# Montauk Point, New York

## Hurricane & Storm Damage Reduction

## Final Feasibility Report
## & Environmental Impact Statement

US Army Corps
of Engineers
New York District

New York State Department
of Environmental Conservation

FINAL - October 2005

# Montauk Point, New York
# Hurricane & Storm Damage Reduction - Feasibility Study

## Syllabus

If allowed to continue, progressive instability of the Montauk Point bluff would result in the irrecoverable loss of the historic Montauk Point Lighthouse and its associated structures, along with archaeological resources. The implication would be the total loss of all historical properties, both buried and above ground. Once this information is lost, it can never be recovered, and future study of the complex would be impossible. The alternative plans developed for this feasibility report are superior to the no action plan as they provide substantial storm damage protection.

The alternative plans included five significantly different measures: stone revetment, offshore breakwater with beach fill, T-groins with beach fill, beach fill, and relocation of the lighthouse. The stone revetment is the most reliable and cost effective structural solution. Because of the steep terrain in the area, the cost of relocation is prohibitive. In addition, relocation would have adverse effects on the surrounding archeological resources, would degrade existing habitats and historic views, and also effect recreational use of the area. Also, a replacement light tower would have to be constructed, as the lighthouse, in its current location, continues to serve as a functioning aid to navigation.

Therefore, the selected plan consists of the construction of a stone revetment with a 73-year storm design (Alternative Plan 2B). This level of design was chosen based on an economic optimization of a wide range of designs to reduce the risk of losses due to storm damages.

- Stone revetment, 840-feet in length, with a crest width of 40-feet at elevation +25 feet NGVD, and 1V:2H side slopes.
- 12.6-ton quarrystone armor units extending from the crest down to embedded toe.
- Three layers of 4-5 ton armor units are used atop the splash apron. It is assumed that some of these stones can be re-used in the proposed revetment from the present structure.
- The bottom of the armor stone layer in the toe is located at a depth of 12-feet from the existing bottom.
- A heavily embedded toe is incorporated to protect against breaking waves, provide long-term stone stability, and scour at the toe of the structure. Stone sub-layers are specified in accordance with standard Corps design procedures.

The selected NED plan is also the locally preferred plan. The local sponsor, New York State Department of Environmental Conservation is willing to provide all items of local cooperation, and is in full support of the selected plan.

The proposed work will have no significant impact on the quality of the environment in the project area. Special consideration was given to the effects of the selected plan on fishing, surfing, and cultural experiences. Most impacts associated with this project will be temporary, and none of the impacts are regarded as significant.

The land that will be protected by implementation of this recommended project is deeded to the Montauk Historical Society (MHS). The MHS is a private, not for profit association that is not part of any state or local government. This land is held open, for use by all on equal terms, regardless of origin or home area. Existing Corps policy indicates that there is no Federal interest in protection of a property owned by a single private non-profit entity.

However, although the MHS is clearly a single, private landowner, they must, by deed restriction and State charter, act as a public entity akin to agencies of State and local governments. The MHS must accomplish a public education mission to stay in operation, must follow Federal National Historic Preservation requirements for maintenance work, and membership and enjoyment of the benefits of the facility and educational programs are open to all, with no restriction, for a fee. Under the deed and charter, the MHS cannot structure and constrain uses of the property, nor can anyone who cares to join the MHS and enjoy the benefits of the facility and water resources project be excluded.

In light of these facts, New York District requested a waiver to the single landowner policy from the Assistant Secretary of the Army (Civil Works) and was granted an exception allowing the completion of the feasibility study with a view towards pursuing a cost-shared construction project for Montauk Point, New York.

The first cost of the selected plan is estimated to be $13,722,000 at October 2004 price levels. The total benefits attributed to this selected plan are estimated at $1,578,700 while the annual costs are $889,300. Therefore, the benefit to cost ratio is 1.8 to 1, with total net benefits of $689,400.

The cost-sharing for construction of this storm damage reduction project is as follows:

| | |
|---|---|
| 50% Federal Share | $6,861,000 |
| 50% Non-Federal Share | $6,861,000 |
| Total Project First Cost | $13,722,000 |

An annual revetment maintenance cost of $52,300 will be a 100% Non-Federal expense.

# Montauk Point, New York

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## Feasibility Main Report – Sections

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## Feasibility Report – Appendices and Environmental Impact Statement

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# Montauk Point, New York

## 1. Study Authorities

This feasibility study was conducted under the authority of a resolution adopted by the Committee on Environment and Public Works of the U.S. Senate on May 15, 1991.

> *"Resolved by the Committee on Environment and Public Works of the United States Senate, that the Secretary of the Army is hereby requested to review the report of the Chief of Engineers on Fire Island to Montauk Point, New York, published as House Document Number 86-425, 86th Congress, 2nd session, and other pertinent reports, to determine whether modifications of the recommendations contained therein are advisable at the present time, with a view to preserving, restoring, and protecting Montauk Point and vicinity, including the historic Montauk Lighthouse and associated facilities, from erosion, environmental degradation, and coastal storm damage."*

Another resolution, also dated May 15, 1991 authorized the study of interim emergency protection works until a comprehensive project was formulated, designed and constructed:

> *"Resolved by the Committee on Environment and Public Works of the United States Senate, that the Committee recognizes that unacceptable cultural and historic impacts would result from loss of historic property to structures in the vicinity of the Montauk Lighthouse, Montauk, New York and in recognition, the Secretary of the Army is requested to review the report of the Chief of Engineers on Fire Island to Montauk Point, New York, published as House Document Number 86-425, 86th Congress, 2nd session, and other pertinent reports, to determine what interim emergency protection works can be carried out to serve as protection for the lighthouse and bluff until a comprehensive study determines the best environmental, cultural and economical plan to enhance and protect this important resource."*

The Reconnaissance Report, dated February 1993, determined that, *"In view of the limited protection afforded by the U.S. Coast Guard and the Montauk Historical Society in 1990, 1992 and 1993, no additional interim emergency measures are warranted at this time"*. This feasibility study confirmed the findings of the Reconnaissance Report. Therefore, the feasibility of a comprehensive project was explored.

## 2. Feasibility Cost Sharing Agreement

The feasibility study for Montauk Point, New York was initiated on April 25, 2000 and cost shared on a 50% Federal, 50% non-Federal basis at a total cost of $900,000. The non-Federal cost sharing partner is the New York State Department of Environmental Conservation (NYSDEC).

## 3. Feasibility Study Purpose

The Feasibility Study is the second phase of the Corps of Engineers planning process and follows a favorable Reconnaissance Report and execution of a Feasibility Cost Sharing Agreement between the Corps of Engineers and the non-Federal sponsor, NYSDEC.

The purpose of the Feasibility Study is to fully evaluate all reasonable solutions to identified problems. The Feasibility Report documents the planning, engineering, design, real estate, environmental activities and NEPA documentation required to support a decision on Federal participation in the construction of a project. The Feasibility Report is a complete decision document that provides the basis for recommending the potential implementation of a project; to be followed by a value engineering study, preparation of a Design Documentation Report and completion of Plans & Specifications, during the Preconstruction Engineering and Design phase, upon execution of a Design Agreement.

## 4. Previous Reports

The New York District completed a Reconnaissance Report for Montauk Point, New York in February 1993. Headquarters USACE certified the Reconnaissance Report to be in accord with Administration policy in May 1993. This report recommended that a cost-shared feasibility study be conducted. The potential recommended plan of improvement identified in the reconnaissance report entailed the placement of a 770-foot long stone revetment to cover the most critically eroding area of Montauk Point.

## 5. Study Area

The study area is located in Suffolk County, New York, between the Atlantic Ocean and Block Island Sound at the easternmost end of the south fork of Long Island (Figure 1). Montauk is in the Town of East Hampton. The study area includes the entire historic Montauk Point Lighthouse Complex situated on a high bluff underlain with glacial till, approximately 70-feet above Mean Sea Level (MSL). The lighthouse is the focal point of the historic complex and surrounding facilities, and acts as a junction marker for ships headed for New York Harbor or Long Island Sound. The area surrounding the lighthouse is operated by the Montauk Historical Society as a State park and is used primarily by fishermen, surfers and sightseers. The lighthouse property includes a museum that serves to educate visitors about the history of lighthouses (with historic artifacts) as navigational aids for over 200 years of our nation's history. The Montauk Historical Society (non-profit 501-C-3) is dedicated to the protection, preservation and educational development of this nationally significant historic site. Through programs, exhibits, publications and special events, the story of this site is conveyed to the public. Membership in the Montauk Historical Society and visitation to the lighthouse is fee based and open to all without any discrimination. Fees help maintain the properties and overall operation.

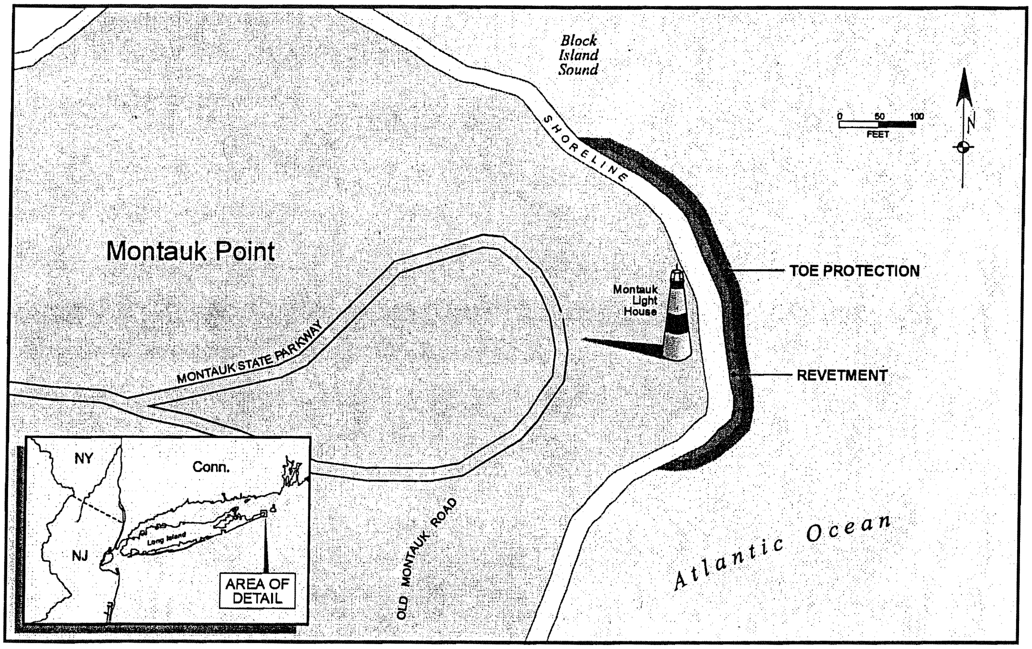
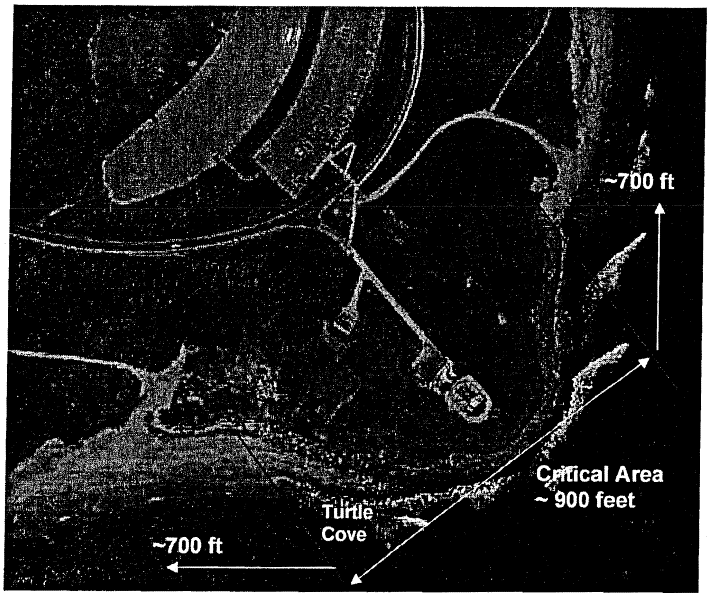


Figure 1 – Study Area

The critical area of study consists of the fronting bluff covering about 900-feet of shoreline. The ownership of the property was transferred from the U.S. Coast Guard to the Montauk Historical Society (in accordance with HR 3675, Department of Transportation and Related Agencies Appropriations Act, 1997, Sec. 341, Conveyance of Light Station, Montauk, New York). All surrounding property is owned by the State of New York.

Continued ownership of the property is subject to the condition that the Montauk Historical Society maintains the Montauk Light Station in accordance with the provisions of the National Historic Preservation Act of 1966, amended (16 U.S.C. 470 et seq.) and other applicable laws. All rights, title and interest would revert to the United States if the Montauk Light station ceases to be maintained in accordance with the National Historic Preservation Act as a nonprofit center for public benefit for interpretation and preservation of the material culture of the United States Coast Guard, maritime history of Montauk and Native American and colonial history.

The bluff and beach along this entire area are considered to be critical elements of the stability of the lighthouse. Erosion control structures are required to protect the bluff faces from the forces of oncoming waves. The area of concern consists of 2,300 feet of shoreline, extending from the pivotal point of the adjacent bluff to the south to a beach area to the north (Figure 2). The entire area must be considered in order to prevent adverse impacts from this project, and to make certain it is environmentally sustainable.



Study Area

Figure 2 – Area of Concern

## 6. Background & History

Montauk Point is located in Suffolk County, approximately 125 miles east of New York City. The Point separates the Atlantic Ocean to the south from Block Island Sound to the north. The Montauk Point Lighthouse acts as a junction marker for ships headed for New York Harbor or Long Island Sound. The Montauk Point Light Station was authorized for construction in 1792 by President George Washington. Construction was initiated in June 1796 and completed in November 1796 at a cost of $22,300. The lantern is about 80-feet above the ground. The lantern was lit with sperm oil until the 1860s, kerosene until the 1940s and, finally, electricity with a 300,000-candlepower lamp. When the light was completed it was located 300-feet from the edge of the cliff. Presently the lighthouse is less than 120-feet from the edge of the bluff, and other major structures are now precariously situated within 50-feet of the bluff edge.

The Montauk Point Lighthouse is listed on the National Register of Historic Places. Since its construction, the lighthouse has served as an important navigation aid for the first land encountered by ships headed for New York Harbor and Long Island Sound, as well as other ports on the eastern seaboard. Continued erosion has been recognized as a problem for many decades and various efforts have been made to stabilize the shoreline with limited success. The following is a historical account/review of the area (Figures 3 thru 9 illustrate historical shoreline evolution on a qualitative basis).

1792 The lighthouse is authorized for construction by President George Washington on land previously utilized by the Montaukett Indians. The shoreline is approximately 200-feet seaward of the present position.

