Top Elevation: 9 Feet NGVD</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRM Map Zone: A2</td>
<td>FIRM Map Elevation:</td>
</tr>
</tbody>
</table>

Primary Type: Revetment
Primary Material: Stone
Primary Height: 10 to 15 Feet

Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
Placed stone revetment in front of the bridge abutment. No visible scour, some stone rotation. Stones are 3 feet by 2 feet by 2 feet. Creast is one stone width. Slope is 1 on 1.

Condition Rating: B
Level of Action: Minor
Description: Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating: IV
Action Description: High Value Inshore Structures with Potential for Infrastructure Damage and/or Moderate Density Residential Dwellings (1-10 dwellings impacted / 100 feet of shoreline)

Structure Images:
065-007-000-015-100-PHO1A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
## Structure Assessment Form

**Property Owner:**
- State
- Presumed Structure Owner:
- Owner Name: MHD

**Location:**
- Gillis Bridge

**Date:** 3/13/2009

**Location:**
- Based On Comment: 

**Earliest Structure Record:**
- Estimated Reconstruction/Repair Cost: $19,760.00

<table>
<thead>
<tr>
<th>Length</th>
<th>Top Elevation</th>
<th>FIRM Map Zone</th>
<th>FIRM Map Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 Feet</td>
<td>40 Feet NAVD 88</td>
<td>A2</td>
<td>9 Feet NGVD</td>
</tr>
</tbody>
</table>

**Primary Type:** Groin/ Jetty  
**Primary Material:** Stone  
**Primary Height:** Over 15 Feet  
**Secondary Type:** 
**Secondary Material:** 
**Secondary Height:**

**Structure Summary:**
Placed stone groin with stone that are approximately 3 feet by 3 feet by 3 feet. Slope is approximately one on one. Minor unraveling at the head of the groin. The crest is one stone wide. There appears to be one layer of armor stone.

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Priority Rating</th>
<th>Level of Action</th>
<th>Action Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B Good</td>
<td>II Low Priority</td>
<td>Minor</td>
<td>Inshore Structures Present with Limited potential for Significant Infrastructure Damage</td>
</tr>
<tr>
<td>Description</td>
<td>Priority Rating</td>
<td>Level of Action</td>
<td>Action Description</td>
</tr>
<tr>
<td>Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure/landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent/limit future deterioration and extend life of structure.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Structure Images:**
- 065-007-000-015-200-PH02A.JPG
- 065-007-000-015-200-PH02B.JPG

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment
Structure Assessment Form

Property Owner: State
Presumed Structure Owner: State
Owner Name: MA-DCR

Location: Merrimac River
Based On Comment: 
Earliest Structure Record: 1974
Estimated Reconstruction/Repair Cost: $62,462.00

Property Details:

Length: 520 Feet
Top Elevation: 9 Feet NGVD
FIRM Map Zone: A2
FIRM Map Elevation: 

Standard Type: Revetment
Primary Material: Stone
Primary Height: 5 to 10 Feet
Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
A stone revetment at a boat ramp in satisfactory condition. The geotextile is exposed between stones.

Condition Rating
Level of Action Description
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating
Action Description
II Low Priority
Future Project Consideration
Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
065-030-000-001-100-PHO1A.JPG

Structure Documents:
USACE April 1974 Proposed Access 065-030-000-001-100-COE1A
MA-DCR March 1974 Proposed Access 065-030-000-001-100-DCR1A

Prepared By: Bourne Consulting Engineering
Structure Assessment Form

Property Owner: State
Presumed Structure Owner: State
Owner Name: MA-DCR

Location: State Park
Based On Comment:
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $320,892.00

Length: 130 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: V3
FIRM Map Elevation: 12 Feet NGVD
Primary Type: Groin/Jetty
Primary Material: Stone
Primary Height: Over 15 Feet
Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
A stone groin unravelling inshore at the west side and at the offshore end. Both sides and crest underlayer stone are exposed but in fair condition.

Condition Rating Level of Action Description
C Fair Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority Rating Action Description
I None Long Term Planning Considerations No Inshore Structures or Residential Dwelling Units Present

Structure Images: 065-030-000-001-200-PHO2A.JPG
Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: State

Presumed Structure Owner: State

Owner Name: MA-DCR

Location: State Park

Based On Comment:

Earliest Structure Record: 1952

Estimated Reconstruction/Repair Cost: $560,155.00

Length: 2060 Feet NAVD 88

FIRM Map Zone: V3

FIRM Map Elevation: 12 Feet NGVD

Top Elevation: 11 Feet NAVD 88

Primary Type: Bulkhead/ Seawall

Primary Material: Concrete

Primary Height: 5 to 10 Feet

Secondary Type: Revetment

Secondary Material: Stone

Secondary Height: 5 to 10 Feet

Structure Summary:
A precast concrete wave return face seawall set on top of stone revetment. Generally in satisfactory condition, except there is 300 linear feet of damaged revetment and loss of wall backfill along centered portion of wall. There are trees, shrubs and dune behind wall, and a campground roadway set back.

Condition Rating Level of Action Description
B Good Minor Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
I None

Long Term Planning Considerations
No Inshore Structures or Residential Dwelling Units Present

Structure Images:
065-030-000-001-300-PHO3A.JPG

Structure Documents:

MA-DCR April 1952 Proposed Shore 065-030-000-001-300-DCR3A
MA-DCR March 2001 Seawall 065-030-000-001-300-DCR3B
MA-DCR May 2002 Emergency Seawall 065-030-000-001-300-DCR3C

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: State

Presumed Structure Owner: State

Owner Name: MA-DCR

Location: State Park

Based On Comment: 

Earliest Structure Record: Unknown

Estimated Reconstruction/Repair Cost: $9,600.00

Length: 40 Feet

Top Elevation: 11 Feet NAVD 88

FIRM Map Zone: V3

FIRM Map Elevation: 12 Feet NGVD

Primary Type: Groin/Jetty

Primary Material: Stone

Primary Height: 5 to 10 Feet

Secondary Type: 

Secondary Material: 

Secondary Height: 

Structure Summary:
A mortared stone groin with minor mortar loss. The stones at the offshore end have shifted approximately 3 inches offshore, causing open joints. Generally satisfactory condition.

Condition Rating
B Good

Priority Rating
I None

Level of Action Description
Minor

Action Description
No Inshore Structures or Residential Dwelling Units Present

Structure Images:
065-030-000-001-400-PHO4A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: __________________________
State: __________________________

Presumed Structure Owner: __________________________
State: __________________________

Owner Name: __________________________
MA-DCR

Location: Salisbury Beach South Dune

Based On Comment: __________________________

Earliest Structure Record: Unknown

Estimated Reconstruction/Repair Cost: $94,010.00

Date: 3/19/2009

Length: 395 Feet
Top Elevation: 88 Feet NAVD 88

FIRM Map Zone: V2
FIRM Map Elevation: 16 Feet NGVD

Primary Type: Coastal Dune
Primary Material: Sand
Primary Height: 5 to 10 Feet

Secondary Type: __________________________
Secondary Material: __________________________
Secondary Height: __________________________

Structure Summary:
Sand dune at the southern most part of Salisbury Beach. Behind is parking lot, in front is a sandy beach. Dune is well covered with dune grass but has signs of minor erosion.

Condition Rating
C
Fair

Level of Action Description
Moderate
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

Priority Rating
I
None

Long Term Planning Considerations
No Inshore Structures or Residential Dwelling Units Present

Structure Images:
065-030-000-001-500-PHO5A.JPG
065-030-000-001-500-PHO5B.JPG
065-030-000-001-500-PHO5C.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

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<td>15 Feet NAVD 88</td>
<td>V2</td>
<td>15 Feet NGVD</td>
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**Structure Summary:**
A beach nourishment area per the Harbor Master, good condition. Some nearby buildings elevated on piles.

**Condition Rating**
- A
- Excellent

**Priority Rating**
- I
- None

**Level of Action**
- None

**Action Description**
- Long Term Planning Considerations
- No Inshore Structures or Residential Dwelling Units Present

**Description**
- Like new condition. Structure expected to withstand major coastal storm without damage. Stable landform (beach, dune or bank). Adequate system exists to provide protection from major coastal storm.

**Structure Images:**
- [065-032-000-104-100-PHO1A.JPG]

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: State
Presumed Structure Owner: State
Owner Name: MA-DCR

Location: Salisbury Beach
Based On Comment: Tax Map
Earliest Structure Record: 2000

Date: 9/25/2007
Estimated Reconstruction/Repair Cost: $45,030.00

Length: 570 Feet
Top Elevation: 15 Feet NAVD 88
FIRM Map Zone: V2
FIRM Map Elevation: 16 Feet NGVD

Primary Type: Coastal Dune
Primary Material: Sand
Primary Height: 10 to 15 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
A dune with sand fence and some dune grass at the crest. There is some recently dumped sand and some ocean side erosion. There is street parking behind the dune.

Condition Rating: B Good
Level of Action Description: Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating: II Low Priority
Action Description: Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
- 065-036-000-154-100-PHO1A.JPG

Structure Documents:
- MA-DCR Jan 2000 Proposed Dune 065-036-000-154-100-DCR1A
- MA-DCR May 2000 Proposed Dune 065-036-000-154-100-DCR1B

Prepared By: Bourne Consulting Engineering
Structure Assessment Form

Property Owner:
State

Presumed Structure Owner:
State

Owner Name:
MA-DCR

Location:
Driftway Street

Based On Comment:
Tax Map

Earliest Structure Record:
Unknown

Date:
9/25/2007

Estimated Reconstruction/Repair Cost:
$0.00

Length: 55 Feet
Top Elevation: 15 Feet NAVD 88
FIRM Map Zone: V2
FIRM Map Elevation: 15 Feet NGVD

Primary Type: Coastal Beach
Primary Material: Sand
Primary Height: Under 5 Feet

Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
A beach nourishment area, per the Harbor Master, that is in good condition.

Condition Rating Level of Action Description
A Excellent None Like new condition. Structure expected to withstand major coastal storm without damage. Stable landform (beach, dune or bank). Adequate system exists to provide protection from major coastal storm.

Priority Rating Action Description
I None Long Term Planning Considerations No Inshore Structures or Residential Dwelling Units Present

Structure Images:
065-036-000-154-200-PHO2A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: State

Location: Salsbury Beach Dune

Presumed Structure Owner: State

Based On Comment: 

Date: 3/19/2008

Earliest Structure Record: Unknown

Estimated Reconstruction/Repair Cost: $561,680.00

Length: 1180 Feet

Top Elevation: 16 Feet NAVD 88

FIRM Map Zone: V2

FIRM Map Elevation: 16 Feet NGVD

Primary Type: Coastal Dune

Primary Material: Sand

Primary Height: 5 to 10 Feet

Secondary Type: 

Secondary Material:

Secondary Height:

Structure Summary:
Dune fronting small houses. Many areas of low spots and voids. Not a constant shape. Slope is eroded throughout. In front of it is a sandy beach.