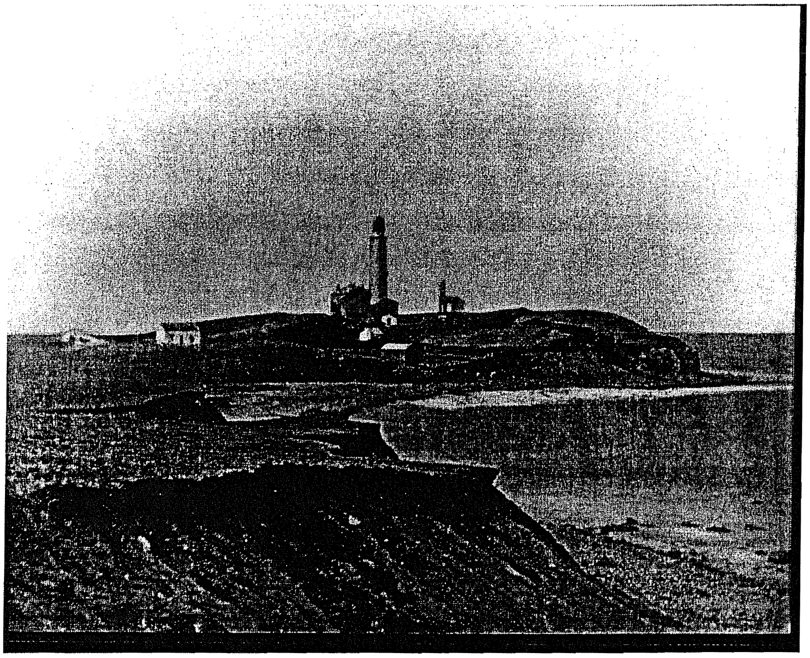


Figure 3 - Montauk Point, 1878

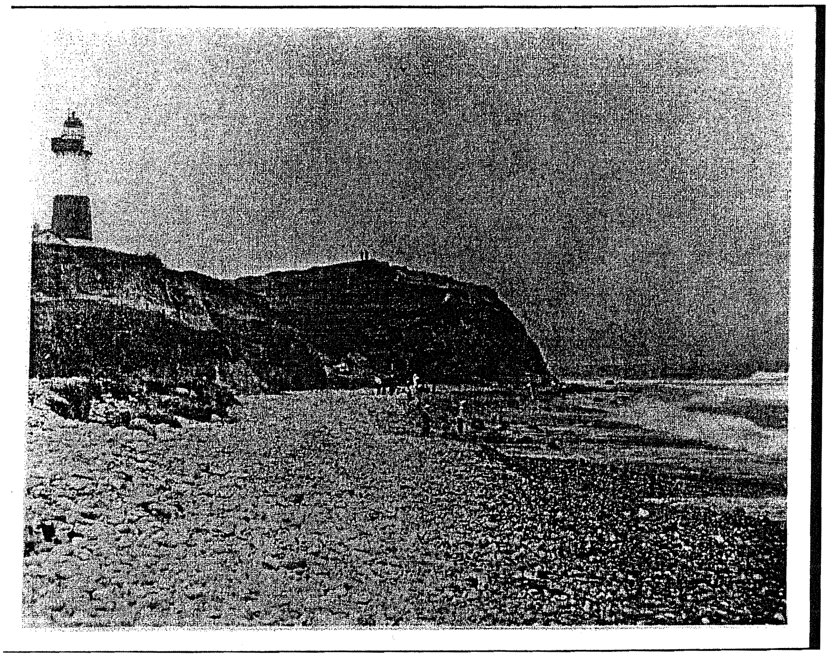


Figure 4 - Montauk Point, 1928

1946 A 700-foot stone revetment is constructed at the bluff toe, with vegetative plantings along the upper half of the cliff (New York District, 1944). The crest elevation is +20 feet MSL, tapering down to +15 feet MSL at both ends. The crest width is 23-feet with a core and double armor layer of 4 to 8-ton stone. The base layer is 8-ton stone. Since its construction, this entire seawall has completely failed and is now 10 to 70-feet seaward of the existing bluff toe. Most of the stone is at an elevation of about mean high water, with remnants present as rubble along the seaward extent of the present structure toe.

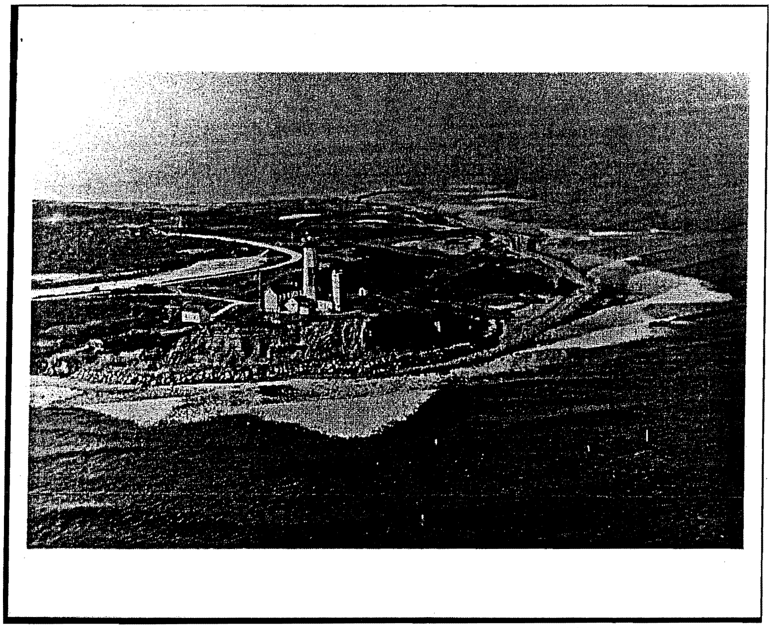


Figure 5 - Montauk Point With Revetment, Circa 1946

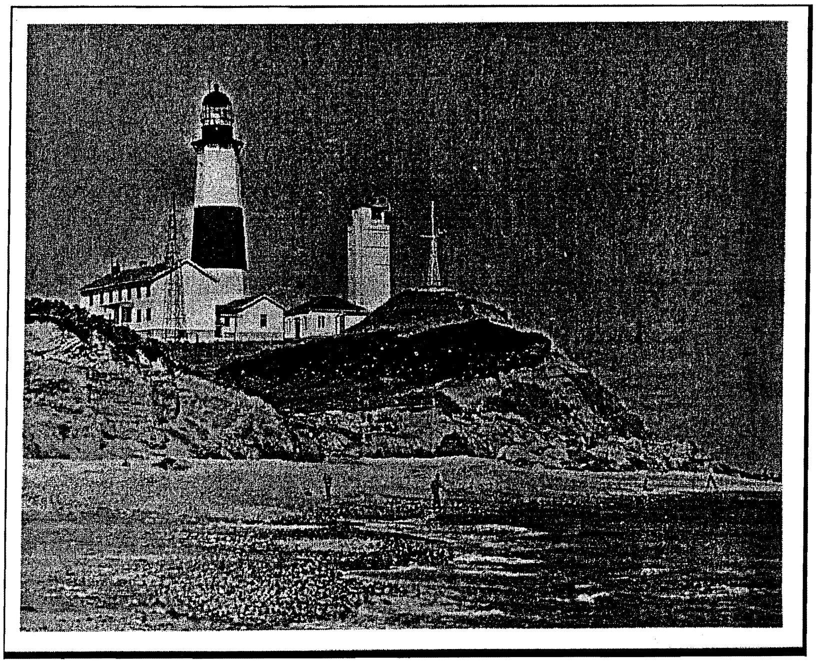
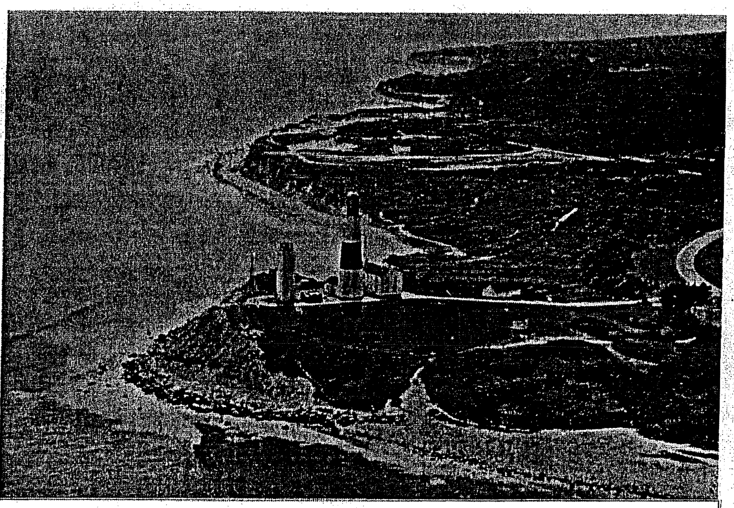


Figure 6 - Montauk Point, 1950s

1960s Department of Transportation places rubble over the edge of the bluff just to the south of the lighthouse. After the October 1991 storm, the rubble slides down the slope, due to scouring of the bluff toe. Most of the rubble is subsequently cleared away during the construction of the revetment in 1992.



This 1960s aerial of Montauk Point shows the U.S.A.C.O.E. revetment and the untouched bluff face before Giorgina Reids pilot project on the eastern slope.

Figure 7 - Montauk Point, 1960s

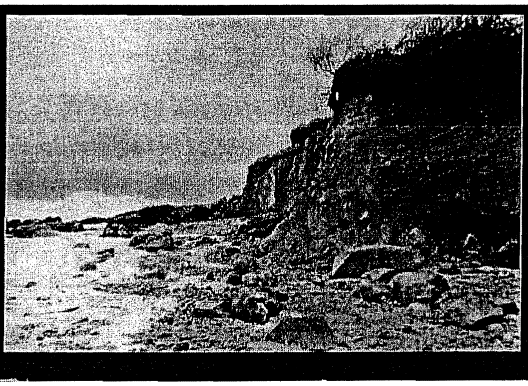
1971 The first terracing project is constructed along the bluff slope by Ms. Georgina Reid, a locally renouned preservationist. The construction is on U.S. Coast Guard property just north of the lighthouse.

1972 U.S. Coast Guard places gabions along about 280 feet of the point above the failed 1946 seawall along the toe of the bluff. The gabion system subsequently settles gradually and the crest is of insufficient elevation (only up to +15 feet MSL) to provide protection. It is significantly damaged by the Halloween Storm of 1991.

1980s Terracing and beach grass plantings continue through the 1970s and 1980s. The vegetation includes beach grasses, bushes, seedlings, shrubs and wildflowers up to five feet in height. Dense foliage occupies most of the north end of the point. The lower east side of the bluff is reshaped to a more stable angle, terraced with lumber and secured by steel stakes to provide a flat surface for the beach grass. The vegetation appears to hold the bluff face against the forces of ground seepage, rainfall and runoff. Terracing efforts subsequently deteriorate due to the impacts of major storms in the early 1990s.

1990 The Montauk Historical Society and the New York State Department of Parks and Recreation construct a revetment along Turtle Cove, south of the lighthouse. A 6-feet deep, 15-feet wide trench is excavated for the toe of 263 lineal feet of revetment. Geotextile fabric is placed in the trench and a base layer of 50-pound stone is placed on the fabric. Up to 14,000 pound stones are placed on the base stone up to an elevation of +20 feet MSL. The revetment subsequently settles to a crest elevation of +5 to +10 feet MSL during the October 1991 storm and is no longer adequate as a shore protection structure.

1992 After severe erosion due to the Halloween Storm of 1991 (The Perfect Storm), a new revetment is constructed by the U.S. Coast Guard landward of the old revetment. An emergency construction effort commences along about 300 feet of shoreline. The crest elevation is +25 feet MSL, with 1-3 ton stones placed on the slope above a 14 feet wide berm crest at elevation +18 MSL of a single 10-ton armor layer, which slopes down to the existing toe (generally on stone from the 1946 failed revetment). The Montauk Historical Society constructs a 150-foot long structure along the eastern section of Turtle Cove. The design is similar to the Coast Guard section but 5- to 10-ton stone is used.



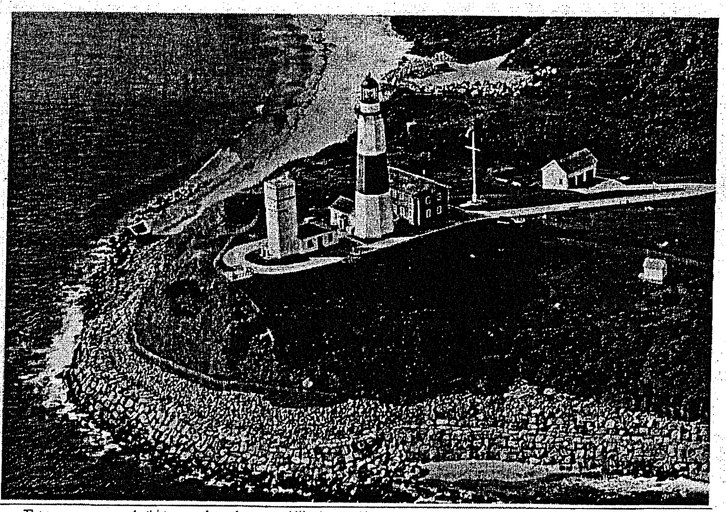
The upper photo is a post storm inspection of the northeast bluff after the December 1992 nor'easter.

The photo below shows the completed revetment with the engineered pedestrian access that allows visitors to traverse Montauk Point.

This dramatic before and after is the result of the cooperative efforts of the N.Y.S.D.E.C., the Long Island Office of Parks, Recreation and Historic Preservation, and the Montauk Historical Society.

Figure 8 - Montauk Point, 1992

1993 New York District Reconnaissance Study determines sufficient economic justification and Federal interest to conduct a feasibility study.



The same camera angle thirty years later shows a stabilized toe and bluff face. The cooperative efforts of the U.S.A.C.O.E., the U.S.C.G. the N.Y.S.D.E.C., the Long Island Office of Parks, Recreation and Historic Preservation and the Montauk Historical Society have improved the erosion control protection at Montauk Point. (c 1995 Peter Paul Muller Jr.)

Figure 9 - Montauk Point, 1995

## 7. Existing Conditions

Because the present shore protection measures (somewhat similar to the 1946 revetment that failed) were not designed to withstand significant storm events over a substantial duration, i.e. lack of a buried toe, inadequate stone size, and insufficient overtopping protection, it is expected that the revetment now in place will fail in the foreseeable future. When the lighthouse was originally completed, it was located 300 feet from the edge of the bluff. Presently, the lighthouse is less than 120 feet from the edge of the bluff, and other major structures within the complex are now within 50 feet. As noted during recent site inspections, the current revetment is sustaining damage due to stone movement. Based on stone size and crest elevation, the design level of protection provided by the existing structure is estimated between a 10-year and 15-year frequency storm. Although the existing structure is subject to, and is exhibiting signs of the beginning of the slope failure process, no emergency construction is expected to be necessary prior to potential construction of a comprehensive plan of protection. Monitoring following storm events would determine whether prudent remedial measures should be taken if a comprehensive project is not implemented.