Condition Rating
D Poor

Level of Action Description
Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

Priority Rating Action Description
III Moderate Priority Consider for Active Project Improvement Listing

Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

Structure Images:
065-036-000-154-300-PHO3A.JPG
065-036-000-154-300-PHO3B.JPG
065-036-000-154-300-PHO3C.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
Section II - Salisbury

Part C

Structure Photographs
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<th>BCE Structure No</th>
<th>Document No</th>
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Section II - Salisbury

Part D

Structure Documents

TOWN DOCUMENT LIST

MA DCR - DOCUMENT LIST

MA DEP – Ch 91 DOCUMENT LIST
  • Copies of License Documents

USACE – PERMIT DOCUMENT LIST
  • Copies of Permit Documents
No Town Documents for the Town of Salisbury

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<th>Document No</th>
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<td>April 1952</td>
<td>Proposed Shore Protection - Salisbury Beach Reservation - Salisbury - Prepared for the DPM of Massachusetts - Division of Waterways</td>
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<td>Plan Accompanying Petition of Town of Salisbury to build a solid fill and pile and Timber Pier in Merrimack River Salisbury 1948</td>
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<td>Bulkhead Seawall</td>
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PLAN ACCOMPANYING PETITION OF TOWN OF SALISBURY TO BUILD A SOLID FILL AND PILE AND TIMBER PIER IN MERRIMACK RIVER SALISBURY 1948

NO 3095
APPROVED BY DEPARTMENT OF PUBLIC WORKS OCTOBER 26, 1948
COMMISSIONER OF PUBLIC WORKS ASSISTANT COMMISSIONERS DIRECTOR, DIVISION OF WATERWAYS
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<td>Permit Plan - Town Pier Facility Rehabilitation - Salisbury, Massachusetts</td>
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<td>Proposed Access Ramp and Facilities - Black Rock Creek at Merrimack River - Salisbury, Massachusetts - Application by DPW of Massachusetts - Division of Waterways</td>
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<td>Black Rock Creek</td>
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SUGGESTED METHOD OF DEMOLITION OF PIER

- Float, gangway ramp and wood braces to be removed by others
- Remove rail, benches and deck (by town)
- Remove all piles in their entirety (for bid purposes assume 53 piles at pier and 26 at bulkhead)
- Remove all existing cut off piles (for bid purposes assume 18 each)

SUGGESTED METHOD OF DEMOLITION OF BULKHEAD

- Install steel sheeting for permanent scour protection inside existing wood soldier pile & lagging
- Construct stone bulkhead (see drawing 6)
- Remove existing wood soldier piles & lagging
- Cut steel sheeting approximately 0.5 ft below mud line. (see Table 1 on drawing 6)

NOTES:

- Elevations refer to NGVD of 1929, the bench mark being the top of a stone bound EL - 10.5 ft.


- Property line data taken from plan of Land surveyed for town of Salisbury May 1983 by Carroll H. Knowles.

- Land owner Town of Salisbury, MA, BK 5210 PG 72, BK 4296 PG 215

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<td>EXISTING SITE &amp;</td>
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GENERAL NOTES

1. THE CONTRACTOR SHALL VISIT THE SITE AND BE KNOWLEDGABLE OF CONDITIONS THEREON. THE CONTRACTOR SHALL INSPECT, VERIFY, AND BE RESPONSIBLE FOR ALL CONDITIONS OF THE PROJECT AND SHALL NOTIFY THE ENGINEER OF ANY CONDITION REQUIRING MODIFICATIONS BEFORE PROCEEDING WITH THE WORK.

2. CONTRACTOR SHALL VERIFY ALL PROPOSED AND EXISTING CONDITIONS, INCLUDING THEIR LOCATIONS, DIMENSIONS AND ELEVATIONS IN THE FIELD AND SHALL TAKE ALL NECESSARY FIELD MEASUREMENTS, STATIONS AND OFFSETS SHOWN ON DRAWINGS ARE APPROXIMATE. NOTIFY THE ENGINEER OF ANY LAYOUT CONDITION THAT IS NOT CONSISTENT WITH THE DRAWINGS OR THAT WILL IMPAIR LAYOUTS OR ATTACHMENTS OF FINISHES PRIOR TO PROCEEDING WITH THE AFFECTED PORTION OF THE WORK.

3. THE UTILITIES SHOWN HAVE BEEN COMPILED FROM INFORMATION FURNISHED BY FIELD SURVEY AND VARIOUS UTILITY COMPANIES. ACCURACY AND COMPLETENESS ARE NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL MAKE FIELD INVESTIGATIONS AND OBTAIN INFORMATION FROM UTILITY COMPANIES TO CONFIRM THE LOCATION AND ELEVATION OF ALL SURFACE UTILITIES. IF ANY DISCREPANCIES ARISE, THE CONTRACTOR SHALL REPORT TO THE ENGINEER IMMEDIATELY.

4. THE CONTRACTOR IS TO COORDINATE ALL SUBCONTRACTORS' WORK BEFORE THE WORK IS INSTALLED, AUGUST, AND RECONSTRUCTION OF WORK DUE TO LACK OF COORDINATION SHALL BE DONE AT NO EXPENSE TO THE OWNER.

5. CONSTRUCTION SHALL BE MADE FROM APPROVED SHOP DRAWINGS ONLY.

6. CONTRACTOR SHALL LAYOUT ALL SITE IMPROVEMENTS FOR ENGINEER'S APPROVAL PRIOR TO STARTING WORK.

7. FINISH GRADES OF PAVEMENTS AND SITE IMPROVEMENTS SHALL BE SHOWN FOR APPROVAL BY ENGINEER PRIOR TO STARTING WORK.

8. NEW PAVEMENTS ARE TO BE PLANTED WHERE THEY MEET EXISTING.

9. BEFORE EXCAVATING, INSTALLING, BACKFILLING, GRAVING AND PAVING, ALL UTILITY COMPANIES, PUBLIC AND PRIVATE, MUST BE NOTIFIED AND RECEIVED.

10. THE CONTRACTOR SHALL TAKE ADEQUATE PRECAUTIONS TO PROTECT ALL STRUCTURES, WALKS, STREETS, PAVEMENTS, Tress, SUBSURFACE ELEMENTS, OVERHEAD WIRING, AND PLANTINGS. ON OR OFF THE PREMISES, AND SHALL REPAIR AND REPLACE OR OTHERWISE MAKE GOOD AS DIRECTED BY THE ENGINEER ANY DAMAGE CAUSED.

11. REMOVAL OF SITE ELEMENTS SHALL INCLUDE THE REMOVAL OF FOUNDATIONS TO FULL DEPTH UNLESS OTHERWISE INDICATED.

12. THE CONTRACTOR SHALL REMOVE FROM THE PROJECT SITE ALL STAMPS, MARKS, AND EMBLEMS FOUND THEREON. STORAGE OF SUCH MATERIALS ON THE PROJECT SITE WILL NOT BE PERMITTED. THE CONTRACTOR SHALL LEAVE THE SITE IN A SAFE, CLEAN, AND LEVEL CONDITION UPON COMPLETION OF EACH DAY'S WORK.

13. REMOVE AND DISPOSE OF ALL STRUCTURES, PAVEMENT AND OTHER MATERIALS IDENTIFIED FOR DEMOLITION OR PLANS AND ELEVATIONS.

14. MATERIALS DESIGNATED FOR REMOVAL SHALL BE DISPOSED OF IN A LEGAL MANNER AT NO ADDITIONAL COST TO THE OWNER.

15. SURFACES TO REMAIN IN THE AREA OF DEMOLITION ARE TO BE REPAIRED AND PATCHED TO MATCH SURROUNDING WORK.

16. FOR SLAB AND WALL REMOVAL, MAKE CUTS ALONG EDGES. DO NOT OVER CUT THE SPECIFIED PORTION.

17. BEFORE STARTING THE DRAINAGE WORK, THE CONTRACTOR SHALL FIELD VERIFY EXISTING DRAINAGE CONDITIONS SHOWN ON THE DRAWINGS, AS WELL AS THE PROPOSED LOCATIONS AND ELEVATIONS. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER IMMEDIATELY.

18. CONTRACTOR SHALL MAINTAIN THE INTEGRITY OF THE EXISTING STORM DRAINAGE AT ALL TIMES.

19. ALL EXISTING SIGNS SHALL BE REMOVED AND STOCKED, UNLESS OTHERWISE NOTED ON PLANS.

20. ALL TIMES WITHIN THE PROJECT LIMITS SHALL REMAIN, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

---

PERMIT PLAN

TOWN PIER FACILITY REHABILITATION
SALISBURY, MASSACHUSETTS

EXISTING SITE & DEMOLITION PLAN

CONTRACT NO 3423-0

MAY 9, 2001 SHEET 8 OF
EXISTING PIER & BULKHEAD LICENCE
PERMIT TO BUILD SOLID FILL PIER
AND TIMBER PIER IN MERRIMAC RIVER
SALISBURY 1948 NO. 3095

MERRIMACK

PERMIT PLAN
TOWN PIER FACILITY REHABILITATION
SALISBURY, MASSACHUSETTS

PERMIT PLAN
CONTRACT NO. 3423-D
MAY 9, 2001  SHEET 13 OF
NEW BULKHEAD
(SEE DWG S-4)

BENT 1

PERMIT PLAN
TOWN PIER FACILITY REHABILITATION
SALISBURY, MASSACHUSETTS

REPLACEMENT PIER ELEVATIONS
CONTRACT NO 3423-D
MAY 9, 2001 SHEET 15 OF
LONGITUDINAL ELEVATION
1/4" = 1'-0"
PERMIT PLAN
TOWN PIER FACILITY REHABILITATION
SALISBURY, MASSACHUSETTS
REPLACEMENT PIER ELEVATIONS
CONTRACT NO 3423-D
MAY 9, 2001 SHEET 18 OF
ELEVATION = 8.5

- ANNUAL HIGH TIDE = 5.5
- MEAN HIGH TIDE = 3.8

- MEAN LOW TIDE = -5.65
- MUDLINE

MATCH LINE SEE SHEET 19

PERMIT PLAN
TOWN PIER FACILITY REHABILITATION
SALISBURY, MASSACHUSETTS
REPLACEMENT PIER ELEVATIONS
CONTRACT NO 3423-D
MAY 9, 2001
SHEET 20 OF
ELEVATION - BENTS 8 & 9

PERMIT PLAN
TOWN PIER FACILITY REHABILITATION
SALISBURY, MASSACHUSETTS
REPLACEMENT PIER ELEVATIONS
CONTRACT NO 3423-D
MAY 9, 2001
SHEET 24 OF
PERMIT PLAN
TOWN PIER FACILITY REHABILITATION
SALISBURY, MASSACHUSETTS
BORING LOCATION PLAN
CONTRACT NO 3423-D
MAY 9, 2001 SHEET 32 OF
PERMIT PLAN
TOWN PIER FACILITY REHABILITATION
SALISBURY, MASSACHUSETTS
BORING LOCATION PLAN
CONTRACT NO 3423-D
MAY 9, 2001 SHEET 33 OF
DETAIL A (STONE SIZE)

NTS

* SEE GENERAL NOTE 3

<table>
<thead>
<tr>
<th>TABLE 1 - BULKHEAD ELEVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BULKHEAD</td>
</tr>
<tr>
<td>SECTION</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

(1) REFER TO CONSTRUCTION NOTE 4 IF ROCK ENCOUNTERED.