Recent efforts, including terracing, vegetation and improved revetment construction, have decreased the erosion rate. Repeated storm effects, however, will continue to cause erosion at the ends of the structure, eventually compromising the revetment and upper bluff areas. This, in turn, is expected to result in the eventual loss of bluff material, the lighthouse and its adjacent structures.

## 8. Hydrology - Existing Drainage

Montauk Point Lighthouse is located on a knoll with the surrounding topography sloping away from the lighthouse along a steep gradiant. The site is well vegetated and contains slopes of up to 40 percent grade. Slope lengths are short and show little sign of past erosion. Drainage facilities at the site consist of roof drains, a slotted drain and bluff terraces. The site can be divided into three primary hydrologic drainage areas:

- The bluff area surrounding the lighthouse - runoff from this area flows over the bluff to the Atlantic Ocean.
- Area south of the lighthouse between the bluff and the concrete driveway leading to the lighthouse - runoff from this area flows southwest towards the Atlantic.
- Area north of the lighthouse driveway - runoff from this area flows north towards Long Island Sound.

Sources of runoff at the site include lawn areas, building roofs and paved areas. The site contains minimal facilities for the collection and conveyance of stormwater. Runoff from the lawn areas flows to the Atlantic Ocean via uncontrolled overland flow. No conveyance channels are utilized in directing runoff from lawn areas to specific discharge points. Since most of the slopes within the lawn area are relatively short, runoff can be expected to exist in the form of sheet flow. However, due to the vegetated condition of the unimproved areas of the site, runoff velocities are low enough to prevent rills from developing on sloped areas.

The bluff has been terraced and vegetated to reduce the erosion of the bluff face. In addition to the vegetated terraces, rock outlets have been constructed in areas prone to concentrated flow conditions due to natural drainage patterns or groundwater discharge. Roof drains from the museum have outlets along the slopes surrounding the structure. Although a source of concentrated flow, the roof drain outlets do not appear to cause adverse impacts to the grassed slopes. A third discharge point, located on the south side of the museum, discharges water from the roof drains on the south side of the building. Additionally, some of the roof drains discharge to the lawn area without being conveyed away from the buildings with discharge pipes.

Generally, the drainage facilities at the site appear to be adequate and cause no adverse impacts to the surrounding area. Little evidence of past erosion was observed at the site. Routine maintenance of the drainage facilities and vegetation is needed to prevent occurrence of erosion in the future.

## 9. Geology

A subsurface exploration program was conducted at Montauk Point Lighthouse to assess the subsurface conditions of the site (reference Engineering Appendix). The results confirm the basic layering scheme presented in the USACE *Reconnaissance Report: Montauk Point, New York*, 1993. That report described a three-layer model, consisting of Montauk till at the base, overlain by (lower) stratified Hempstead gravel (composed of distinct strata of sand, silt and clay) and a surface layer (upper) Hempstead gravel (composed of cohesionless fine sand with little silt). All of Turtle Hill, on which the lighthouse stands, is a slump block that remained after the retreat of a glacier.

## 10. Historic Shoreline Changes – Erosion Processes

Bluff erosion is caused by a number of forces. At the toe of the bluff, erosion forces include:

- Astronomical and storm tides that allow waves and tidal currents to gradually erode the toe of the bluffs that were exposed with no overlying stone.
- Waves and currents that serve to mobilize and transport sediments away from the shoreline. As the bluff toe erodes and steepens, the upper bluff collapses and slides into the ocean. There is also a net loss of beach material due to littoral transport.

Erosion forces also act on the upper parts of the bluff. These sources of erosion include:

- Water collecting in upland wetlands and ponds, seeps slowly toward the sea, both on the surface and through the soil. Seepage exits on the face of the bluffs, further loosening and moving soil down the bluff face.
- Wave spray and runup erode the bluff face by saturating and washing away sediment.
- Rain adds to the erosion of the sloped bluff face and surface runoff during storms by impinging upon the sediment and washing out large amounts of soil to the beach below. A lack of vegetation on the bluff face could allow the rain and surface water to act directly on the soil. Because of adequate vegetation on the bluffs at Montauk Point, this is not presently happening, but could occur in the future if plant coverage decreases.
- High coastal winds add to the erosion process. Winds will blow loose soil from the face of the bluffs and will cause trees and taller vegetation to sway back and forth, which in turn loosens the soil at their base.

## 11. Storm-induced Erosion Rates

Because of the steep slopes and high elevations associated with the bluffs at Montauk Point, storms can cause catastrophic bluff failure and erosion of large amounts of soil. In the 1993 Reconnaissance Report, a site survey described erosion measurements that were made in June 1992. The survey indicated that the unprotected (beach fronted) bluff immediately to the north of the lighthouse eroded 20-feet and the unprotected (beach fronted) bluff 800-feet north of the lighthouse receded about 30-feet during the October 1991 storm.

## 12. Long Term Erosion Rates

Long-term erosion rates along two cross sections using reported historic shorelines and aerial photography were analyzed (Figures 10 & 11). The data was plotted in cross-section view (Figure 12). The historical long-term shoreline recession rate was found to be 2.2-feet per year for the beach and bluff toe and 1.2-feet per year for the top of bluff. In the past 125 years of record (1868-1993), the bluff has receded 150-feet and beach has receded about 330-feet. Erosion rates since 1993 in critical areas of erosion are not pertinent due to the construction of a successfully performing revetment, which is curtailing shoreline retreat. It has been estimated that the average annual erosion rate for the bluff and beach is 6 cubic yards per foot per year, resulting in a total of 5,000 cubic yards of erosion per year in the critical erosion area. The historical data shows that the beach recession rate adjacent to the revetment has been reduced by about 50% since the construction of coastal structures, whereas the bluff recession has stabilized at about 25% of the pre-1945 revetment recession rate due to the terracing construction above the revetment.

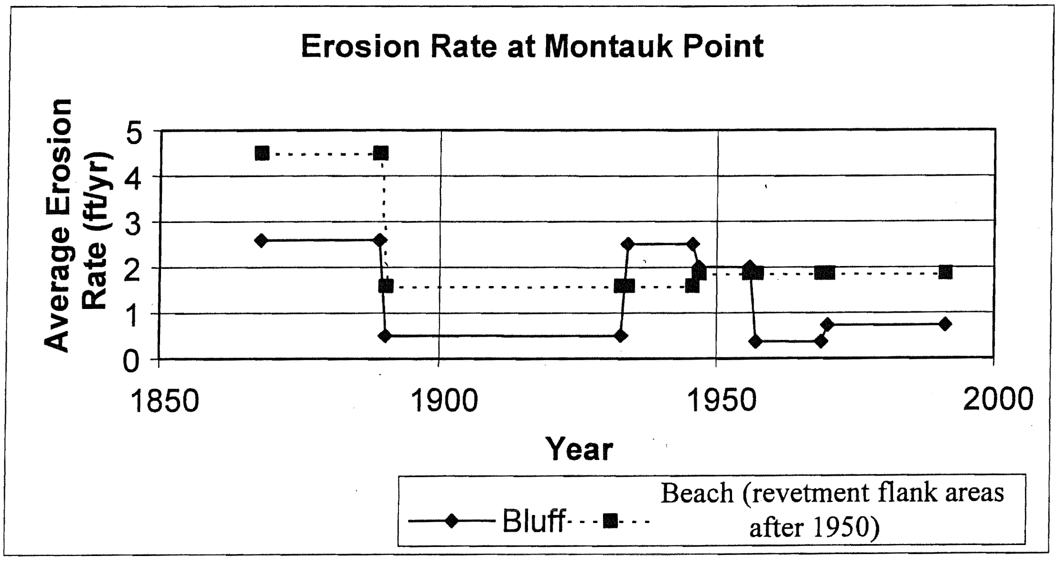


Figure 10 - Average Erosion Rates Since 1868 at Montauk Point (New York District, 1993)

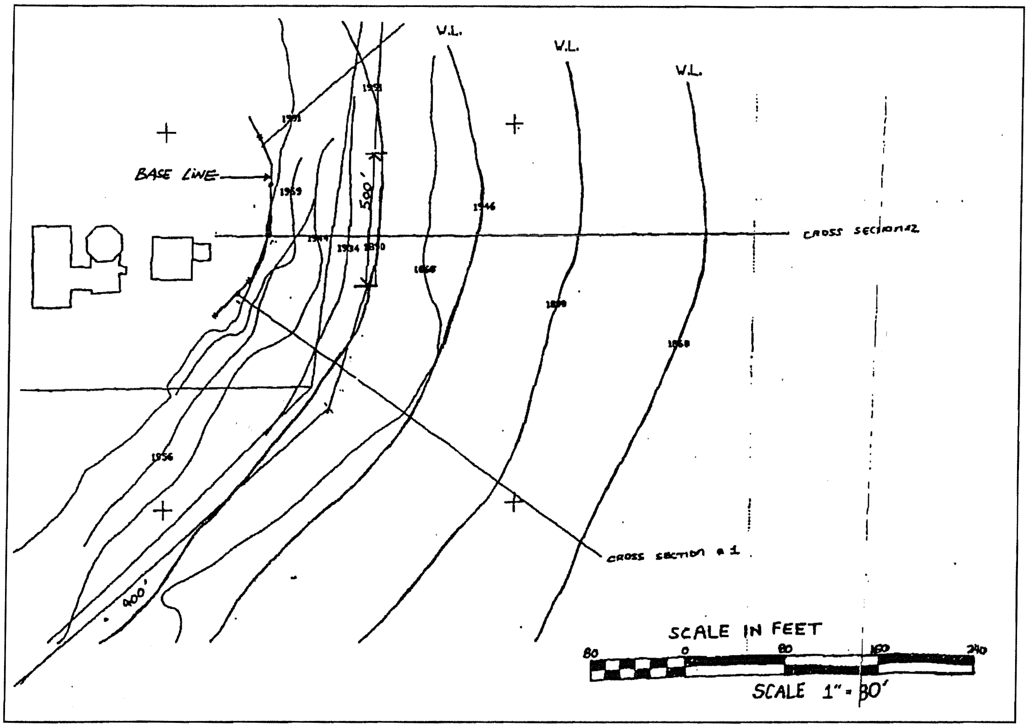


Figure 11 - Shoreline Changes 1865-1992 (New York District, 1993)

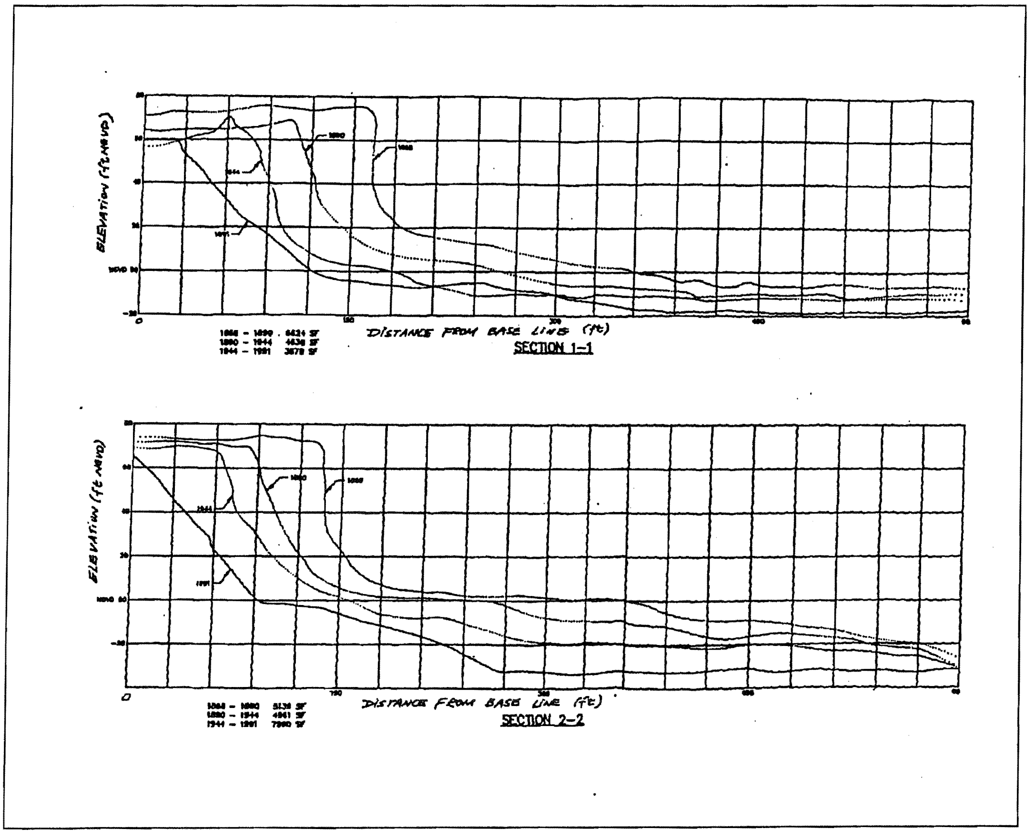


Figure 12 - Shoreline Changes, Cross-Sections

## 13. Waves

The basis for developing wave characteristics for Montauk Point was an excerpt from a report entitled "Fire Island to Montauk Point Reformulation Project (FIMP), Moffatt & Nichol, June, 2000". The basis of that analysis was the Army Corps of Engineers Wave Information Study, 1976-1994, with adjustments made as necessary based on "observed behavior of longshore transport" as described in a The Coastal and Hydraulics Laboratory (CHL) Progress Report dated January 1997. The wave transformation data used by Moffatt & Nichol for the FIMP study used the offshore WIS waves at Stations 75, 77, and the CHL-modified Stations 79 and 80 for the 1976-1994 time period.

Table 1 indicates that the hindcasted wave height information for storms is, on average, 5.4 feet lower than measured, the periods are 0.5 seconds low, and the directions average about 39 degrees more toward the southeast. These differences are due to a variety of details related to the numerical modeling of waves; however, for purposes of this study it should be noted that extreme waves are, on average about 5.4 feet lower than measured with significantly higher deviation (8 to 12 feet) at the high end of the distribution. These differences, however, become less of a concern in areas such as Montauk Point where the design waves are depth-limited.

Table 1 - Comparison of measured and hindcasted wave characteristics

| Event | Measured Peak Wave Height, Hmo (ft) | Hindcast Peak Wave Height, Hmo (ft) | Measured Wave Period, Tp, (s) at Peak | Hindcast Wave Period, Tp, (s) at Peak | Measured Wave Direction, Dm, (deg) at Peak | Hindcast Wave Direction, Dm, (deg) at Peak |
|---|---|---|---|---|---|---|
| **12/11/92** | 30.5 | 18.7 | 12.5 | 12.0 | 83 | 133 |
| **11/28/93** | 21.3 | 18.7 | 11.5 | 12.0 | 151 | 144 |
| **8/19/91** | 19.0 | 18.4 | 16.7 | 13.0 | 64 | 148 |
| **1/5/92** | 20.3 | 16.1 | 9.1 | 14.0 | 59 | 133 |
| **3/14/93** | 23.9 | 15.4 | 14.3 | 10.0 | 155 | 122 |
| **3/4/93** | 19.7 | 15.1 | 10.0 | 10.0 | 60 | 126 |

Table 2 presents extreme wave heights estimated by Moffatt & Nichol at the 32.8-feet contour irrespective of wave direction based on storm stages developed by CHL in 1996 for the Fire Island to Montauk Point Study. These stages were updated by CHL in 1998 and resulted in no change in the offshore wave development.