MLW -4.8
MHW 4.6
AHTL 6.3

PERMIT PLAN
TOWN PIER FACILITY REHABILITATION
SALISBURY, MASSACHUSETTS

BORING LOCATION PLAN
CONTRACT NO 3423-D
MAY 9, 2001 SHEET 34 OF
CONSTRUCTION NOTES:
1. INSTALL STEEL SHEETING TIGHT TO THE LANDSIDE OF THE EXISTING
   SOLDIER PILE & LAGGING AND TO WATERSIDE OF
   CONCRETE WALL TO TIP ELEVATION SHOWN ON TABLE 1
   OR TO TOP OF ROCK IF ENCOUNTERED ABOVE DESIGNATED ELEVATION.
2. EXCAVATE TO STONE BLOCK BULKHEAD SUBGRADE ELEVATION AS SHOWN
   ON TABLE 1. REMOVE CONCRETE WALL TO ELEVATION SHOWN ON 1.
3. PLACE 3/4" STONE LEVELING COURSE TO ELEVATION B.
4. IF ROCK IS ENCOUNTERED ABOVE ELEVATION B, DELETE CRUSHED STONE.
5. INSTALL WOVEN FILTER FABRIC (SPECIFICATION 02200) AGAINST STONE
   AND BACKFILL WITH ONSITE MATERIAL AS INDICATED ON THE DRAWINGS.
   COMPACT TO 93% OF MAXIMUM DRY DENSITY AS PER ASTM D1557, METHOD C.
6. REMOVE EXISTING SHEET PILING AND LAGGING.
7. CUT AND REMOVE STEEL SHEETING TO ELEVATIONS SHOWN ON THE
   DRAWINGS.
8. IMPACTS DUE TO REMOVAL OF EXISTING BULKHEAD AND CUTTING OF STEEL
   SHEET WILL BE MITIGATED BY REGRADING DISTURBED SOIL AND REPLANTING
   EXISTING PLANTS DAILY WITH THE TIDE CYCLE.

GENERAL NOTES:
1. ELEVATIONS REFER TO NGVD (1929). THE BENCH MARK
   BEING THE TOP OF A STONE BOUND EL = 10.51'.
2. FOR BORING LOGS SEE SPECIFICATION. PROBES WERE DRILLED
   WITH A 2 1/4" SOLID AUGER TO 5.0 FT. ALL PROBES REACHED
   5.0 FT WITHOUT REFUSEL EXCEPT P-17 WHICH ENCOUNTERED
   PROBABLE BOULDER AT 4.7 FT.
Section III

Newburyport
Section III – Community Findings – City of Newburyport

COMMUNITY DESCRIPTION

The City of Newburyport consists of a land area of 8.38 square miles out of a total area of 10.58 square miles and had a population of 17,189 in the 2000 census. The City is located on the North Shore of Massachusetts and its location can be seen on this report’s cover. The estimated length of shoreline that is directly exposed to open ocean waves is 1 miles with the remaining shoreline semi-protected by offshore structures or landforms. The City is protected from major coastal storms by both natural and man-made shoreline structures that require maintenance to insure the long term protection of its coastline. The man-made and publicly owned structures that protect the City were investigated for their ability to provide adequate protection from major coastal storms. Structures have been identified as publicly owned, including coastal dunes and beaches, based on evidence of investment of public funds made to create/enhance/maintain these structures. The assessment did not include floating or pile supported structures as they are assumed not to provide any significant coastal protection from major storm events.

STRUCTURE INVENTORY

Within the City of Newburyport, there were 17 structures which had public or unknown ownership which provide significant coastal protection. The location of the structures can be seen in Sheets 1 through Sheet 3 in Section III-B of this report. The structures were categorized by their type and by their structural condition based on a preliminary field assessment. The distribution of structures by type and condition can be seen in the following table:

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>Structure Condition Rating</th>
<th>Total Length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Bulkhead / Seawall</td>
<td>11</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Revetment</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Breakwater</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groin / Jetty</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Coastal Dune</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Beach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>1</td>
<td>9</td>
</tr>
</tbody>
</table>

Within the above table, the total length of each type of structure is also provided. The structures are listed by the type which is providing the primary coastal protection. Many sites have multiple structure types at the same location (i.e. revetment in front of seawall). These secondary structures, although not identified within these tables, are included in the development of repair/rehabilitation costs.

The development of repair costs has been included by structure type and by condition. In the City of Newburyport’s case there are a total of 16 structures which would require approximately $2.1 million to bring all the coastal structures to “A” Rating. Most critical will be the structures in the “D” and “F” classifications as those are assumed to undergo some level of damage or failure during the next major coastal storm event of which Newburyport has none.
MASSACHUSETTS COASTAL INFRASTRUCTURE
INVENTORY AND ASSESSMENT PROJECT

STRUCTURE REPAIR / RECONSTRUCTION COST - City of Newburyport

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkhead / Seawall</td>
<td>11</td>
<td>$499,191</td>
<td>$1,260,454</td>
<td></td>
<td></td>
<td></td>
<td>$1,759,645</td>
</tr>
<tr>
<td>Revetment</td>
<td>5</td>
<td>$256,885</td>
<td>$66,528</td>
<td></td>
<td></td>
<td></td>
<td>$323,413</td>
</tr>
<tr>
<td>Breakwater</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groin / Jetty</td>
<td>1</td>
<td></td>
<td></td>
<td>$30,025</td>
<td></td>
<td></td>
<td>$30,025</td>
</tr>
<tr>
<td>Coastal Dune</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Beach</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>$</td>
<td>$756,076</td>
<td>$1,357,007</td>
<td>$</td>
<td>$</td>
<td>$2,113,083</td>
</tr>
</tbody>
</table>

Based on the limited research within the scope of this project research, the presumed ownership of the structures was established on an initial basis and would be subject to more intense review in future tasks. Structures identified as being owned privately were excluded from further consideration. Although ownership of the land on which the structure was located was a factor, the structure ownership was treated as a separate issue from land ownership. For the City of Newburyport, the breakdown of structures by assumed ownership is as follows:

STRUCTURE OWNERSHIP / REPAIR COST - City of Newburyport

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town Owned</td>
<td>16</td>
<td>$756,076</td>
<td>$1,180,226</td>
<td></td>
<td></td>
<td></td>
<td>$1,936,302</td>
</tr>
<tr>
<td>Commonwealth of Massachusetts</td>
<td>1</td>
<td>$176,781</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$176,781</td>
</tr>
<tr>
<td>Federal Government Owned</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown Ownership</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>$</td>
<td>$756,076</td>
<td>$1,357,007</td>
<td>$</td>
<td>$</td>
<td>$2,113,083</td>
</tr>
</tbody>
</table>

The identification of presumed ownership was not based on the investigation of legal documents but relied on property ownership and from construction and regulatory documents that were found. A more detailed investigation of legal documents and agreements would be required where structure ownership is disputed. A more detailed identification of structure type, length, condition and location can be found in Section III-B which contains Structure Assessment Reports for each individual structure found.

SUMMARY

The enclosed reports and associated documents reflects the City of Newburyport’s coastal structure information that will eventually be input into a state-wide GIS database and will be accessible through MassGIS. This data, when compiled state-wide, will be critical in the development of both short term and long term planning for maintaining and improving Massachusetts coastal protection.

This database will also provide relatively quick access to identify available documentation for these structures as well as the ability to be updated as coastal structure improvements are made.
Section III - Newburyport

Part B

Structure Assessment Reports
COASTAL STRUCTURE LOCATION PLAN

CITY OF NEWBURYPORT
COASTAL INFRASTRUCTURE INVENTORY
AND ASSESSMENT PROJECT
DECEMBER 2007

SCALE: 1" = 150'

B.C. E. Bourne Consulting Engineering

SHEET 3
Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Newburyport

Location: Railroad Avenue

Based On Comment:

Earliest Structure Record: 1975

Estimated Reconstruction/Repair Cost: $918,060.00

Length: 535 Feet
Top Elevation: NAVD 88 Feet
FIRM Map Zone: V3
FIRM Map Elevation: 13 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Steel
Primary Height: Over 15 Feet

Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
Steel sheetpiles cells with a concrete cap with moderate sheetpile corrosion in splash and tidal zones. There are minor defects on the concrete cap. It is in fair condition for storm protection. The boardwalk and park are above.

Condition Rating
C Fair

Level of Action Description
Moderate

Priority Rating
II Low Priority

Action Description
Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
- 051-011-000-001B-100-PHO1A.JPG
- 051-011-000-001B-100-PHO1B.JPG

Structure Documents:
- USACE July 1975 Propose Rebuild of
- MA-DCR November 2 Boardwalk
- DEP June 1976 Plans Accompanying

Prepared By: Bourne Consulting Engineering
<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Railroad Avenue</td>
<td>7/23/2007</td>
</tr>
<tr>
<td>Presumed Structure Owner:</td>
<td>Based On Comment:</td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner Name:</td>
<td>Earliest Structure Record:</td>
<td>Estimated Reconstruction/Repair Cost:</td>
</tr>
<tr>
<td>Newburyport</td>
<td>1975</td>
<td>$109,824.00</td>
</tr>
</tbody>
</table>

Length: 320 Feet NAVD 88  
Top Elevation: Feet NGVD  
FIRM Map Zone: V3  
FIRM Map Elevation: 13  

Primary Type: Bulkhead/ Seawall  
Primary Material: Steel  
Primary Height: Over 15 Feet  
Secondary Type:  
Secondary Material:  
Secondary Height:  

Structure Summary:  
A steel sheetpile bulkhead with tie-backs and concrete cap with moderate steel corrosion in the splash and tidal zones. It is in satisfactory condition for storm protection.