Table 2 - Extreme storm statistics produced by the Fire Island to Montauk Reformulation Study

| Return Period (yrs) | Significant Wave Height (ft) | Storm Stage (ft, NGVD) | Max. Breaker Height (ft) (-32.8 ft NGVD contour) | Design Significant Wave Height (ft) -32.8 ft depth | Wave Period (s) |
|---|---|---|---|---|---|
| **2** | 17.13 | 4.53 | 29.12 | 16.18 | 13.00 |
| **5** | 20.57 | 5.38 | 29.79 | 16.55 | 13.15 |
| **10** | 21.03 | 5.75 | 30.12 | 16.73 | 14.48 |
| **25** | 21.56 | 6.83 | 30.53 | 16.96 | 16.13 |
| **44** | 21.99 | 7.20 | 30.87 | 17.15 | 17.10 |
| **50** | 22.11 | 7.42 | 30.99 | 17.22 | 17.37 |
| **73** | 22.49 | 7.50 | 31.38 | 17.43 | 18.11 |
| **100** | 22.83 | 7.60 | 31.78 | 17.66 | 18.66 |
| **150** | 23.26 | 8.63 | 32.32 | 17.96 | 19.44 |
| **200** | 23.62 | 9.12 | 32.70 | 18.17 | 20.04 |
| **500** | 24.70 | 10.83 | 33.88 | 18.82 | 22.23 |

For development of design waves, it was determined that the waves will be depth-limited at the location of the revetment. Three approach lines (cross-sections) were developed using the most recent (2001) topographic and hydrographic surveys over which the waves at the –32.8 ft contour were transformed. The approach lines are very similar in profile view, and wave transformation model test runs indicated that the nearshore wave characteristics are all virtually identical adjacent to the revetment. Therefore one cross-section (SE) was used for detailed wave transformation modeling. The nearshore model SBEACH was employed to perform the wave transformation because it is a one-dimensional model that includes surf zone processes that are very important in this exposed environment.

Nearshore design waves were also developed for comparative purposes using the spectral model STWAVE. Boundary wave spectra were developed using the extreme significant offshore wave heights and wave periods along with waves from the East and South-Southeast. At Montauk, the presence of more northerly exposure is blocked, so the worst storm waves would be more from the East to South-Southeast. For each wave case, the appropriate water level was added to the water depths based on the CHL extreme storm surges.

Table 3 presents the results of the calculations for significant wave heights at the toe of the present structure based on the two numerical models employed. The differences in results at the structure toe are due to slightly different representations of the bottom profile and the wave breaking processes.

Table 3 - Without-Project Storm Significant Wave Heights at Toe of Revetment

| Storm Return Period (years) | Wave Height at Toe (ft) | Wave Height at Toe (ft) | Local Wave Direction for Storms from E | Local Wave Direction for Storms from SSE |
|---|---|---|---|---|
| | SBEACH | STWAVE | Deg from due E | Deg from due E |
| 2 | 4.36 | 3.27 | +5 | -22 |
| 5 | 4.82 | 4.75 | +5 | -27 |
| 10 | 5.05 | 5.19 | +5 | -25 |
| 25 | 5.41 | 5.86 | +5 | -26 |
| 50 | 5.77 | 6.35 | +5 | -27 |
| 72 | 6.05 | 6.55 | +5 | -27 |
| 100 | 6.40 | 6.80 | +5 | -27 |
| 500 | 7.87 | 8.77 | +5 | -29 |

(Wave directions are from STWAVE. At Turtle Cove, the wave directions are –12 deg for easterly storms and –60 deg for south-southeasterly storms)

## 14. Water Levels

Astronomical tide statistics were reviewed from two sources: the New York District's Reconnaissance Report for Montauk Point, and NOAA Benchmark Sheets for Montauk Point (Fort Pond, New York). The tidal statistics are generally within 0.31 feet for all relevant tidal datums, with the NOAA statistics higher than those used in the reconnaissance report. Using the relationship between current Mean Sea Level and NGVD29 that the NOAA tidal datums were referenced to NGVD29 and are shown in Table 4.

Table 4 - Tidal statistics for Montauk Point

| Level | Elevation, MLLW feet (NAN, 1993) | Elevation, MLLW feet (NOAA, 2001) | Elevation, NGVD feet (NOAA-0.8') |
|---|---|---|---|
| **Mean Higher High Water (MHHW)** | 2.4 | 2.60 | 1.80 |
| **Mean High Water (MHW)** | 2.0 | 2.31 | 1.51 |
| **Mean Sea Level (MSL)** | 1.2 | 1.24 | 0.44 |
| **Mean Low Water (MLW)** | | 0.18 | -0.62 |
| **Mean Lower Low Water (MLLW)** | 0.0 | 0.00 | -0.80 |

The Coastal and Hydraulics Laboratory (CHL, 1998) refined the storm surge levels for the Fire Island to Montauk Point Reformulation Project that were presented in Table 2. Those levels, which included a tabulation of stage-frequency values for the combination of tropical and extratropical storms, are added to the astronomical Mean Sea Level to produce total water levels shown in Table 5.

The highest observed water level, according to NOAA recorded water levels at Montauk, was +7.90 feet NGVD recorded in 1954. However, this water level was taken offshore and did not include the significant impact of wave setup (refer to Table 5).

Table 5 - Storm tide statistics developed by the Coastal and Hydraulics Laboratory

| Return Period (years) | Combined Storm Surge (Tropical plus Extratropical), NGVD feet | Combined Storm Surge + Astronomical MSL, NGVD feet | Wave Setup (from FIMP) | Storm Surge + Wave Setup + Astronomical MSL, NGVD feet | Utilized Storm Stage + Wave Setup NGVD feet |
|---|---|---|---|---|---|
| **5** | 4.76 | 5.20 | 2.72 | 7.92 | 8.10 |
| **10** | 5.34 | 5.78 | 2.88 | 8.66 | 8.69 |
| **25** | 6.14 | 6.58 | 3.19 | 9.77 | 9.52 |
| **50** | 6.73 | 7.17 | 3.42 | 10.59 | 10.34 |
| **100** | 7.33 | 7.77 | 3.57 | 11.34 | 11.51 |
| **500** | 10.29 | 10.73 | 3.88 | 14.61 | 14.51 |

## 15. Tidal Currents

Tidal currents play a role in transporting sediment along the beach. At a location such as Montauk Point, flows pass around the point as the astronomical tidal wave enters Long Island Sound to the north and the Atlantic Ocean to the south. Currents are very strong along the toe of the revetment and likely enhance the transport of fine sediments that are winnowed from the bluff face after being mobilized and sorted by waves.

## 16. Slope Stability Analysis

The till exposed in the wave cut bluffs surrounding Montauk Point is a well graded mixture of boulders, sand, gravel, and underlying silt pre-consolidated by the weight of glacial ice (Figure 13). It has a long stand up time for near vertical slopes but gradually erodes and fails with time under annual rainfall and runoff (Figure 14). Under large magnitude wave actions with high storm surges, the dense till will be scoured and result in toe failures of the mid to upper bluff above the revetment for the till and overlying granular soils. The slope stability analysis of existing conditions was performed for sections representing the steepest slopes that are near and surrounding the lighthouse. Results indicated that the slopes and the present conditions are at equilibrium with little or no safety margin.

The upper parts of the slopes, which are near the angle of repose for the granular soils, show the highest potential for failure if existing conditions are even slightly disturbed. The upper slopes would consistently fail if terracing and vegetation stabilization measures, maintained by the Montauk Point Historical Society, were not practiced.

In addition, a greater surface area and volume of material near the shoreline can fail with external disturbance, however this is unlikely to occur due to the very dense nature of the underlying shoreline soil (till).

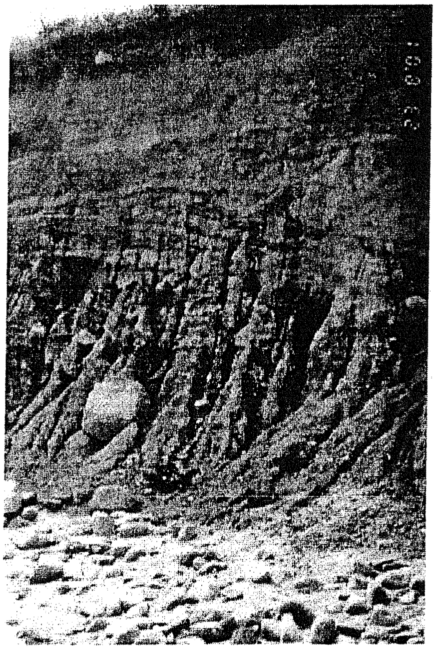


Figure 13 - Typical bluff cross-section with glacial till at Montauk Point

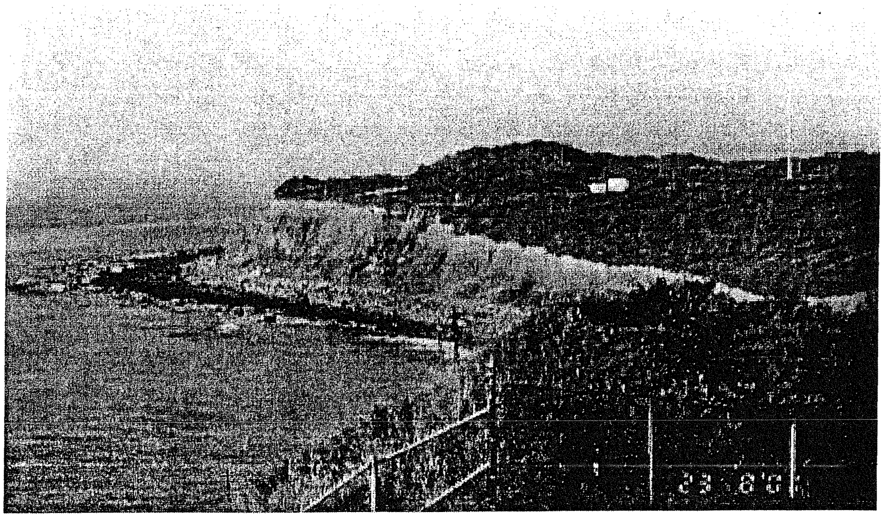


Figure 14 - Eroded bluff south of Turtle Cove with wave-eroded toe and consequent bluff failure

## 17. Scour, Runup, Overtopping, Wave Attack Forces

The toe of the existing stone revetment consists of stone overlying stiff glacial till. The scour mechanisms associated with glacial till and stone are not predictable using numerical models. Therefore a physical model was built to assess failure mechanisms. Because the revetment toe is glacial till and generally overlain with stone, it is expected that toe scour will be minimal during a given storm event but would be subject to some, but not significant, long-term scour. Runup due to the maximum breaking wave at the toe of the revetment ranges from +22.2 feet NGVD during a 2-year event to +32.0 feet NGVD during a 500-year event (Table 6). Based on the topography data collected in 2001, it appears that the revetment is overtopped along its entire length by the upper 2% of wave runups during all storm events listed. This is consistent with observations that wave runup on the order of several feet deep occurs along the fence at the top of the revetment, which varies as low as elevation +20 feet NGVD.

Table 6 - Without-project, maximum runup & potential for overtopping

| Storm Return Period (years) | Max. Water Level at Toe w/Wave Setup (feet, NGVD) | Breaking Wave Height (feet, NGVD) | Max. Runup Level (feet, NGVD) | Revetment Overtopped | Revetment Threatened |
|---|---|---|---|---|---|
| **2** | 7.1 | 7.50 | 22.2 | Entirely | No |
| **5** | 8.1 | 8.37 | 23.4 | Entirely | No |
| **10** | 8.7 | 8.82 | 23.4 | Entirely | No |
| **25** | 9.5 | 9.57 | 23.7 | Entirely | Yes |
| **50** | 10.2 | 10.32 | 24.5 | Entirely | Yes |
| **100** | 11.5 | 11.38 | 26.4 | Entirely | Yes |
| **500** | 14.5 | 13.00 | 32.0 | Entirely | Yes |

## 18. Stability Analysis Evaluation

The stability analysis of existing conditions was performed along three cross sections (Figure 15). These sections represent the steepest slopes that are near and surrounding the lighthouse. Section A-A is the steepest of the three sections.

The stability analysis on each section indicates that the slopes and the present conditions are at equilibrium with little or no safety margin. This is indicated by a factor of safety of approximately 1.0 for Sections A-A and B-B. The upper parts of the slopes, which are near the angle of repose for the granular soils, show the highest potential for failure if existing conditions are even slightly disturbed. At Section A-A, the upper slopes would consistently fail if terracing and vegetation stabilization measures, maintained by the Montauk Point Historical Society, were not practiced.

It is noted that Section C-C is stable with a minimum slope stability factor of safety of 1.25 due to the lower bluff elevation and milder slopes. However, a much larger failure surface and volume of material starting at the shoreline also has a low factor of safety (1.094) in section A-A and can fail with external disturbance, although much less likely due to the very compacted state of the soils near the toe of the bluff below elevation +15 feet NGVD +/-.

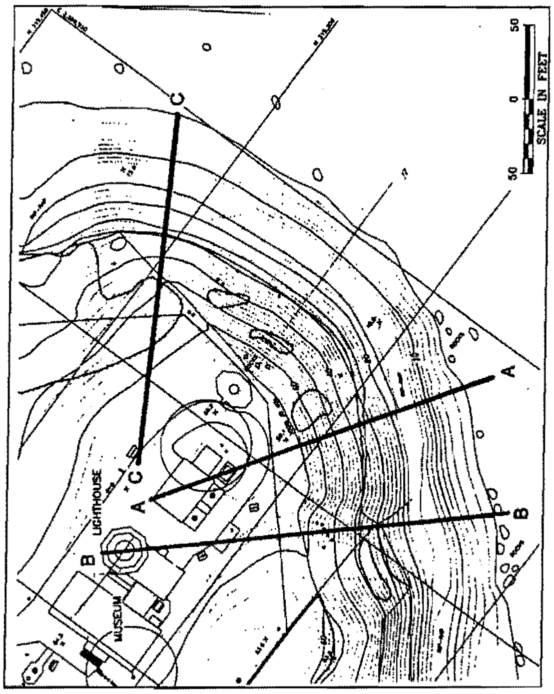


Figure 15 - Locations of cross-sections for slope stability modeling

## 19. Without-Project Future Conditions

Existing conditions of the revetment show that if no further protection to the fronting bluff occurs, there is a significant threat to the existing bluff protection and ultimately to the treasured resources of the lighthouse, bluff and surroundings. The following describe how the deterioration of the existing bluff protection would lead to direct storm damage and eventual loss of the lighthouse complex and surroundings. Three possible failure modes are considered in determining the remaining life of the existing shore protection structure.