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Priority Rating</th>
<th>Level of Action</th>
<th>Action Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B Good</td>
<td>II Low Priority</td>
<td>Minor</td>
<td>Inshore Structures Present with Limited potential for Significant Infrastructure Damage</td>
</tr>
</tbody>
</table>

Description: Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Structure Images:  
051-011-000-001B-200-PHO2A.JPG  
051-011-000-001B-200-PHO2B.JPG  
051-011-000-001B-200-PHO2C.JPG

Structure Documents:  
USACE July 1975 Propose Rebuild of Boardwalk  
MA-DCR November 2 Plans Accompanying  
DEP June 1976  

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner:
Local

Location:
Railroad Avenue

Date:
7/23/2007

Presumed Structure Owner:
Local

Based On Comment:

Owner Name:
Newburyport

Earliest Structure Record:
1975

Estimated Reconstruction/Repair Cost:
$80,652.00

Length: 235 Feet
Top Elevation: Feet NAVD 88

FIRM Map Zone: V3
FIRM Map Elevation: Feet NGVD 13

Primary Type: Bulkhead/Seawall
Primary Material: Steel
Primary Height: Over 15 Feet

Secondary Type:
Secondary Material:
Secondary Height:

Structure Summary:
Steel sheetpile cells with a concrete cap. There is moderate corrosion in the splash and tidal zones and minor defects on concrete cap. It is in satisfactory condition for storm protection.

Condition Rating
B Good

Priority Rating
II Low Priority

Level of Action Description
Minor Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure/landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent/limit future deterioration and extend life of structure.

Structure Images:
051-011-000-001B-300-PHO3A.jpg

Structure Documents:
USACE July 1975 Propose Rebuild of 051-011-000-001B-300-COE3A
MA-DCR November 2 Boardwalk 051-011-000-001B-300-DCR3A
DEP June 1976 Plans Accompanying 051-011-000-001B-300-LIC3A

Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

**Property Owner:** Local

**Location:** Railroad Avenue

**Date:** 7/23/2007

**Presumed Structure Owner:** Local

**Based On Comment:**

**Owner Name:** Newburyport

**Earliest Structure Record:** 2001

**Estimated Reconstruction/Repair Cost:** $0.00

<table>
<thead>
<tr>
<th>Length: 125 Feet</th>
<th>Top Elevation: 3 Feet NAVD 88</th>
<th>FIRM Map Zone: V3</th>
<th>FIRM Map Elevation: 13 Feet NGVD</th>
</tr>
</thead>
</table>

**Primary Type:** Bulkhead/Seawall

**Primary Material:** Stee

**Primary Height:** Over 15 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

**Structure Summary:**
A coated steel sheet pile bulkhead with concrete cap in good condition. There is a park area behind the wall.

**Condition Rating**
- **Priority Rating**
  - **Level of Action**
    - **Description**

  Like new condition. Structure expected to withstand major coastal storm without damage. Stable landform (beach, dune or bank). Adequate system exists to provide protection from major coastal storm.

**Structure Images:**
051-011-000-001B-400-PH04A.jpg

**Structure Documents:**
MA-DCR November 2 Boardwalk 051-011-000-001B-400-DCR4A

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Town: Newburyport
Structure ID: 051-011-000-002-100
Key: community-map-block-parcel-structure

Property Owner: State
Presumed Structure Owner: State
Owner Name: MHD

Location: Gillis Bridge
Date: 3/13/2009

Based On Comment:

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $176,781.00

Length: 55 Feet NAVD 88
Top Elevation: 10 Feet NGVD
FIRM Map Zone: A2
FIRM Map Elevation: 10 Feet NGVD

Primary Type: Bulkhead / Seawall
Primary Material: Stone
Primary Height: Over 15 Feet

Secondary Type: Revetment
Secondary Material: Stone
Secondary Height: Over 15 Feet

Structure Summary:
Stone blocks that are approximately 4 feet by 2 feet by 2 feet with dumped stone that varies in size in front of them. Most of the dumped stones are 3 feet in diameter. Heavy rotation and movement of the stones behind structure is the bridge abutment for Gillis Bridge.

Condition Rating
C Fair

Level of Action Description
Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

Priority Rating Action Description
III Moderate Priority Consider for Active Project Improvement Listing Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

Structure Images:
051-011-000-002-100-PHO1A.JPG
051-011-000-002-100-PHO1B.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
## Structure Assessment Form

**Property Owner:**
- Local

**Presumed Structure Owner:**
- Local

**Owner Name:**
- Newburyport

**Location:**
- Fish Coop

**Based On Comment:**

**Earliest Structure Record:**
- 2001

**Estimated Reconstruction/Repair Cost:**
- $96,096.00

**Date:**
- 7/23/2007

**Length:**
- 280 Feet NAVD 88

**Top Elevation:**
- 12 Feet NGVD

**FIRM Map Zone:**
- V3

**FIRM Map Elevation:**
- 

**Primary Type:**
- Bulkhead/Seawall

**Primary Material:**
- Steel

**Primary Height:**
- Over 15 Feet

**Secondary Type:**
- 

**Secondary Material:**
- 

**Secondary Height:**
- 

**Structure Summary:**
A steel sheetpile bulkhead with tie-backs in satisfactory condition with minor general corrosion. A portion of the area behind the bulkhead is a commercial boat loading/unloading area.

**Condition Rating**
- B Good

**Level of Action Description**
- Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure/landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent/limit future deterioration and extend life of structure.

**Priority Rating Action Description**
- II Low Priority
- Future Project Consideration
- Inshore Structures Present with Limited potential for Significant Infrastructure Damage

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**Structure Images:**
- 051-012-000-009-100-PHO1A.jpg

**Structure Documents:**
- MA-DCR November 2 Boardwalk 051-012-000-009-100-DCR1A

---

**Prepared By:** Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Newburyport

Location: Harbor Master Office Area
Based On Comment:
Earliest Structure Record: 2001
Estimated Reconstruction/Repair Cost: $27,456.00

Town: Newburyport
Structure ID: 051-012-000-009-200
Key: community-map-block-parcel-structure

Date: 7/23/2007

Length: 80 Feet
Top Elevation: 88 Feet NAVD 88
FIRM Map Zone: V3
FIRM Map Elevation: 12 Feet NGVD

Primary Type: Bulkhead/ Seawall
Primary Material: Steel
Primary Height: Over 15 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
A steel sheetpile bulkhead with park boardwalk above, with general minor corrosion of sheet pile. In satisfactory condition.

Condition Rating
Level of Action Description
B Good Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
051-012-000-009-200-PHO2A.JPG

Structure Documents:
MA-DCR November 2 Boardwalk 051-012-000-009-200-DCR2A

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner:
Local

Presumed Structure Owner:
Local

Owner Name:
Newburyport

Location:
Harbor Master Building

Based On Comment:

Earliest Structure Record:
2001

Estimated Reconstruction/Repair Cost:
$29,858.00

Length: 60 Feet
Top Elevation: Feet NAVD 88

FIRM Map Zone: V3
FIRM Map Elevation: 12 Feet NGVD

Primary Type: Revetment
Primary Material: Stone
Primary Height: Over 15 Feet

Secondary Type: Bulkhead/Seawall
Secondary Material: Steel
Secondary Height: 10 to 15 Feet

Structure Summary:
A steel framed deck spanning over placed stone block revetment and drainage outfall, in satisfactory condition. The Harbor Master building is set back.

Condition
Rating
Level of Action
Description

Priority
Rating
Action
Description

V
Immediate / Highest Priority
Consider For Immediate Action Due to Public Safety and Welfare Issues
Critical Inshore Structures Present with Potential for Infrastructure Damage and/or High Density Residential Dwellings Condition of structure may warrant emergency stabilization as failure may result in potential loss of property and/or life. (>10 dwellings impacted / 100 feet of shoreline)

Structure Images:
051-012-000-009-300-PHO3A.JPG

Structure Documents:
MA-DCR November 2 Boardwalk 051-012-000-009-300-DCR3A

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

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<th>Location:</th>
<th>Date:</th>
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<th>FIRM Map Elevation: 12 Feet NGVD</th>
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Primary Type: Bulkhead/Seawall  
Primary Material: Concrete  
Primary Height: Under 5 Feet  
Secondary Type: Revetment  
Secondary Material: Stone  
Secondary Height: 5 to 10 Feet

Structure Summary:
A precast concrete wave return wall above large placed stone revetment along Water Street. Above the salt marsh, there are two areas with small localized sinkholes in the sidewalk; in satisfactory condition.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Rating</th>
<th>Priority</th>
<th>Level of Action</th>
<th>Action</th>
<th>Description</th>
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<tr>
<td>B</td>
<td>Good</td>
<td>II</td>
<td>Minor</td>
<td>Low Priority</td>
<td>Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.</td>
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Structure Images:
051-026-000-028-100-PHO1A.JPG  
051-026-000-028-100-PHO1B.JPG

Structure Documents:
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<td>March 1971</td>
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<td>Proposed Shore</td>
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<td>051-026-000-028-100-COE1A</td>
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Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Newburyport

Location: Water Street
Based On Comment:
Earliest Structure Record: Unknown

Length: 85 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: V3
FIRM Map Elevation: Feet NGVD 12

Primary Type: Bulkhead/ Seawall
Primary Material: Stone
Primary Height: Under 5 Feet
Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
A mortared rubble stone wall with granite cap stones and some repair concrete cast in place. There is a collapsed area 8 feet long with overtopping erosion in fair condition. Located at the Bus Stop, adjacent to Water street.

Condition Rating
C Fair

Level of Action Description
Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

Priority Rating
I None

Action Description
No Inshore Structures or Residential Dwelling Units Present

Structure Images:
051-030-000-009-100-PH01A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Newburyport

Location: Simons Beach
Based On Comment:
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $57,380.00

Date: 7/23/2007

Length: 135 Feet
Top Elevation: 12 Feet NGVD
FIRM Map Zone: V3
FIRM Map Elevation: Unknown

Primary Type: Bulkhead / Seawall
Primary Material: Stone
Primary Height: Under 5 Feet

Secondary Type: Secondary Material: Secondary Height:

Length: 135 Feet
Top Elevation: 12 Feet NGVD
FIRM Map Zone: V3
FIRM Map Elevation: Unknown

Primary Type: Bulkhead / Seawall
Primary Material: Stone
Primary Height: Under 5 Feet

Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
A stone seawall inshore of salt marsh along Water Street, in fair condition. It is mortared rubble with a granite block cap. There is some mortar missing and overtopping scour damage.

Condition Rating Level of Action Description
C Fair Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images: 051-030-000-013-100-PH01A.JPG
Structure Documents:

Prepared By: Bourne Consulting Engineering
### CZM Coastal Infrastructure Inventory and Assessment

#### Structure Assessment Form

**Property Owner:** Local

**Presumed Structure Owner:** Local

**Owner Name:** Newburyport

**Location:** Simons Beach

**Based On Comment:**

**Earliest Structure Record:** Unknown

**Date:** 7/23/2007

**Estimated Reconstruction/Repair Cost:** $66,528.00

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<td>200 Feet</td>
<td>Feet NAVD 88</td>
<td>V3</td>
<td>12 Feet NGVD</td>
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</tbody>
</table>

**Primary Type:** Revetment

**Primary Material:** Stone

**Primary Height:** Under 5 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

---

**Structure Summary:**
A dumped rubble stone revetment with random alignment in fair condition, along Water Street.

**Condition Rating**

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<th>Condition</th>
<th>Rating</th>
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<td>Fair</td>
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**Level of Action Description**
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

**Priority Rating Action Description**

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<th>Action</th>
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<td>Future Project Consideration</td>
<td>Inshore Structures Present with Limited potential for Significant Infrastructure Damage</td>
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**Structure Images:** 051-030-000-013-200-PH02A.JPG

**Structure Documents:**

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**Prepared By:** Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

**Structure Assessment Form**

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<th>Primary Material:</th>
<th>Primary Height:</th>
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<tbody>
<tr>
<td>Stone</td>
<td>5 to 10 Feet</td>
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**Structure Summary:**
A mortared rubble stone wall with precast concrete cap, along Water Street at top of salt marsh. There are some joints missing mortar and a few missing stones. It is in fair condition.

**Condition Rating**
- **Description:** Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

**Priority Rating**
- **Level of Action Description:**
  - Moderate
  - Low Priority
  - Inshore Structures Present with Limited potential for Significant Infrastructure Damage

**Structure Images:**
- [051-030-000-013-300-PHO3A.JPG]

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Newburyport

Location: Cashman Park
Based On Comment: 
Earliest Structure Record: 1974
Estimated Reconstruction/Repair Cost: $70,270.00

Date: 7/23/2007

Length: 585 Feet
Top Elevation: 9 Feet NGVD
FIRM Map Zone: A2
FIRM Map Elevation: 

Primary Type: Revetment
Primary Material: Stone
Primary Height: 5 to 10 Feet

Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
A medium size stone placed revetment parallel with slope that protects the parking lot and sidewalk including the apparently abandoned boat ramp. The revetment is in satisfactory condition.

Condition Rating
Level of Action Description
B Good Minor Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
[051-054-000-003-100-PHO1A.JPG]

Structure Documents:
[USACE June 1974 Proposed 051-054-000-003-100-COE1A]
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local

Presumed Structure Owner: Local

Owner Name: Newburyport

Location: Cashman Park

Based On Comment:

Earliest Structure Record: 1993

Estimated Reconstruction/Repair Cost: $52,853.00

Date: 7/23/2007

Length: 440 Feet

Top Elevation: 9 Feet NAVD 88

FIRM Map Zone: A2

FIRM Map Elevation: 9 Feet NGVD

Primary Type: Revetment

Primary Material: Stone

Primary Height: 5 to 10 Feet

Secondary Type: Secondary Material:

Secondary Height:

Structure Summary:
A medium size stone placed revetment parallel with slope, protecting sidewalk and parking lot, including active boat ramp. Some loss of undersized underlayer, but in satisfactory condition.

Condition Rating B

Priority Rating Low Priority

Level of Action Minor

Future Project Consideration

Description Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
051-054-000-003-200-PHO2A.JPG

Structure Documents:
DEP February 19 Plan Accompanying 051-054-000-003-200-LIC2A

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

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<td>Presumed Structure Owner:</td>
<td>Based On Comment:</td>
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<td>Local</td>
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<td>A2</td>
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<table>
<thead>
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<th>Primary Type: Revetment</th>
<th>Primary Material: Stone</th>
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<tr>
<td>Primary Height: 5 to 10 Feet</td>
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<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
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</thead>
<tbody>
<tr>
<td>Secondary Height:</td>
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</table>

Structure Summary:
A medium size stone placed revetment parallel with slope, protecting sidewalk and lawn area. There is some loss of undersized underlayer and areas with wave over erosion and scour. It is in satisfactory condition.

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Priority Rating</th>
<th>Level of Action Description</th>
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<tbody>
<tr>
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Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Structure Images:
051-054-000-003-300-PHO3A.JPG

Structure Documents:
DEP November 2 Plan Accompanying 051-054-000-003-300-LIC3A

Prepared By: Bourne Consulting Engineering
**CZM Coastal Infrastructure Inventory and Assessment**  
**Structure Assessment Form**

**Property Owner:** Local  
**Presumed Structure Owner:** Local  
**Owner Name:** Newburyport  
**Location:** Cashman Park  
**Dates:**  
- **Date:** 7/23/2007  
- **Estimated Reconstruction/Repair Cost:** $30,025.00  

**FIRM Map Zone:** A2  
**FIRM Map Elevation:** 9  
**Top Elevation:** 25 Feet NAVD 88  
**Feet NGVD:**  

**Length:**  
- **25** Feet NAVD 88  
- **9** Feet NGVD  

**Top Elevation:** 25 Feet NAVD 88  
**Feet NGVD:**  

**Primary Type:** Groin/ Jetty  
**Primary Material:** Stone  
**Primary Height:** 5 to 10 Feet  
**Secondary Type:**  
**Secondary Material:**  
**Secondary Height:**  

**Structure Summary:**  
A placed stone groin with concrete end wall at drain outfall. There is some erosion of the undersized underlayer, and crest stones with poor interlocking and open joints. It is in fair condition.

**Condition Rating**  
- **Condition:** C  
- **Rating:** Fair

**Level of Action Description**  
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

**Priority Rating Action Description**  
- **Priority:** II  
- **Rating:** Low Priority  
- **Action:** Future Project Consideration  
- **Description:** Inshore Structures Present with Limited potential for Significant Infrastructure Damage

**Structure Images:**  
- 051-054-000-003-400-PHO4A.JPG

**Structure Documents:**  
- **DEP**  
- **November 2 Plan Accompanying**  
- 051-054-000-003-400-LIC4A

Prepared By: Bourne Consulting Engineering
Section III - Newburyport

Part C

Structure Photographs
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<th>BCE Structure No</th>
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<th>Contract/ Drawing Number</th>
<th>Entity</th>
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<td>Structure Condition Photo at Time of Survey</td>
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<td>Structure Condition Photo at Time of Survey</td>
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</tbody>
</table>
Section III - Newburyport

Part D

Structure Documents

TOWN DOCUMENT LIST

MA DCR - DOCUMENT LIST

MA DEP – Ch 91 DOCUMENT LIST

- Copies of License Documents

USACE – PERMIT DOCUMENT LIST

- Copies of Permit Documents
<table>
<thead>
<tr>
<th>BCE Structure No</th>
<th>Document No</th>
<th>Contract/Drawing Number</th>
<th>Entity</th>
<th>Municipality</th>
<th>Date</th>
<th>Title</th>
<th>Sheets</th>
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<th>Description</th>
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<tr>
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<td>2002-01</td>
<td>MA-DCR</td>
<td>Newburyport</td>
<td>November 2001</td>
<td>Boardwalk Renovations and Extension Project</td>
<td>44</td>
<td>Between Center Street and Green Street</td>
<td>Bulkhead</td>
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<tr>
<td>051-011-000-001B-200</td>
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<td>2002-01</td>
<td>MA-DCR</td>
<td>Newburyport</td>
<td>November 2001</td>
<td>Boardwalk Renovations and Extension Project</td>
<td>44</td>
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<td>Bulkhead</td>
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<tr>
<td>051-011-000-001B-300</td>
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<td>44</td>
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<td>Bulkhead</td>
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<td>Bulkhead</td>
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<td>MA-DCR</td>
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<td>44</td>
<td>Between Center Street and Green Street</td>
<td>Bulkhead</td>
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<td>2002-01</td>
<td>MA-DCR</td>
<td>Newburyport</td>
<td>November 2001</td>
<td>Boardwalk Renovations and Extension Project</td>
<td>44</td>
<td>Between Center Street and Green Street</td>
<td>Bulkhead</td>
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<td>MA-DCR</td>
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<td>November 2001</td>
<td>Boardwalk Renovations and Extension Project</td>
<td>44</td>
<td>Between Center Street and Green Street</td>
<td>Bulkhead</td>
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<td>194 DEP</td>
<td>Newburyport</td>
<td>June 1976</td>
<td>Plane Accompanying Petition of Newburyport Authority to Maintain Existing Fill and to Place and Maintain Bulkhead and Fill in Merrimack River, Newburyport, MA</td>
<td>2</td>
<td>Railroad Ave</td>
<td>Bulkhead and Fill</td>
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<td>051-011-000-001B-200-LIC2A</td>
<td>194 DEP</td>
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<td>June 1976</td>
<td>Plane Accompanying Petition of Newburyport Authority to Maintain Existing Fill and to Place and Maintain Bulkhead and Fill in Merrimack River, Newburyport, MA</td>
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<td>Railroad Ave</td>
<td>Bulkhead and Fill</td>
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<td>194 DEP</td>
<td>Newburyport</td>
<td>June 1976</td>
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<td>2</td>
<td>Railroad Ave</td>
<td>Bulkhead and Fill</td>
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<td>051-054-000-003-200</td>
<td>051-054-000-003-200-LIC2A</td>
<td>3214 DEP</td>
<td>Newburyport</td>
<td>February 1993</td>
<td>Plan Accompanying Petition of City of Newburyport to License and Maintain a Boat Ramp, Floats, Pile and Dolphin Cluster - Merrimack River - Newburyport, Essex County, MA</td>
<td>4</td>
<td>Cashman Park</td>
<td>Existing Riprap</td>
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<td>051-054-000-003-300-LIC3A</td>
<td>9105 DEP</td>
<td>Newburyport</td>
<td>November 2001</td>
<td>Plan Accompanying Petition of City of Newburyport, MA, to Construct Stone Revetment</td>
<td>8</td>
<td>Merrimack River</td>
<td>Stone Revetment</td>
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<td>051-054-000-003-400</td>
<td>051-054-000-003-400-LIC4A</td>
<td>9105 DEP</td>
<td>Newburyport</td>
<td>November 2001</td>
<td>Plan Accompanying Petition of City of Newburyport, MA, to Construct Stone Revetment Merrimack River</td>
<td>8</td>
<td>Merrimack River</td>
<td>Stone Revetment</td>
<td></td>
</tr>
</tbody>
</table>
PLANS ACCOMPANYING PETITION OF NEWBURYPORT REDEVELOPMENT AUTHORITY TO MAINTAIN EXISTING FILL AND TO PLACE AND MAINTAIN BULKHEAD AND FILL IN MERRIMACK RIVER NEWBURYPORT, MASS.