1) Toe erosion at the base of the revetment that would lead to toe stone instability and revetment collapse;

2) Wave action dislodging lighter than required armor stones prevalent and interspersed on the revetment surface; and

3) Wave runup and overtopping that would dislodge the revetment crest stones and lead to revetment collapse.

The exact elevation of the toe of the present structure is not well-defined, but is estimated from photographs and spot elevations in recent topographic surveys obtained by the New York District in 2001. It is noted that failure of the revetment would be followed by bluff failure, which would then threaten the lighthouse. Revetment failure alone will not cause the immediate catastrophic failure to the lighthouse, since the slope stability of the bluff, after revetment failure, has a factor of safety greater than 1. The recession of the bottom profile for the beachfront flanking the revetment is less than the maximum (due to a differing shoreline orientation) based on historical recession rates below the water line.

A corresponding sea level rise (0.01-feet/year) and profile horizontal recession (approximately 1-foot/year historically) for the beachfront flanking the revetment is included. For the revetted area, the recession rates are assumed to be negligible due to the presence of the revetment (recession of the upper part of the profile is assumed, based on performance, to be arrested by vegetative shore protection measures). In addition, erosion immediately adjacent to the revetment will diminish below the historical 1-foot/year rate due to the sheltering effect of the existing revetment, and thus, will negate flanking potential.

These three modes of failure can occur individually or in combination. Because of the uncertainty in predicting the impacts of these three modes of failure (i.e. stone displacement from wave impacts due to undersized stone, erosion of the toe foundation soil (hardened till), or displacement of stone on the upper part of the revetment due to wave runup and overtopping) a physical model of the revetment was undertaken (2002) at the University of Delaware Center for Applied Coastal Engineering. Based on the results of the physical model, the primary mechanism expected to cause bluff failure is the effect of waves, including direct impact and runup/overtopping, on the armor stone. Large-scale slope failure (i.e. that initiated at the shoreline or structure toe) is not expected to occur due to the presence of glacial till and large amounts of stone overlying the soils.

### Failure of the structure due to revetment toe erosion

The physical model was not able to exactly replicate the condition of the dense foundation soil (glacial till) overlain with a thin veneer of sand) at the revetment toe, but these conditions in the model were simulated with a hardened bottom. In addition, based on eyewitness accounts from continuous observation over extended periods of time, including severe storms, both storm-induced and long-term toe erosion are considered to be relatively minor in terms of toe stone instability. Although some long-term erosion does occur in the revetted area, it is difficult to compute or otherwise quantify realistic rates. Maintenance practices will tend to protect the base of the structure, and the predominance of dense glacial till overlain by stone will significantly retard toe erosion. Therefore, the toe erosion mode of failure is not considered pertinent to the overall cause of failure.

### Failure of armor layer (displacement of armor stone on the revetment slope)

When the water level is elevated by both astronomical tide and storm surge, waves impact the armor stone. The present armor stone will be stable in waves of a certain size, above which they are expected to become damaged (dislodged), resulting in failure of the structure. Because the existing structure is not a recommended type of cross section, i.e. significantly varying stone sizes of one layer with no buried toe, but with stone that is interlocked tightly, and the associated uncertainty in stone performance under storm conditions, a physical model was constructed to replicate the existing revetment as closely as possible in terms of variance in stone size and degree of interlocking. The model tested storm waves ranging from the 2-year return period to the 100-year return period range and very minor displacement of armor stone on the revetment slope was observed. The model included areas of undersized stone interlocked among larger armor units and no failure was observed for the range of waves tested. Thus, this failure mode is not considered pertinent to the overall cause of failure

### Failure due to displaced armor from wave overtopping

Additional slope stability analyses were performed to model the reduction of the height of the upper revetment due to wave overtopping and the subsequent wave scour of the underlying soils of a failed revetment. These analyses were performed for three cases: the existing revetment height to an elevation of +18 feet MSL; a revetment height of +14 feet MSL after lowering by initial upper revetment failure; and the failed revetment with a height of +10 feet MSL. These analyses, combined with the physical model results that show upper revetment failure below elevation +10 MSL, indicated that under the latter conditions, the top of the slope would recede landward a distance of approximately 26 feet subsequent to failure of the revetment between elevations +10 feet MSL and +18 feet MSL. The slope profile changes are presented on Figure 16.

The physical model was tested for wave runup and overtopping of the revetment for an approximately 2-year return period storm through an approximately 100-year return period storm. Based on the results of the model test, it was determined that stone displacement, from overtopping of the revetment crest, is anticipated between a 10-year return period storm and a 20-year return period storm, say a 15-year return period storm. This result is substantiated by a semi-empirical analytical method to determine damage threshold exceedance from overtopping (Coastal Engineering Manual 1997 Part VI).

Since the last storm experienced at Montauk Point of this significance was in 1993, there is a likelihood (with a 60% probability) that this 15-year return period storm will occur by the year 2006 and cause significant damage (at least 25% damage level) to the revetment itself.

The previous paragraphs address the potential for significant damage to the revetment. However, this damage in and of itself does not create an immediate threat to the lighthouse since bluff slope failure affecting the lighthouse would not occur just from damage to the revetment. Once the upper sections of the revetment are displaced (2006), the foundation soil underlying the displaced stone would become exposed and subject to subsequent erosion. To determine the extent of erosion of the toe of the upper bluff above the damaged revetment that would cause significant bluff failure to threaten the stability of the lighthouse structure, a slope stability analysis was performed.

The results of this analysis (Figure 16) determined that for significant bluff failure, the damaged crest elevation of the revetment would degrade to approximately +10 feet NGVD (indicated by the physical model from a 10-year return period to a 20-year return period storm) and the upper bluff toe at that elevation would recede horizontally approximately 10 feet. This should cause about 30 feet of loss of the bluff crest and immediately threaten the lighthouse facility at the most critical area to the southeast of the structure.

The period of time estimated for this condition to occur, subsequent to 2006, is an additional 8-10 years, which results from long term erosion at the upper bluff toe (at elevation +10 feet NGVD) with no significant storm occurrence, or from an approximately 10-year return period storm which has a likelihood of occurrence (60% probability) by the year 2015.

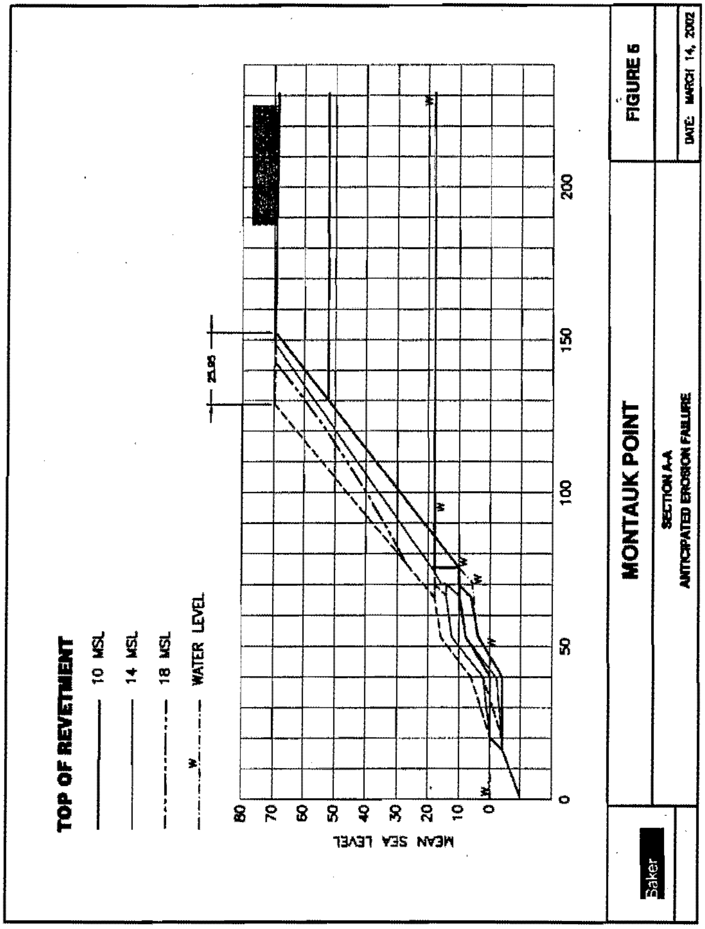


Figure 16 – Slope Profile Changes

Most Likely Without-Project Future Condition

The history of this area indicates that the U.S. Coast Guard and later on, the Montauk Point Historical Society, have attempted to repair the revetment protecting the bluff whenever a severe storm has damaged the protective structure. The most recent storm that damaged the revetment occurred in 1993. Afterwards, the Montauk Point Historical Society raised funds to repair the revetment back to its pre-damaged condition, approximately a 15-year storm design.

Historically, emergency repairs were accomplished in the 1960s, 1970s, 1980s, and 1990s prior to 1993, which has been the consistent practice since the construction of a revetment to protect the bluff in 1944. However, these emergency repairs, financed with limited available local funds, will ultimately not be able to keep the revetment structure intact, which will lead to the eventual loss of the lighthouse complex and surroundings.

## 20. Problems, Needs, Opportunities, Planning Objectives

Problems

Presently the lighthouse is less than 120-feet from the edge of the bluff and other major structures are within 50-feet of the bluff edge. Continued erosion has been recognized as a problem for many decades and various efforts have been made to stabilize the shoreline with varied success. Over several decades, many erosion control measures have been constructed to protect the lighthouse from the danger of erosion. Presently the existing revetment, built in the early 1990's, provides protection. Because the present shore protection measures were not designed to withstand major storm events over a substantial duration, i.e. lack of buried toe, inadequate stone size, insufficient overtopping protection, it is expected that the revetment now in place will fail in the foreseeable future.

The revetment, in combination with other recent efforts, including terracing, vegetation and improved revetment construction, has decreased the erosion rate. However, the lack of a buried toe and random interspersed inadequate stone size, over time, is leading to loss of adequate stone interlocking and eventual anticipated displacement of upper revetment armor stone from wave overtopping. This will lead to the eventual compromise of the revetment and upper bluff areas, which subsequently, is expected to result in the eventual loss of the lighthouse and its adjacent structures if no corrective action is taken.

Though there have been repeated efforts to halt the progressive erosion of the bluff, these actions have had limited success. All efforts have worked for a time, but none could provide long-term protection. The remaining lands and lighthouse are so important that the State of New York, Montauk Historical Society and local interests are expected to continue to fight the erosion, but only with a scale of protection defined by past practices.

### Needs

Erosion has seriously reduced the ability of the shorefront in the project area to provide adequate protection to backshore properties from coastal storms and wave attack. As a result of future projected revetment instability and subsequent bluff erosion, the historic structure, as well as the associated artifacts within the vicinity, will be in critical danger if a long-term protection plan is not implemented.

### Opportunities

There have been numerous locally coordinated efforts to fortify the critical shoreline areas by the State, Town and U.S. Coast Guard, in order to protect the Montauk Point complex, a national treasure. Opportunities exist to complement, enhance and augment local efforts in a collaborative planning environment.

### Planning Objectives

Planning objectives were identified based on the problems, needs and opportunities as well as existing physical and environmental conditions present in the study area. The main Federal objective is to contribute to National Economic Development (NED) consistent with the nation's environmental policy, pursuant to national environmental statutes, applicable executive orders and other Federal planning requirements. The following general and specific objectives have been identified:

General requirements include:

- Meet the needs and concerns of the public within the study area
- Respond to the public desires and preferences
- Be flexible to accommodate changing economic, social and environmental patterns and changing technologies
- Integrate with and be complementary to other related programs in the study area
- Implement with respect to financial and institutional capabilities and public consensus
- Conform with USACE environmental operating principles

Specific requirements include:

- Protect Montauk Point and vicinity, including the historic lighthouse and associated facilities from erosion, environmental degradation and coastal storm damage
- Reduce the threat of future bluff instability by protecting against wave attack and erosion from ocean impacts
- Provide an economically justified approach for bluff protection at Montauk Point
- Prevent the aggravation of erosion in adjacent areas

Technical constraints include:

- Plans must represent sound, safe and acceptable engineering solutions taking into account the overall littoral system effects
- Plans must be in compliance with Corps of Engineers regulations
- Plans must be realistic and state-of-the-art while not relying on future research
- Maintain proper stone interlocking for bluff protection
- Plans must provide features that minimize the effect of shoreline erosion processes

Economic constraints include:

- Plans must be efficient, make optimal use of resources and not adversely affect other economic systems
- Average annual benefits must exceed the average annual costs

Environmental constraints include:

- Plans must avoid and minimize environmental impacts to the maximum degree practicable
- Plans must consider mitigation or compensation for a potential impact when identified

Regional and Social constraints include:

- All reasonable opportunities for development within the project scope must be weighed, with consideration of state and local interests.
- The needs of other regions must be considered and one area cannot be favored to the detriment of another
- Plans must maintain existing cultural resources to the maximum degree possible, and produce the least possible disturbance to the bluff
- Plans must maintain recreational fishing and surfing experiences

Institutional constraints include:

- Plans must be consistent with existing federal, state and local laws
- Plans must be locally supported and signed by local authorities in the form of a project cooperation agreement, guarantee for all items of local cooperation including cost sharing and all lands, easements and rights-of-way
- Local interests must agree to provide public access to the shore in accordance with Federal and state guidelines and laws
- The plan must be fair and find overall support in the region and state

## 21. Preliminary Alternatives

Criteria for evaluating preliminary alternatives will include appropriateness to site conditions, compliance with New York State Coastal Zone Management criteria, effectiveness of protection, impacts on environmental and cultural resources, and costs (including interest during construction and maintenance).

The feasibility study must formulate and design long-term protection for the lighthouse complex and surrounding area. Preliminary alternative approaches need to be considered in order to develop the most appropriate form of shoreline stabilization for the area.

Preliminary cost estimates are included so that the most cost effective and efficient solutions, considering coastal processes impacts, can be selected for detailed design and economic optimization.

Alternatives that are feasible approaches to storm protection and shoreline stabilization need to address both present and future needs. The present need is to eliminate the threat of erosion and to provide acceptable levels of protection from the impacts of wave attack and storm recession.

Preliminary Alternatives include:

- Alternative # 1 - No Action Plan
- Alternative # 2* - Stone Revetment
- Alternative # 3* - Offshore Breakwater with Beach Fill
- Alternative # 4* - T-groins with Beach Fill
- Alternative # 5* - Beach Fill
- Alternative # 6* - Relocation of the Lighthouse

* *Alternatives # 2 thru # 6 are developed at the same storm design. They are designed to withstand a 73-year return period storm. This level of design is commensurate with a project evaluation over a 50-year period, because over 50 years there would be a 50% risk of a 73-year or greater storm event.*

## 22. Preliminary Alternative #1 - Repair Structure As-Needed (No Action)

The No Action Plan (no Federal action through the Corps of Engineers) would consist of a continuation of the without-project condition, which includes the eventual displacement of the existing revetment and subsequent erosion of the exposed bluff. If allowed to occur, progressive instability of the bluff would result in the irrecoverable loss of the lighthouse and its associated structures, along with archaeological resources.