JUNE, 1976
SASAKI ASSOCIATES WATERTOWN, MASS.

Sheet 1 of 2

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED IN CONFORMITY WITH THE RULES AND REGULATIONS OF THE BOARD OF ZONING OF THE CITY OF NEWBURYPORT, MASS. AND THAT IT IS IN CONFORMITY WITH THE ZONING LAWS OF THE COMMONWEALTH OF MASSACHUSETTS.

APPROVAL UNDER THE SUBDIVISION CONTROL LAW IS NOT REQUIRED.

[Signature]
2/16/1976
TIMBER FLOAT SECTION
SCALE: 1"=2'

CONCRETE RAMP SECTION
SCALE: 1"=10'

LICENSE PLAN NO. 3214
Approved by Department of Environmental Protection
Date: Feb 10 1993

CITY OF NEWburyPORT MAY 7, 1992 SHEET 3 OF 4
REVETMENT SECTION

DATUM EL 0.0

SCALE: 1"=4'

NOTES:

ELEVATIONS ARE SHOWN IN FEET AND TENTHS BASED ON THE PLANE OF MEAN LOW WATER. NEGATIVE VALUES REPRESENT DEPTHS BELOW THAT SAME PLANE.

FLOOD ZONE A2 EL 3 MSL.

ALL TIMBER ABOVE THE HIGH TIDE LINE SHALL BE CCA TREATED AT 1.0 pcf.

ALL TIMBER BELOW THE HIGH TIDE LINE SHALL BE CCA TREATED AT 2.5 pcf.

ALL HARDWARE SHALL BE GALVANIZED.

FACILITY PROVIDES PUBLIC ACCESS TO NAVIGABLE WATERS.

VOLUME OF FILL BELOW THE MEAN HIGH WATER LINE = 564 C.Y.

VOLUME OF FILL BELOW THE HIGH TIDE LINE = 1,028 C.Y.

ABUTTERS:

NORTHERLY:
MERRIMAC CORPORATION
TOWLE
280 MERRIMAC
NEWBURYPORT, MA 01950

SOUTHERLY:
RIVERS EDGE CONDO ASSOC.
WILLIAM KRUMPSKY
126 MERRIMAC UNIT 40
NEWBURYPORT, MA 01950

CITY OF NEWBURYPORT
MAY 7, 1992

SHEET 4 OF 4
EXISTING CONDITIONS PLAN

NOTES:
1. DATUM: MLLW = 0.00; MHW = 8.00; HTL = 9.00;
   FEMA 100YR FLOODPLAIN EL = 12.1.
2. SURVEY PERFORMED BY NUCCI VINE ASSOCIATES, INC.
   FEB 16 AND FEB 23, 2001. CAN VARY DUE TO SEASONAL AND WEATHER CONDITIONS.
   SURVEY ON FEB 23 PERFORMED WITH GROUND SNOW COVER. PARK SITE FEATURE LOCATIONS APPROXIMATE.
3. PROPERTY LINE AND SOME SITE FEATURES APPROXIMATELY
   SCALE FROM CITY ASSESSOR PLANS AND AVAILABLE DOCUMENTS.

LICENCE PLAN NO. 9105
Approved by Department of Environmental Protection of Massachusetts

Nov 8, 2001
<table>
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<th>BCE Structure No</th>
<th>Document No</th>
<th>Contract/ Drawing Number</th>
<th>Entity</th>
<th>Municipality</th>
<th>Date</th>
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<th>Description</th>
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<td>75-253</td>
<td>USACE</td>
<td>Newburyport</td>
<td>July 1975</td>
<td>Propose Rebuild of Seawall with Public Dock in Merrimack River at Newburyport - County of Essex, State of Massachusetts</td>
<td>5</td>
<td>Water Street</td>
<td>Seawall Rebuild</td>
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<td>051-011-000-0018-300-COE3A</td>
<td>75-253</td>
<td>USACE</td>
<td>Newburyport</td>
<td>July 1975</td>
<td>Propose Rebuild of Seawall with Public Dock in Merrimack River at Newburyport - County of Essex, State of Massachusetts</td>
<td>5</td>
<td>Water Street</td>
<td>Seawall Rebuild</td>
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<td>051-026-000-028-100-COE1A</td>
<td>71-174</td>
<td>USACE</td>
<td>Newburyport</td>
<td>March 1971</td>
<td>Proposed Shore Protection - Concrete Seawall - Merrimack River - Newburyport - Application by DPW of Massachusetts - Division of Waterways</td>
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<td>Concrete Seawall</td>
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<td>74-203</td>
<td>USACE</td>
<td>Newburyport</td>
<td>June 1974</td>
<td>Proposed Reconstruction of Access Ramp and Facilities - Merrimack River - Cashman Park - Newburyport, Massachusetts - Application by DPW of Massachusetts - Division of Waterways</td>
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<td>Cashman Park</td>
<td>Reconstruction</td>
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</tbody>
</table>
PURPOSE: Propose to rebuild seawall with public dock

DATUM: Mean sea level

ADJACENT PROPERTY OWNERS
1. Melcom L. & Beverly T. Hudson
2. Graf Trust

IN Merrimack River
AT Newburyport
COUNTY OF Essex STATE Mass.
APPLICATION BY

SHEET 1 OF 5 DATE 7-9-72
exist ground

9" Reinforced conc. deck

El. 9.0

El. 4.5 mean high water

El. 4.5 mean low water

PZ-32 Steel sheet piling

Tieback and deadman

Public float

El. 15.0

exist. river bottom

SECTION "A"

HORIZONTAL

1" = 10'

scale

feet

1" = 40'

scale

feet

Datum mean sea level

Sheet 2 of 5
PURPOSE: Propose to rebuild seawall with public dock

DATUM: Mean sea level

ADJACENT PROPERTY OWNERS
1. Malcom L. & Beverly T. Hudson
2. Graf Trust

IN Merrimack River
AT Newburyport
COUNTY OF Essex STATE Mass.
APPLICATION BY

SHEET 1 OF 5 DATE 7-9-72
EXIST. GROUND

9'' Reinforced conc. deck

EXIST. WOOD BULKHEAD

Tieback and Deadman

PZ-32 Steel sheet piling

Dredged to EL-17.0

Estimated Volume of dredged material = 4,300 CF

EXIST. RIVER BOTTOM

SECTION "B"

HORIZONTAL

40 0 40 80

scale feet

T=40'

VERTICAL

10 5 0 10 20

scale feet

T=10'

Datum: Mean sea level
Sheet 3 of 5
SECTION "C"

HORIZONTAL

1"=40'

40
0
40
80

scale
feet

VERTICAL

1"=10'

10
5
0
10
20

scale
feet

Datum mean sealevel
Sheet 4 of 5

exist. ground

35'

9" Reinforced conc. deck

El. 9.0

El. 4.5 M.H.W

El. -4.5 ML.W

Stone & gravel fill
Tieback & deadman

PZ-32 Steel sheet piling

Public float

exist. river bottom
PURPOSE: Propose to rebuild seawall with public dock

DATUM: Mean sea level

ADJACENT PROPERTY OWNERS
1. Malcolm L. & Beverly T. Hudson
2. Graf Trust

IN Merrimack River
AT Newburyport
COUNTY OF Essex STATE Mass.
APPLICATION BY

SHEET 1 OF 5 DATE 7-9-73
NOTE:
ELEVATIONS ARE IN FEET AND TENTHS ABOVE THE PLANE OF MEAN LOW WATER.
MINUS FIGURES SHOW DEPTHS BELOW THE SAME PLANE.
LOCATION OF PROPOSED WORK SHOWN IN RED.
SURVEY DATE: APRIL 1970
CONTRACT NO. 2715

PLAN OF WATER ST. SEAWALL & BOAT RAMP
SCALE 1"=50'

SECTION THRU BOAT RAMP
SCALE 1"=50'

SECTION A-A
SCALE 1"=50'

PROPOSED SHORE PROTECTION
CONCRETE SEAWALL
MERRIMACK RIVER
NEWBURYPORT

APPLICATION BY
DEPARTMENT OF PUBLIC WORKS OF MASSACHUSETTS
DIVISION OF WATERWAYS
MARCH 1970

ACT. DEPUTY CHIEF ENGINEER FOR WATERWAYS

Fred C. Schueler
NOTE: Elevations are in feet and tenths and refer to the plane of Mean Low Water, minus figures denote depths below that plane.

CONTRACT NO. 62 P.A.
LOCATION OF PROPOSED WORK SHOWN IN RED

PROPOSED RECONSTRUCTION OF ACCESS RAMP AND FACILITIES
MERRIMACK RIVER
CASHMAN PARK
NEWBURYPORT MASS.
APPLICATION BY
DEPARTMENT OF PUBLIC WORKS
OF MASSACHUSETTS
DIVISION OF WATERWAYS
JUNE, 1979

SIGNED

DEPUTY CHIEF ENGINEER - WATERWAYS
PROPOSED RECONSTRUCTION OF
ACCESS RAMP AND FACILITIES
MERRIMACK RIVER
CASHMAN PARK
NEWBURYPORT MASS.
APPLICATION BY
DEPARTMENT OF PUBLIC WORKS
OF MASSACHUSETTS
DIVISION OF WATERWAYS
Section IV

Newbury
Section IV – Community Findings – Town of Newbury

COMMUNITY DESCRIPTION

The Town of Newbury consists of a land area of 24.25 square miles out of a total area of 26.45 square miles and had a population of 6,717 in the 2000 census. The Town is located on the North Shore of Massachusetts and its location can be seen on this report’s cover. The estimated length of shoreline that is directly exposed to open ocean waves is 5 miles with the remaining shoreline semi-protected by offshore structures or landforms. The Town is protected from major coastal storms by both natural and man-made shoreline structures that require maintenance to insure the long term protection of its coastline. The man-made and publicly owned structures that protect the Town were investigated for their ability to provide adequate protection from major coastal storms. Structures have been identified as publicly owned, including coastal dunes and beaches, based on evidence of investment of public funds made to create/enhance/maintain these structures. The assessment did not include floating or pile supported structures as they are assumed not to provide any significant coastal protection from major storm events.

STRUCTURE INVENTORY

Within the Town of Newbury, there were 5 structures which had public or unknown ownership which provide significant coastal protection. The location of the structures can be seen on Sheet 1 and 2 in Section IV-B of this report. The structures were categorized by their type and by their structural condition based on a preliminary field assessment. The distribution of structures by type and condition can be seen in the following table:

<table>
<thead>
<tr>
<th>STRUCTURE TYPE AND QUANTITY - Town of Newbury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Structure</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Bulkhead / Seawall</td>
</tr>
<tr>
<td>Revetment</td>
</tr>
<tr>
<td>Breakwater</td>
</tr>
<tr>
<td>Groin / Jetty</td>
</tr>
<tr>
<td>Coastal Dune</td>
</tr>
<tr>
<td>Coastal Beach</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Within the above table, the total length of each type of structure is also provided. The structures are listed by the type which is providing the primary coastal protection. Many sites have multiple structure types at the same location (i.e. revetment in front of seawall). These secondary structures, although not identified within these tables, are included in the development of repair/rehabilitation costs.

The development of repair costs has been included by structure type and by condition. In the Town of Newbury’s case there are a total of 5 structures which would require approximately $1.1 million to bring all the coastal structures to “A” Rating. Most critical will be the structures in the “D” and “F” classifications as those are assumed to undergo some level of damage or failure during the next major coastal storm event. To reconstruct these structures, identified in the preliminary survey as being in poor condition, an estimated $139,400 would be required to upgrade the Town’s coastal protection.
STRUCTURE REPAIR / RECONSTRUCTION COST - Town of Newbury

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>Structure Condition Rating</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Bulkhead / Seawall</td>
<td>$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revetment</td>
<td>$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakwater</td>
<td>$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groin / Jetty</td>
<td>2</td>
<td>$ 96,330</td>
<td>$ 139,452</td>
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<tr>
<td>Coastal Dune</td>
<td>1</td>
<td></td>
<td>$ 790,000</td>
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<tr>
<td>Coastal Beach</td>
<td>2</td>
<td>$ 43,085</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>$</td>
<td>$ 139,415</td>
</tr>
</tbody>
</table>

Based on the limited research within the scope of this project research, the presumed ownership of the structures was established on an initial basis and would be subject to more intense review in future tasks. Structures identified as being owned privately were excluded from further consideration. Although ownership of the land on which the structure was located was a factor, the structure ownership was treated as a separate issue from land ownership. For the Town of Newbury, the breakdown of structures by assumed ownership is as follows:

STRUCTURE OWNERSHIP / REPAIR COST - Town of Newbury

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>Structure Condition Rating</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Town Owned</td>
<td>2</td>
<td>$ 139,415</td>
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</tr>
<tr>
<td>Commonwealth of Mass.</td>
<td>1</td>
<td></td>
<td>$ 790,000</td>
</tr>
<tr>
<td>Federal Government</td>
<td></td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>Unknown Ownership</td>
<td>2</td>
<td></td>
<td>$ 139,432</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>$</td>
<td>$ 139,415</td>
</tr>
</tbody>
</table>

The identification of presumed ownership was not based on the investigation of legal documents but relied on property ownership and from construction and regulatory documents that were found. A more detailed investigation of legal documents and agreements would be required where structure ownership is disputed. A more detailed identification of structure type, length, condition and location can be found in Section IV-B which contains Structure Assessment Reports for each individual structure found.

SUMMARY

The enclosed reports and associated documents reflects the Town of Newbury’s coastal structure information that will eventually be input into a state-wide GIS database and will be accessible through MassGIS. This data, when compiled state-wide, will be critical in the development of both short term and long term planning for maintaining and improving Massachusetts coastal protection.

This database will also provide relatively quick access to identify available documentation for these structures as well as the ability to be updated as coastal structure improvements are made.

---

Town of Newbury
Section IV - Newbury

Part B

Structure Assessment Reports
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Newbury

Location: Plum Island Boulevard
Based On Comment: 
Earliest Structure Record: 1956
Estimated Reconstruction/Repair Cost: $96,330.00

Length: 195 Feet
Top Elevation: 20 Feet NGVD
FIRM Map Zone: V2
FIRM Map Elevation: 20 Feet NGVD

Primary Type: Groin/ Jetty
Primary Material: Stone
Primary Height: Over 15 Feet

Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
A stone groin in satisfactory condition and functioning to retain sand to the south. This structure was built by the Army Corps of Engineers.

Condition Rating
Level of Action Description
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
050-002U-000-029-100-PHO1A.jpg

Structure Documents:
MA-DCR February 19 Proposed Shore 050-002U-000-029-100-DCR1A
DEP February 19 Proposed Stone Jetty 050-002U-000-029-100-LIC1A

Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

**Property Owner:**
Local

**Presumed Structure Owner:**
Local

**Owner Name:**
Newbury

**Location:**
Plum Island Boulevard

**Date:**
9/25/2007

**Based On Comment:**

**Earliest Structure Record:**
Unknown

**Estimated Reconstruction/Repair Cost:**
$17,107.00

<table>
<thead>
<tr>
<th>Length (Feet)</th>
<th>Top Elevation (Feet NAVD 88)</th>
<th>FIRM Map Zone</th>
<th>FIRM Map Elevation (Feet NGVD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>135</td>
<td>19</td>
<td>V2</td>
<td>20</td>
</tr>
</tbody>
</table>

**Primary Type:**
Coastal Beach

**Primary Material:**
Sand

**Primary Height:**
5 to 10 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

**Structure Summary:**
Sand nourishment of a beach access ramps with sand fence, in good condition.

**Condition Rating**
- **Condition:** B
- **Rating:** Good

**Level of Action Description**
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

**Priority Rating**
- **Priority:** II
- **Rating:** Low Priority

**Action Description**
Future Project Consideration

**Structure Images:**
- [050-002U-000-029-20C-PHO2A.JPG](#)

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: State
Presumed Structure Owner: State
Owner Name: MA-DCR

Location: Plum Island
Based On Comment:
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $790,000.00

<table>
<thead>
<tr>
<th>Length: 2000 Feet</th>
<th>Top Elevation: 17 Feet NGVD</th>
<th>FIRM Map Zone: V2</th>
<th>FIRM Map Elevation: 17 Feet NGVD</th>
</tr>
</thead>
</table>

Primary Type: Coastal Dune
Primary Material: Sand
Primary Height: 10 to 15 Feet

Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
Sand dune that has a part of it that was recently repaired with coco mats. Signs of moderate erosion and storm damage. No visible dune grass

Condition: C
Rating: Fair
Level of Action: Moderate
Description: Structure is scoured but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

Priority: I
Rating: None
Action: Long Term Planning Considerations
Description: No Inshore Structures or Residential Dwelling Units Present

Structure Images: 050-002U-000-030-100-PHO1A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Unknown
Presumed Structure Owner: Unknown
Owner Name: Unknown

Location: Plum Island - Dartmouth Way
Based On Comment:

Earliest Structure Record: 1959
Estimated Reconstruction/Repair Cost: $139,432.00

Length: 105 Feet
Top Elevation: 20 Feet NGVD
FIRM Map Zone: V2
FIRM Map Elevation:

<table>
<thead>
<tr>
<th>Primary Type: Groin/Jetty</th>
<th>Primary Material: Stone</th>
<th>Primary Height: Under 5 Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary Type:</td>
<td>Secondary Material:</td>
<td>Secondary Height:</td>
</tr>
</tbody>
</table>

Structure Summary:
A unravelled stone groin that is not functioning to retain sand.

Condition Rating
Major

Priority Rating
Low Priority

Level of Action Description
Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

Structure Images:
050-002U-000-044-100-PH01A.JPG

Structure Documents:
MA-DCR January 195 Proposed Shore 050-002U-000-044-100-DCR1A

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Newbury

Location: Plum Island - Dartmouth Way
Based On Comment: 
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $25,978.00

Date: 9/25/2007

Length: 205 Feet
Top Elevation: 17 Feet NAVD 88
FIRM Map Zone: V2
FIRM Map Elevation: 20 Feet NGVD

Primary Type: Coastal Beach
Primary Material: Sand
Primary Height: 5 to 10 Feet
Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
Beach nourishment shaped into a two way walking ramp with sand fencing.

Condition Rating: B
Level of Action Description: Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating: Low Priority
Action Description: Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images: 050-002U-000-044-200-PHO2A.jpg

Structure Documents: 

Prepared By: Bourne Consulting Engineering
Section IV - Newbury

Part C

Structure Photographs
Section IV - Newbury

Part D

Structure Documents

TOWN DOCUMENT LIST

MA DCR - DOCUMENT LIST

MA DEP – Ch 91 DOCUMENT LIST

- Copies of License Documents

USACE – PERMIT DOCUMENT LIST

- Copies of Permit Documents
No Town Documents for the Town of Newbury

<table>
<thead>
<tr>
<th>BCE Structure No</th>
<th>Document No</th>
<th>Contract Drawing Number</th>
<th>Entity</th>
<th>Municipality</th>
<th>Date</th>
<th>Title</th>
<th>Sheets</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
</table>


<table>
<thead>
<tr>
<th>BCE Structure No</th>
<th>Document No</th>
<th>Contract/ Drawing Number</th>
<th>Entity</th>
<th>Municipality</th>
<th>Date</th>
<th>Title</th>
<th>Sheets</th>
<th>Location</th>
<th>Description</th>
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<tr>
<td>050-002U-000-029-100</td>
<td>050-002U-000-028-100-DCR1A</td>
<td>1582</td>
<td>MA-DCR</td>
<td>Newbury</td>
<td>February 1956</td>
<td>Proposed Shore Protection - Stone Jetty - Plum Island Shore - Opposite Plum Island Turnpike - Newbury - Prepared for the DPW of Massachusetts - Division of Waterways</td>
<td>1</td>
<td>Plum Island Turnpike</td>
<td>Jetty</td>
</tr>
<tr>
<td>050-002U-000-044-100</td>
<td>050-002U-000-044-100-DCR1A</td>
<td>2013</td>
<td>MA-DCR</td>
<td>Newbury</td>
<td>January 1959</td>
<td>Proposed Shore Protection - Stone Groin - Plum Island Shore - Opposite Dartmouth Way - Prepared for the DPW of Massachusetts - Division of Waterways</td>
<td>1</td>
<td>Dartmouth Way</td>
<td>Groin</td>
</tr>
<tr>
<td>Document No.</td>
<td>BCGE Description</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>000-0000-000-000</td>
<td>Proposed Site Plan &amp; Shore Protection Plan - WR-00-00-00-000</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>000-0000-000-000</td>
<td>PLUM ISLAND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- PLUM ISLAND

**Summary:**
- The table contains descriptions of various documents related to site plans and shore protection plans. The documents are assigned unique identifiers (Document No.) and are associated with specific locations and descriptions.