While the no action plan fails to meet objectives and needs of the project area, it does provide the basis against which project benefits are measured.

- Emergency efforts by the Montauk Point Historical Society to control the erosion are expected to continue, but in the absence of a comprehensive shore protection project, experience shows that their efforts have not solved and would not solve the long-term problem of significant damage to the existing structure complex, with associated threat to the lighthouse from large storm events over an extended period of time (e.g. 50 years).

- It is estimated that the present revetment structure is susceptible to damage from a 10 to 20-year storm frequency event but progressive damage will occur during lesser events. Emergency repairs will not be able to keep the structure intact without efforts to upgrade the structure design.

- The implication of the bluff failure would be the total loss of all historic properties, both buried and above ground. The architectural and archaeological remains at the lighthouse complex are an invaluable resource in terms of information and national cultural heritage. Once this information is lost, it can never be recovered, and future study of the complex would be impossible. The loss of the lighthouse complex violates the National Historic Preservation Act of 1966, as amended. Bluff failure would also lead to an eventual change in habitat types, and in the recreational use potential of the area

- If the lighthouse complex is lost, the Coast Guard would have to construct a new navigation aid to replace the lighthouse.

## 23. Preliminary Alternative #2 - Stone Revetment

A riprap stone revetment was proposed for long-term erosion control, as shown in Figure 17. The plan consists of 840-feet of revetment protection. The protection covers the most vulnerable bluff area that would directly endanger the lighthouse complex due to bluff failure without the project. The revetment design was based on Engineering Manual 1110-2-1614 "Design of Coastal Revetments, Seawalls and Bulkheads." A heavily embedded toe shall be employed to stand against breaking waves at the toe of the structure. The revetment section features a 40-feet wide crest at +25 feet NGVD, a 1V:2H side slope, 12.6-ton quarrystone armor units extending from the crest down to the embedded toe. Three layers of 4-5 ton armor units are used to construct the splash apron. Filter cloth and sublayers are specified in accordance with standard Corps of Engineers design procedures.

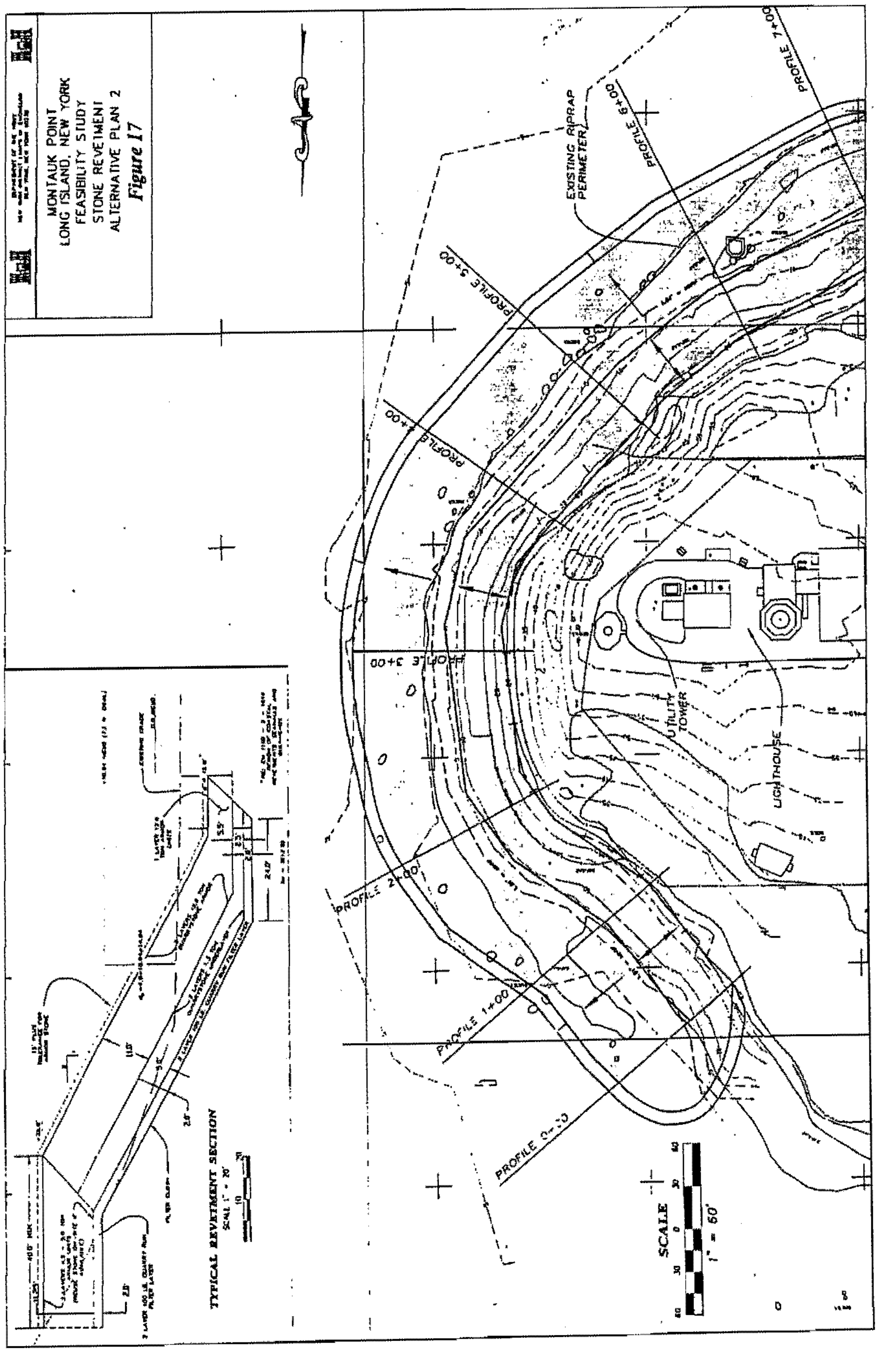
The estimated first cost for the stone revetment is $14,843,000, including 20% contingency, engineering and design, and construction management.

- Revetments are a proven method of shore protection in this area and have a record of acceptance by state and local authorities. Revetment alternatives such as this can utilize much of the stone already on site in the existing structure, thus making good use of existing resources.

- The placement of a stone revetment along the face of the bluff will have a minimal impact on the buried and above ground historic properties. In fact, the addition of stones along the current wall will provide the greatest possible protection for the historic properties and allow them to remain in place for future study.

- The cross section of the revetment can be slightly modified to allow access by fishermen to areas close to the water. It is not expected that a new revetment will change present surfing conditions in any way. There is a revetment in place at Montauk Point now, and the surfing is considered to be good. The proposed revetment will be in the same place as the existing revetment, made of similar rock material, and will be similar to it in all particulars which might effect waves. Wave reflection coefficients are estimated at 13-19 percent less for the proposed revetment alternative than for the existing revetment. The proposed plan will not change wave conditions in any perceivable way.

- Effects of both the existing structure at Montauk and the proposed structure on the littoral sand transport are small and are expected to be local, i.e. are not likely to extend as far alongshore to developed areas such as Ditch Plains or more developed points further west, especially in view of the variable shoreline shape and materials in between. The amount of material that would be contributed downdrift if the proposed revetment alternative was not constructed is very small relative to the total sediment budget and this small amount is added back by some equally minor increase in erosion, a relatively short distance west of the revetment. Any adverse impacts from the proposed revetment alternative are not considered to be significant.



MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
STONE REVETMENT
ALTERNATIVE PLAN 2
*Figure 17*

## 24. Preliminary Alternative #3 - Offshore Breakwater & Beach Fill

The purpose of an offshore breakwater is to reduce the storm wave height offshore of the revetment toe, thus reducing the wave impact force and runup elevation on the bluff. Shoreline recession would be reduced with the construction of an offshore breakwater. The existing revetment and terracing of the upper bluff would provide a reasonable level of protection with the offshore breakwaters in place. As shown in Figure 18, the breakwater would be a rubble mound structure located about 200-feet offshore at about the – 8 feet NGVD contour. Beach fill would be placed from about the MHWL out to the breakwaters to provide additional toe protection to the existing revetment. Approximately 200,000 cubic yards of beach fill would be placed to a berm elevation of +11 feet NGVD. The required renourishment quantity is estimated at 100,000 cubic yards, every 3 years. The sand is assumed to be acquired via a 4,000 cubic yard hopper dredge from Borrow Area IV, seaward of Shinnecock Inlet, as identified in the Fire Island to Montauk Point Reformulation Study. Three separate structures would be built, two being 300-feet in length and one 500-feet in length, with the longest facing the more severe southeasterly direction. The openings between the structures would allow some tidal circulation but also may induce some dangerous currents concentrated in the gaps.

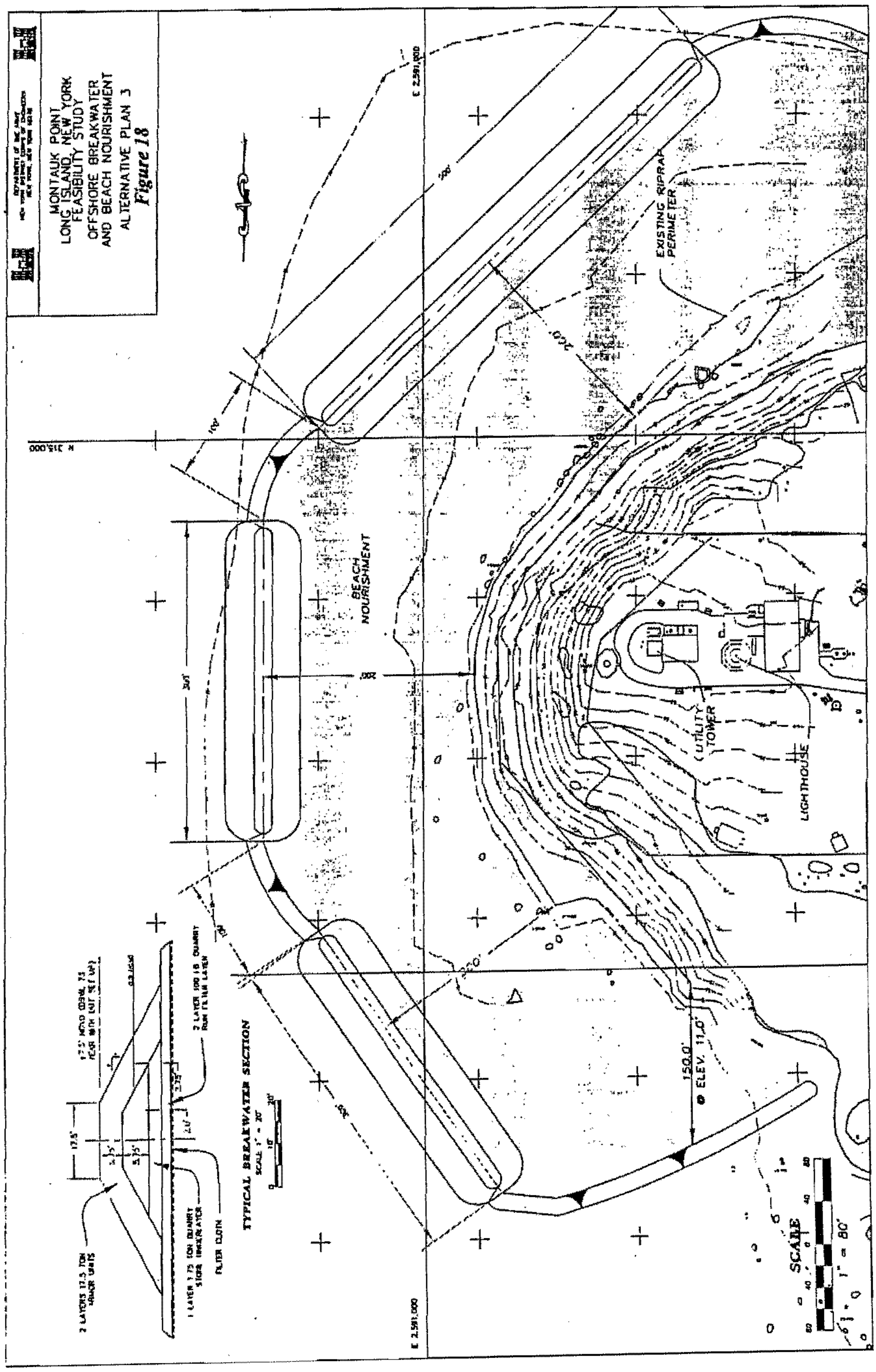
The breakwater design is based on present Corps guidelines. The crest is placed at +7.5 feet NGVD, which is the 73-year water level without wave setup. The armor size is 17.5-tons, placed in two layers on a single layer of 1.75-ton quarrystone underlayer and 2 layers of 100-pound filter stone. The entire structure is built on filter cloth.

The estimated first cost for the offshore breakwater with beach fill is $14,481,000, including 20% contingency, engineering and design, and construction management.

- ➢ Breakwaters will be difficult to construct due to difficult site access and in-water construction. Tidal currents are significant and breaking waves arrive from almost all onshore directions. The breakwater requires very large stone and a substantial width and elevation to be effective. The gaps between the breakwaters may induce significant currents that could increase scour to the bottom, potentially compromising the foundation of the breakwaters sometime in the future. Higher surges with waves that submerge the +11 feet berm will not be prevented from damaging the revetment.

- ➢ Historic properties will remain protected with the offshore breakwater with beachfill alternative, assuming remedial repairs will be made to the existing revetment, as needed.

- ➢ The high currents may cause a safety hazard to swimmers, surfers and fishermen who wade in the area. Surfing activity in the area might be affected by changed reflected wave characteristics.



MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
OFFSHORE BREAKWATER
AND BEACH NOURISHMENT
ALTERNATIVE PLAN 3
*Figure 18*

## 25. Preliminary Alternative #4 - T-Groins with Beach Fill

T-groins, similar to a nearer-to-shore segmented breakwater system with shore-attached groins, are considered as a second breakwater alternative. Similar to the breakwater alternative presented, the purpose of T-groins is to reduce the storm wave height, thus reducing the wave impact force and runup elevation on the bluff. The consistent beach and shoreline recession would be reduced with the construction of T-groins and beach fill. The existing revetment and terracing of the upper bluff would provide a reasonable level of protection with the T-groins in place.

As shown in Figure 19, the T-groin system would be a rubble mound structure located about 100-feet offshore at about the –5 feet NGVD contour. Five separate shore-parallel structures would be built, each being 150-feet in length. A groin would be extended from the center of the shore-parallel breakwater segment to shore, creating individual littoral cells.

Beach fill is placed from shore out to the centerline of the shore-parallel breakwaters to provide erosion protection to the bluff toe to a berm elevation of +11 feet NGVD. Approximately 125,000 cubic yards of beach fill would be placed. The required renourishment quantity is estimated at 100,000 cubic yards every 3 years. The sand is assumed to be trucked in from an upland borrow source. It is expected that embayments in the fill would quickly form as waves and tides re-mold the fill material. The openings between the structures would allow some tidal circulation but also may induce some dangerous currents concentrated in the gaps.

The T-groin design is based on present Corps guidelines. The shore-parallel structure crest is placed at +11 feet NGVD and the groin section crest is placed at +8 feet NGVD. The armor size is 17.5-tons in the shore-parallel structures, placed in two layers on a single layer of 1.75-ton quarrystone underlayer and 2 layers of 100-pound filter stone. The armor size is 4.5-tons in the groins, placed in two layers on 900-pound quarrystone underlayer. The entire structure is built on filter cloth.

The estimated first cost for the T-groins with beach fill is $12,094,000, including 20% contingency, engineering and design, and construction management.

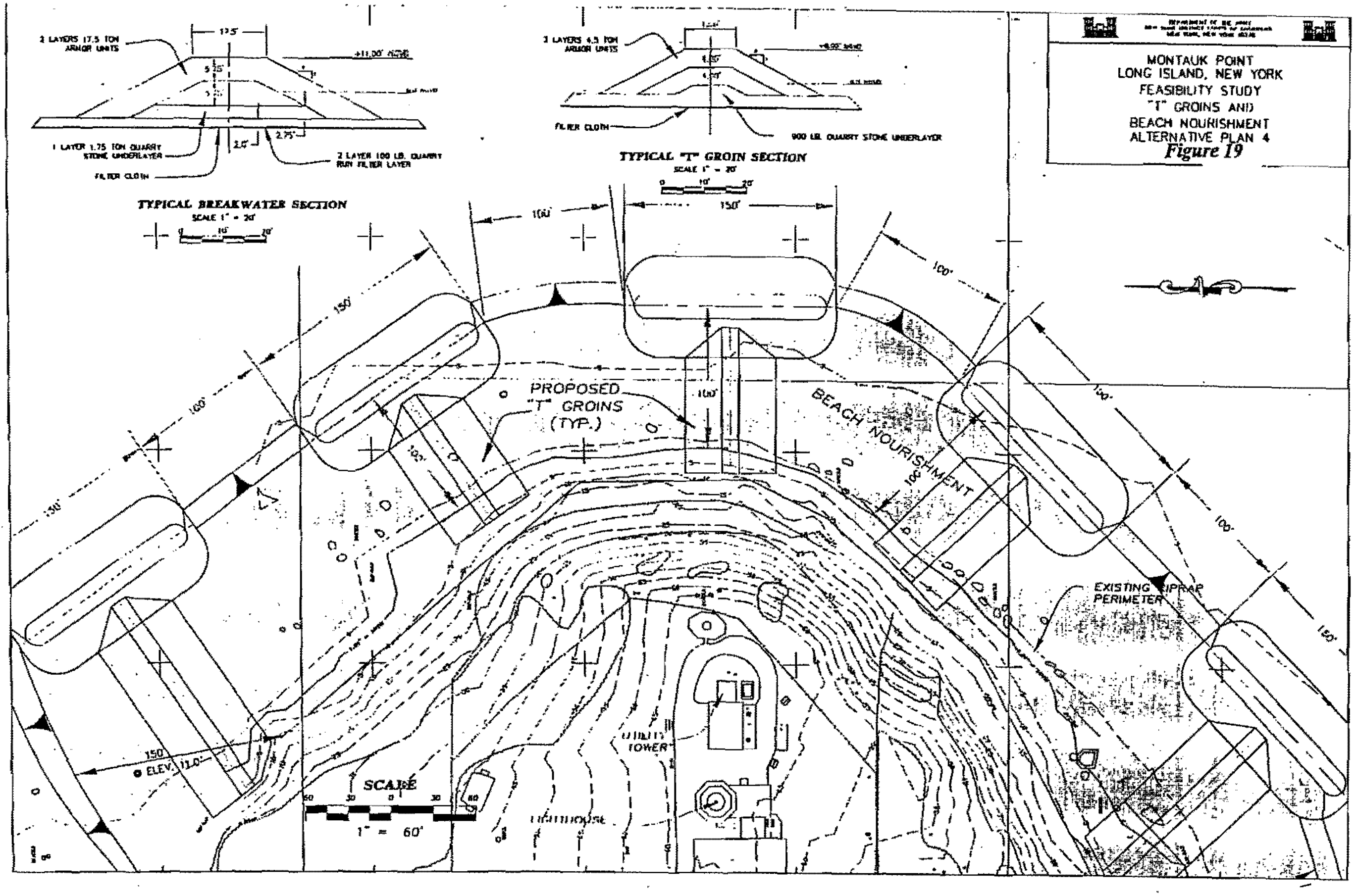
- T-groins will be difficult to construct due to difficult site access, however, land-based equipment can be utilized. Tidal currents are significant and breaking waves arrive from almost all onshore directions. The shore-parallel structures would require very large stone and a substantial width and elevation to be effective. The gaps between the shore-parallel structures may induce significant currents that could scour the bottom, potentially compromising the foundation of the t-groins sometime in the future.

- In this option, the protective beach fill will require renourishment at a rate that is difficult to predict until it is constructed and monitored. Higher surges with waves that submerge the +11 feet berm will not be prevented from damaging the revetment.

- The placement of T-groins along the face of the bluff of Montauk Point will have a minimal negative impact on the buried and above ground historic properties present. The addition of groins along the current wall will, in fact, protect the resources and allow them to remain in place, allowing for their future study.

- The high currents may cause a safety hazard to swimmers, surfers and fishermen who wade in the area. Surfing activity in the area may be affected by changed reflected wave characteristics.

- Impacts stemming from periodic removal of fill at the borrow site could occur. There would probably be seasonal constraints due to essential fish habitat concerns.



MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
"T" GROINS AND
BEACH NOURISHMENT
ALTERNATIVE PLAN 4
**Figure 19**

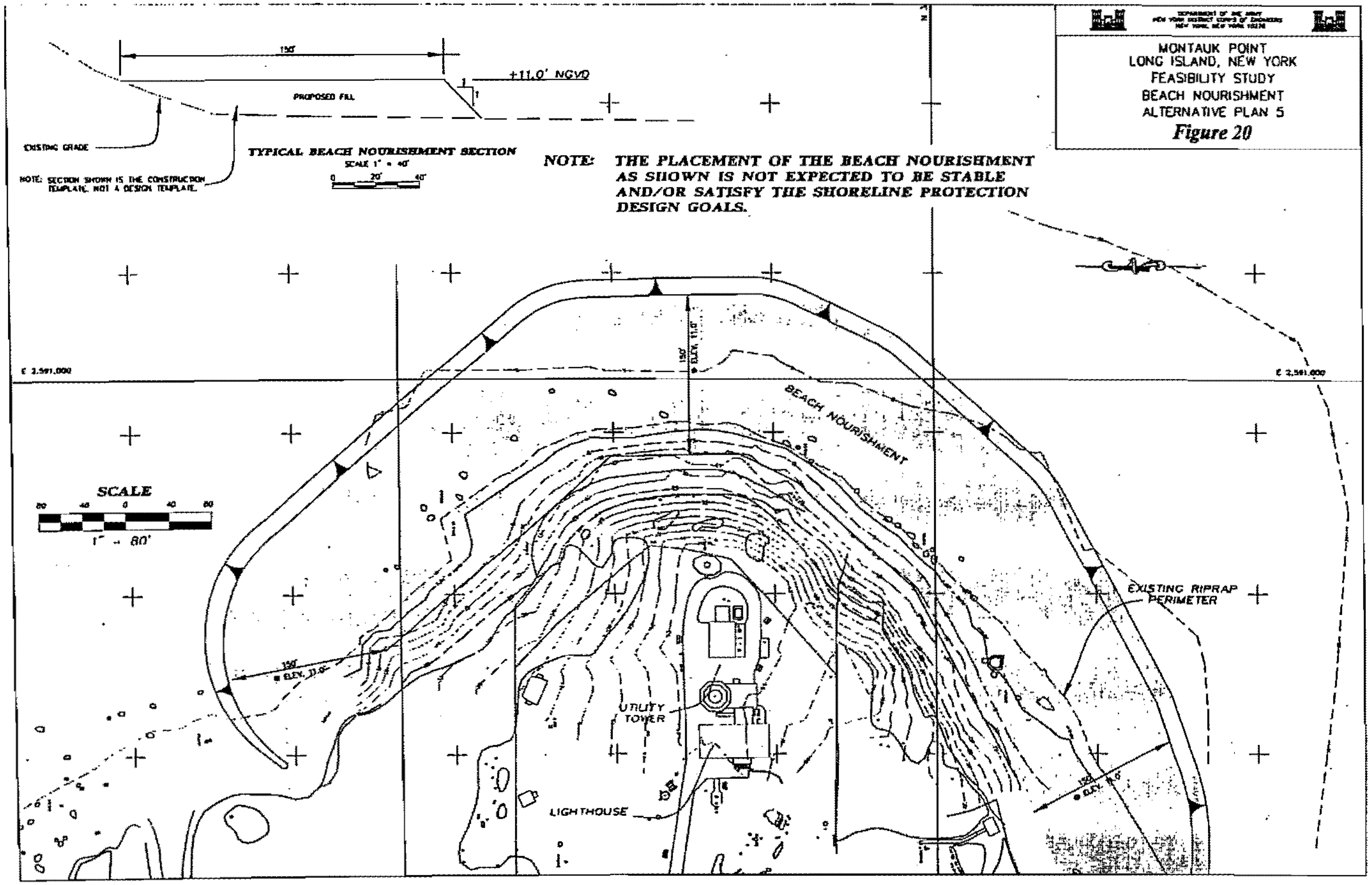
## 26. Preliminary Alternative #5 - Beach Fill

Beach fill or nourishment without containment structures is illustrated in Figure 20. For this design, a construction berm with an elevation of +11 feet NGVD and 150-feet in width is created. Approximately 200,000 cubic yards of beach fill would be placed. The sand is assumed to be acquired via a 4,000 cubic yard hopper dredge from Borrow Area IV, seaward of Shinnecock Inlet, as identified in the Fire Island to Montauk Point Reformulation Study.

- This alternative is not considered feasible for many reasons. High longshore transport rates will remove the fill rapidly at an unpredictable rate and the area will require constant renourishment. A berm at +11 feet NGVD will provide some short-term reduction in the recession of the toe of the bluff, but will not impede higher water levels and waves from impacting the bluff face and therefore will not provide adequate storm damage protection. Seasonal beach surveys (potentially monthly) will be required during the first two to three years after construction to refine the design of the beach fill cross section and to estimate the renourishment requirements. Because of the lack of adequate storm damage protection, this beach fill alternative will not be considered further.

- It expected that a beach nourishment project will change surfing conditions in the area by reducing wave reflection characteristics from the existing stone structures and by filling out the offshore beach profile to a more gradual slope.

- Impacts stemming from periodic removal of fill at the borrow site could occur. There would probably be seasonal constraints due to essential fish habitat concerns. Recreational fishing at the placement site might also be affected.



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NEW YORK, NEW YORK 10278

MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
BEACH NOURISHMENT
ALTERNATIVE PLAN 5

***Figure 20***

**NOTE: THE PLACEMENT OF THE BEACH NOURISHMENT AS SHOWN IS NOT EXPECTED TO BE STABLE AND/OR SATISFY THE SHORELINE PROTECTION DESIGN GOALS.**

## 27. Preliminary Alternative #6 - Relocation of the Lighthouse

Moving the Montauk Point Light Station, a National Register listed property, would preserve the existing structures, but allow for the eventual destruction of the bluff. Prior to the relocation of the existing buildings, the arrangement and relationships of the structures on the landscape as well as the view to and from the lighthouse and bluff would be documented. In addition, subsurface archeological investigations would be required at the current site as well as at the new lighthouse location.

The preliminary estimated cost for moving the Montauk Point Lighthouse and undertaking the required archeological investigations would be approximately $20 million. In addition, the required creation of raised grades landward of the present location of the lighthouse would add an additional cost of $7 million and reduce parking facilities. The overall project would take approximately six years to complete, with a total cost of approximately $27 million.

- The moving of the lighthouse itself is a precarious task at best. Unlike the Cape Hatteras Lighthouse (which rested on a relatively flat, level surface that permitted the National Park Service to move the structure for a cost of approximately $12 Million) the Montauk Point Lighthouse rests upon a hill on top of the bluff. Raised grades would have to be built to raise the level of the ground to the west of the bluff up to the lighthouse grade to insure a stable move.

- The relocation of the Montauk Point Lighthouse will have an adverse effect on the above and below ground resources. Moving the Lighthouse would have an adverse impact on the archaeological resources and compromise the integrity of the lighthouse and associated structures.

- Environmental degradation of habitats and historic views would continue. Relocating the lighthouse could lead to an eventual change in the recreational use potential of the area.

The moving of the Lighthouse was given considerable weight during the Feasibility phase of the project. However, several factors contributed to the decision not to make this proposal the preferred alternative. They included: a) the overall cost of the alternative b) the engineering requirements of having to build up land to meet the hill of Montauk Point to create a level moving surface, c) the destruction of a National Register Landmarked complex by moving it, the setting is destroyed thus violating the spirit of the National Historic Preservation Act of 1966, as amended, d) the loss of value to the Town of Easthampton, Montauk Point and Montauk Point State Parks, as several hundred thousand visitors come to this area each year, in part to see "the end", i.e. Montauk Point Lighthouse, e) the New York State Office of Parks, Recreation and Historic Preservation (see Letter Number 01), the Regulatory Agency that would have to approve any move of a National Register structure has already stated, and has done so throughout the entire process, that they would not approve the moving of the Lighthouse, which would lead to the destruction of the Lighthouse complex area.

Additionally, while the Montauk Historical Society maintains the lighthouse complex, the U.S. Coast guard still operates the beacon and the foghorn as working aids-to-navigation. If the lighthouse were not present, the U.S. Coast Guard would likely erect a tower of which to mount a replacement beacon. As per the agreement signed during the transfer of the property from the Federal Government to the Montauk Historical Society, If the Montauk Historical Society fails to protect or maintain the lighthouse, the property would revert back to the USCG.

## 28. Selected Preliminary Alternative – Stone Revetment

Based on the advantages and disadvantages of each of the alternatives discussed, including an evaluation of environmental quality, other social effects, regional economic development, and national economic development (see Table 7), as well as the estimated costs of construction and periodic nourishment required with the potential alternatives (see Table 7A), and comparison of net benefits (see Table 7B), the selected plan for protection of Montauk Point and the lighthouse complex and bluff is the stone revetment.