**Details:**
- The description of the document for PLUM ISLAND includes the proposed site plan and shore protection plan with specific identifiers (000-0000-000-000).
<table>
<thead>
<tr>
<th>BCE Structure No</th>
<th>Document No</th>
<th>Contract/ Drawing Number</th>
<th>Entity</th>
<th>Municipality</th>
<th>Date</th>
<th>Title</th>
<th>Sheets</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
</table>

No USACE Permit Documents for the Town of Newbury
Section V

Rowley
Section V – Community Findings – Town of Rowley

COMMUNITY DESCRIPTION

The Town of Rowley consists of a land area of 18.72 square miles out of a total area of 20.59 square miles and had a population of 5,500 in the 2000 census. The Town is located on the north shore of Massachusetts and its location can be seen on this report’s cover. The estimated length of shoreline that is directly exposed to open ocean waves is 1 mile with the remaining shoreline semi-protected by offshore structures or landforms. The Town is protected from major coastal storms by both natural and man-made shoreline structures that require maintenance to insure the long term protection of its coastline. According to the Rowley Town Administrator, none of the structures along the Town’s coast are publicly owned and/or maintained. The assessment did not include floating or pile supported structures as they are assumed not to provide any significant coastal protection from major storm events.

SUMMARY

Though there were no publicly owned structures at the time of investigation, the project database can be updated as needed for future construction. The Town of Rowley’s coastal structure information will eventually be input into a state-wide GIS database and will be accessible through MassGIS. This data, when compiled state-wide, will be critical in the development of both short term and long term planning for maintaining and improving Massachusetts coastal protection.
Section V - Rowley

Part B

Structure Assessment Reports

No Publicly Owned/Maintained Structures in the Town of Rowley
Section V - Rowley

Part C

Structure Photographs

No Publicly Owned/Maintained Structures in the Town of Rowley
Section V - Rowley

Part D

Structure Documents

No Publicly Owned/Maintained Structures in the Town of Rowley
Section VI

Ipswich
Section VI – Community Findings – Town of Ipswich

COMMUNITY DESCRIPTION

The Town of Ipswich consists of a land area of 32.61 square miles out of a total area of 42.15 square miles and had a population of 12,987 in the 2000 census. The Town is located on the North Shore of Massachusetts and its location can be seen on this report's cover. The estimated length of shoreline is 1 mile that is directly exposed to open ocean. The Town is protected from major coastal storms by both natural and man-made shoreline structures that require maintenance to insure the long term protection of its coastline. The man-made and publicly owned structures that protect the Town were investigated for their ability to provide adequate protection from major coastal storms. Structures have been identified as publicly owned, including coastal dunes and beaches, based on evidence of investment of public funds made to create/enhance/maintain these structures. The assessment did not include floating or pile supported structures as they are assumed not to provide any significant coastal protection from major storm events.

STRUCTURE INVENTORY

Within the Town of Ipswich, there was 1 structure which had public or unknown ownership which provide significant coastal protection. The location of the structures can be seen on Sheet 1 in Section VI-B of this report. The structures were categorized by their type and by their structural condition based on a preliminary field assessment. The distribution of structures by type and condition can be seen in the following table:

<table>
<thead>
<tr>
<th>Primary Structure Type</th>
<th>Total Structures</th>
<th>Structure Condition Rating</th>
<th>Total Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkhead / Seawall</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revetment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakwater</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groin / Jetty</td>
<td>1</td>
<td>1</td>
<td>130</td>
</tr>
<tr>
<td>Coastal Dune</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Beach</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Within the above table, the total length of each type of structure is also provided. The structures are listed by the type which is providing the primary coastal protection. Many sites have multiple structure types at the same location (i.e. revetment in front of seawall). These secondary structures, although not identified within these tables, are included in the development of repair/rehabilitation costs.

The development of repair costs has been included by structure type and by condition. In the Town of Ipswich’s case there is 1 structure which would require approximately $86,315 to bring all the coastal structures to “A” Rating. Most critical will be the structures in the “D” and “F” classifications as those are assumed to undergo some level of damage or failure during the next major coastal storm event of which Ipswich has none.
STRUCTURE REPAIR / RECONSTRUCTION COST - Town of Ipswich

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkhead / Seawall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revetment</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakwater</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groin / Jetty</td>
<td>1</td>
<td></td>
<td></td>
<td>86,320</td>
<td></td>
<td></td>
<td>86,320</td>
</tr>
<tr>
<td>Coastal Dune</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Beach</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1</td>
<td></td>
<td></td>
<td>86,320</td>
<td></td>
<td></td>
<td>86,320</td>
</tr>
</tbody>
</table>

Based on the limited research within the scope of this project research, the presumed ownership of the structures was established on an initial basis and would be subject to more intense review in future tasks. Structures identified as being owned privately were excluded from further consideration. Although ownership of the land on which the structure was located was a factor, the structure ownership was treated as a separate issue from land ownership. For the Town of Ipswich, the breakdown of structures by assumed ownership is as follows:

STRUCTURE OWNERSHIP / REPAIR COST - Town of Ipswich

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town Owned</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commonwealth of Massachusetts</td>
<td>1</td>
<td></td>
<td></td>
<td>86,320</td>
<td></td>
<td></td>
<td>86,320</td>
</tr>
<tr>
<td>Federal Government Owned</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown Ownership</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1</td>
<td></td>
<td></td>
<td>86,320</td>
<td></td>
<td></td>
<td>86,320</td>
</tr>
</tbody>
</table>

The identification of presumed ownership was not based on the investigation of legal documents but relied on property ownership and from construction and regulatory documents that were found. A more detailed investigation of legal documents and agreements would be required where structure ownership is disputed. A more detailed identification of structure type, length, condition and location can be found in Section VI-B which contains Structure Assessment Reports for each individual structure found.

SUMMARY

The enclosed reports and associated documents reflects the Town of Ipswich's coastal structure information that will eventually be input into a state-wide GIS database and will be accessible through MassGIS. This data, when compiled state-wide, will be critical in the development of both short term and long term planning for maintaining and improving Massachusetts coastal protection.

This database will also provide relatively quick access to identify available documentation for these structures as well as the ability to be updated as coastal structure improvements are made.
Section VI - Ipswich

Part B

Structure Assessment Reports
<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>Plum Island</td>
<td>9/25/2007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Based On Comment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>Tax Map</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Earliest Structure Record:</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA-DCR</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

| Estimated Reconstruction/Repair Cost: | 
|--------------------------------------|-
|                                       | $86,320.00                |

<table>
<thead>
<tr>
<th>Length:</th>
<th>Top Elevation:</th>
<th>FIRM Map Zone:</th>
<th>FIRM Map Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 Feet</td>
<td>Feet NAVD 88</td>
<td>V3</td>
<td>14 Feet NGVD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groin/Jetty</td>
<td>Stone</td>
<td>Under 5 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Priority Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level of Action Description</th>
<th>Action Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>No Inshore Structures or Residential Dwelling Units Present</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Structure Summary:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A stone groin which is substantially unravelled and has reduced function as a groin. There are no nearby structures. The offshore end is in the water at low tide.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition</th>
<th>Rating</th>
<th>Level of Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td>Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Priority</th>
<th>Rating</th>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None</td>
<td>Long Term Planning Considerations</td>
<td></td>
</tr>
</tbody>
</table>

Structure Images:
036-016-000-002-100-PHO1A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
Section VI - Ipswich

Part C

Structure Photographs
Section VI - Ipswich

Part D

Structure Documents

TOWN DOCUMENT LIST

MA DCR - DOCUMENT LIST

MA DEP – Ch 91 DOCUMENT LIST
  - Copies of License Documents

USACE – PERMIT DOCUMENT LIST
  - Copies of Permit Documents
<table>
<thead>
<tr>
<th>BCE Structure No</th>
<th>Document No</th>
<th>Contract/ Drawing Number</th>
<th>Entity</th>
<th>Municipality</th>
<th>Date</th>
<th>Title</th>
<th>Sheet</th>
<th>Location</th>
<th>Description</th>
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<tbody>
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</table>

No Town Documents for the Town of Ipswich
<table>
<thead>
<tr>
<th>BCE Structure No</th>
<th>Document No</th>
<th>Contract/ Drawing Number</th>
<th>Entity</th>
<th>Municipality</th>
<th>Date</th>
<th>Title</th>
<th>Sheets</th>
<th>Location</th>
<th>Description</th>
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No MA - DEP Ch. 91 Documents for the Town of Ipswich
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No USACE - Permit Documents for the Town of Ipswich
No MA - DCR Documents for the Town of Ipswich

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TOWN: IPSWICH
SOURCE: MA-DCR
LOCATION: MA-DCR BOSTON and HINGHAM, MA
DATE OF RESEARCH: JULY 2007
Section VII

Essex
Section VII – Community Findings – Town of Essex

COMMUNITY DESCRIPTION

The Town of Essex consists of a land area of 14.16 square miles out of a total area of 15.94 square miles and had a population of 3,267 in the 2000 census. The Town is located on the north shore of Massachusetts and its location can be seen on this report’s cover. The estimated length of shoreline is 3 miles that are directly exposed to open ocean. The Town is protected from major coastal storms by both natural and man-made shoreline structures that require maintenance to insure the long term protection of its coastline. According to the Essex Town Administrator, none of the structures along the Town’s coast are publicly owned and/or maintained. The assessment did not include floating or pile supported structures as they are assumed not to provide any significant coastal protection from major storm events.

SUMMARY

Though there were no publicly owned structures at the time of investigation, the project database can be updated as needed for future construction. The Town of Essex’s coastal structure information will eventually be input into a state-wide GIS database and will be accessible through MassGIS. This data, when compiled state-wide, will be critical in the development of both short term and long term planning for maintaining and improving Massachusetts coastal protection.
Section VII - Essex

Part B

Structure Assessment Reports

No Publicly Owned/Maintained Structures in the Town of Essex
Section VII - Essex

Part C

Structure Photographs

No Publicly Owned/Maintained Structures in the Town of Essex
No Field Photographs for the Town of Essex

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Section VII - Essex

Part D

Structure Documents

No Publicly Owned/Maintained Structures in the Town of Essex
No Town Documents for the Town of Essex.

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No USACE - Permit Documents for the Town of Essex