Table 7 – Plan Evaluation Matrix

| | Environmental Quality | Other Social Effects | Regional Economic Development | National Economic Development |
|---|---|---|---|---|
| **Alternative 1 - No Action Plan** | - | - | - | - |
| **Alternative 2 - Stone Revetment** | 0 | 0 | + | [illegible] |
| **Alternative 3 - Offshore breakwater with beach fill** | - | - | + | - |
| **Alternative 4 - T Groins with Beach Fill** | - | - | + | - |
| **Alternative 5 - Beach fill only** | - | - | + | - |
| **Alternative 6 - Relocation of Lighhouse** | - | 0 | 0 | - |
| | | | | |
| **+ Indicates a net positive influence or effect** | | | | |
| **0 Indicates no positive or negative effect** | | | | |
| **- Indicates a net negative influence or effect** | | | | |
| | | | | |
| The alternative plans have been evaluated based upon four accounts to facilitate plan selection. | | | | |
| Based upon these evaluations the revetment alternative is the selected NED plan. | | | | |
| The Environmental Quality account displays non-monetary effects on significant cultural and natural resources. | | | | |
| The Other Social Effects account registers plan effects relevant to planning process but not captured in other three accounts. | | | | |
| The Regional Economic Development account regsiters changes in regional economic activity. | | | | |
| The National Economic Development account displays changes in economic value of national output of goods and services. | | | | |

## Table 7A - Preliminary Alternatives Construction Cost Estimates

October 2004 Price Levels

FIRST COST AND ANNUAL COST SUMMARY – Selection of alternative

| | **Alternative #2 Stone Revetment** | Alternative #3 Offshore Breakwater and Beach Fill | Alternative #4 T-Groins and Beach Fill |
|---|---|---|---|
| Total First Cost | **$ 14,843,000** | $ 14,481,000 | $ 12,094,000 |
| Interest During Construction @ 5.375% | **$ 949,000** | $ 752,000 | $ 629,000 |
| Total Investment Cost | **$ 15,792,000** | $ 15,233,000 | $ 12,723,000 |

| | **Alternative #2 Stone Revetment** | Alternative #3 Offshore Breakwater and Beach Fill | Alternative #4 T-Groins and Beach Fill |
|---|---|---|---|
| Annualized Total Investment Cost<br>Based on 50-year design life<br>Annual interest of 5.375% | **$ 916,000** | $ 884,000 | $ 738,000 |
| Annualized Maintenance Cost | **$ 55,000** | $ 57,000 | $ 47,000 |
| Annualized Periodic Nourishment Cost<br>Based on 50-year design life<br>Annual interest of 5.375%<br>100,000 cy nourishment every 3 years | **Zero Cost $0** | $ 502,000 | $ 502,000 |
| **Total Annual Cost** | **$ 971,000** | $ 1,443,000 | $ 1,287,000 |

Table 7B - Screening of Preliminary Alternatives

| | **Alternative #2 Stone Revetment** | Alternative #3 Offshore Breakwater and Beach Fill | Alternative #4 T-Groins and Beach Fill |
|---|---|---|---|
| **Total Annual Cost** | **$971,000** | $1,443,000 | $1,287,000 |
| **Total Annual Benefits *** | $1,578,700 | $1,578,700 | $1,578,700 |
| **Total Net Benefits** | **$607,700** | $135,700 | $291,700 |

* *Alternatives # 2 thru # 4 are developed at the same storm design, as they are each designed to withstand a 73-year return period storm. The benefits claimed are the same because each of the alternatives will protect the same land to the same degree, and each alternative avoids the same average annual project damages.*

Of the potential alternatives discussed above, the stone revetment alternative is the plan that maximizes net benefits. Revetments are a proven method of shore protection in this area and have a record of acceptance by state and local agencies. By re-using some of the stone already on site in the existing structure, cost savings will be realized. Preliminary design variations in the revetment cross-section were considered to evaluate the impacts on construction costs. The cross-section of the preliminary revetment alternative consists of the construction of a revetment section with a crest width of 40-feet at elevation +25 feet NGVD, 1V:2H side slopes, and 12.6-ton quarrystone armor units extending from the crest down to the embedded toe. A heavily embedded toe is incorporated to protect against breaking waves and scour at the toe of the structure.

The embedded toe was designed in accordance with EM 1110-2-1614 entitled "Design of Coastal Revetments, Seawalls and Bulkheads" (1995). Three layers of 4-5 ton armor units are used atop the splash apron. It is assumed that some of these stones can be re-used in the proposed revetment from the present structure. Sublayers are specified in accordance with standard design procedures.

The estimated first cost for the selected preliminary alternative, the stone revetment, is $14,843,000.

The comparison of feasible solutions results in the selection of a revetment as the best approach to protecting the bluff and lighthouse. Three alternative revetments, based upon three different levels of protection, have been analyzed during the Feasibility Study to determine the most economical revetment design.

## 29. Design Optimization of the Stone Revetment Alternative

Design variations in the selected preliminary alternative, i.e. the stone revetment, were considered to economically optimize the construction cost relative to the economic benefits (provide the greatest net economic benefits). The design will provide long-term storm damage protection for the economic life of 50-years and will comply with all design criteria and constraints. Three (3) alternatives were considered for optimization.

Embedded toe design will be in accordance with EM 1110-2-1614 entitled "Design of Coastal Revetments, Seawalls and Bulkheads (1995). Sublayers are specified in accordance with standard design procedures.

Final Improvement Designs – Stone Revetment – 3 Alternatives

For the three alternative revetment sizes developed as part of the optimization, the higher two levels of protection have a heavily embedded toe to protect against breaking waves and scour at the base of the structure. Sublayers are specified in accordance with standard design procedures. It is noted that because the revetment improvement is founded on dense till or stone, no filter cloth is required to underlie the improvement.

This is a design refinement from the preliminary design where filter cloth was included. In addition, the following refinements to the preliminary revetment alternative were made:

1) Quantities changed slightly based on additional cross sections taken.
2) Mobilization and demobilization costs increased to include temporary construction berms at each end of the revetment to facilitate revetment construction.
3) Contingencies were slightly reduced due to the more detailed level of design.

These design refinements do not affect plan formulation (comparison of alternatives) and selection of the stone revetment alternative.

The following sections describe the three variations of the revetment alternative used in order to optimize the design.

## 30. Alternative 2A: Stone Revetment with 150-year Storm Design

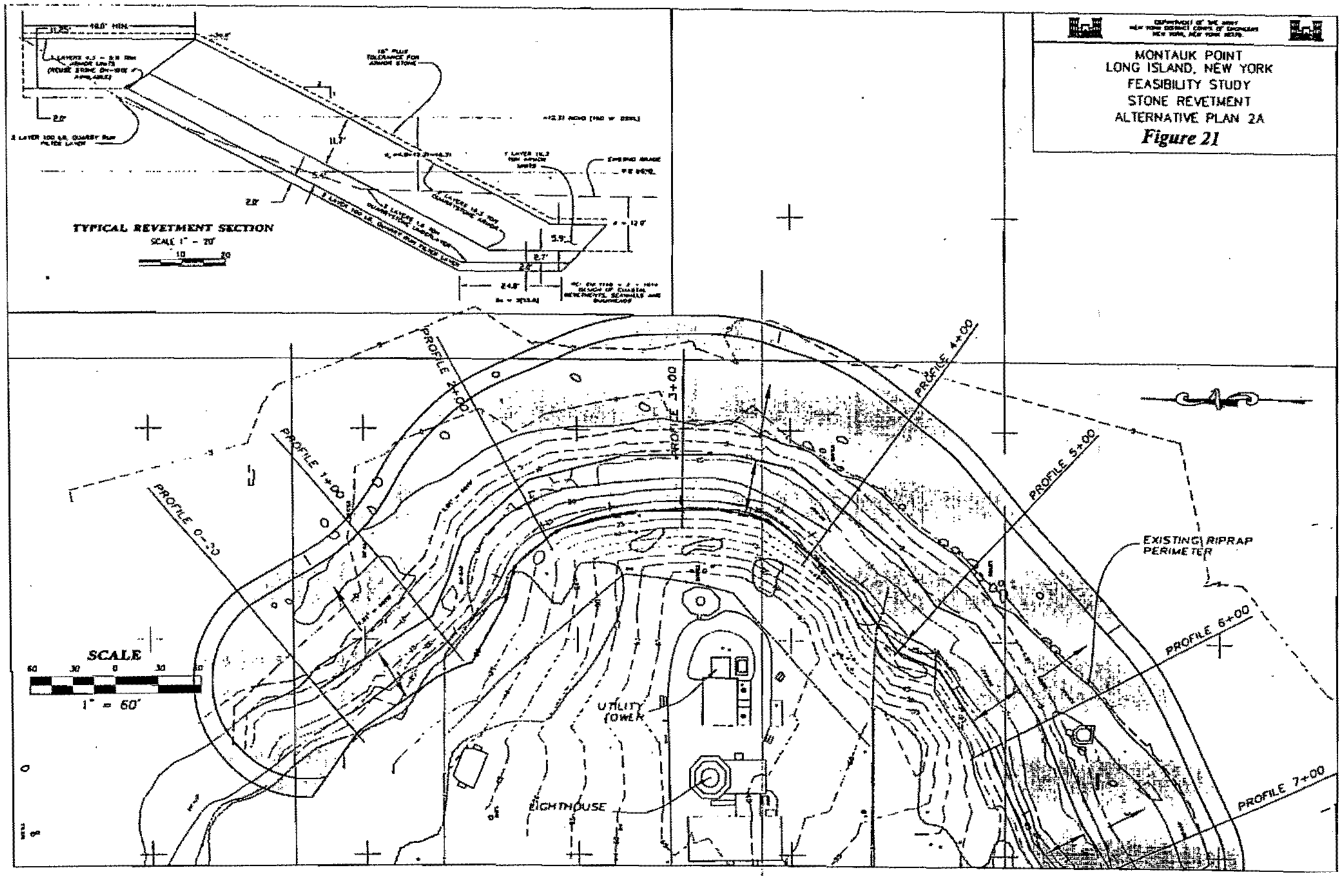
- The design wave for the structure is H $_{150\ Yr.}$ = 14.6-feet based on the average toe elevation near the improved revetment toe of elevation –4 feet NGVD.

- The cross-section of the revetment shown in Figure 21 consists of the construction of a revetment section with a crest width of 40-feet at elevation +30 feet NGVD, 1V:2H side slopes, and 16.3-ton quarrystone armor units extending from the crest down to the embedded toe.

- According to Engineering Manual guidance, the bottom of the armor stone layer in the toe is located 12 feet below existing grade at the toe (the stone crest at approximately –10 feet with the average toe elevation at –4 feet NGVD).

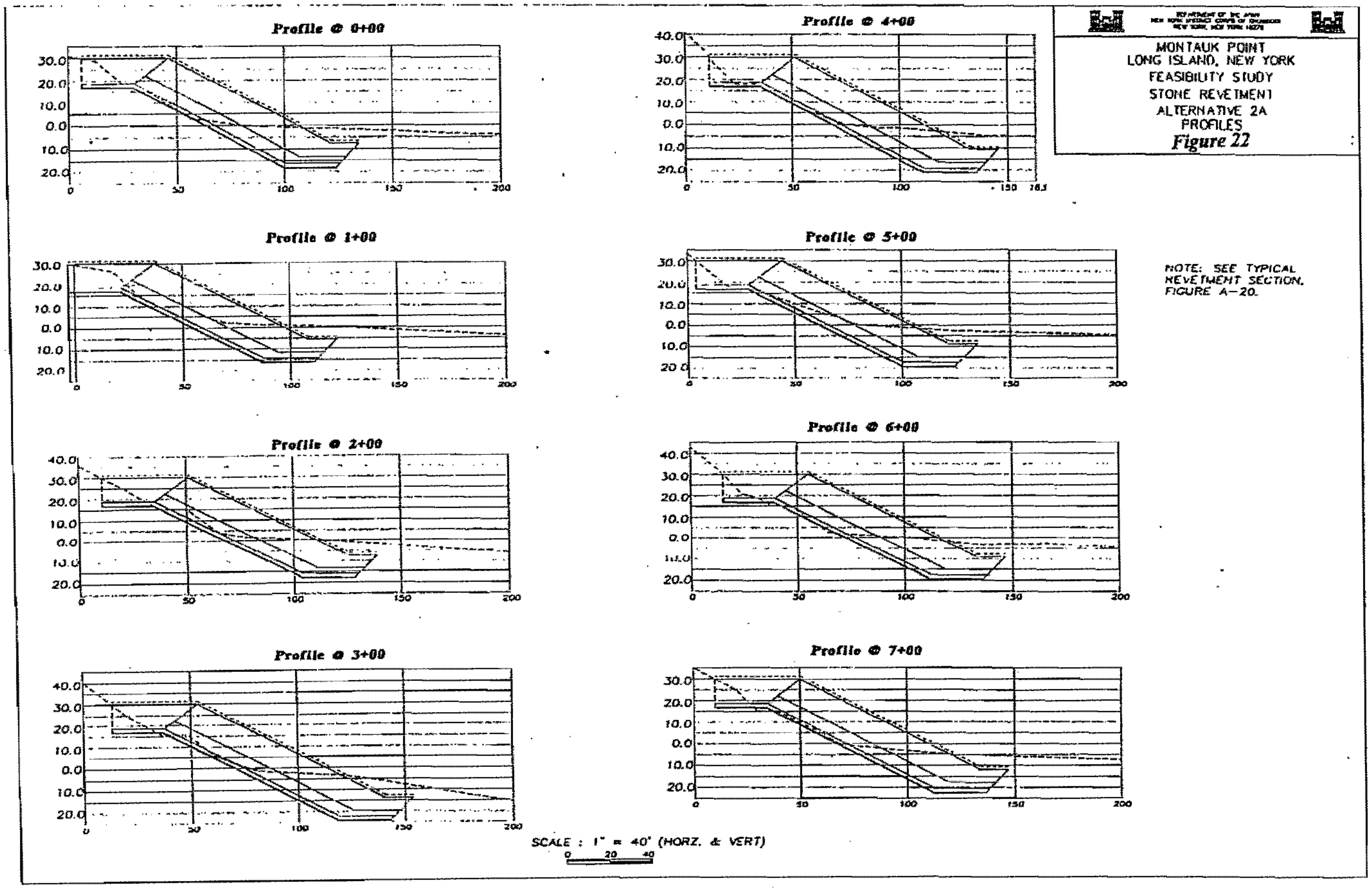
- Three layers of 4-5 ton armor units are used atop the splash apron. It is assumed that some of these stones can be re-used in the proposed revetment from the present structure.

- Cross-sections of this revetment alternative along the existing profiles are shown in Figure 22.



MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
STONE REVETMENT
ALTERNATIVE PLAN 2A

*Figure 21*



MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
STONE REVETMENT
ALTERNATIVE 2A
PROFILES

*Figure 22*

NOTE: SEE TYPICAL REVETMENT SECTION. FIGURE A-20.

SCALE : 1" = 40' (HORZ. & VERT)

## 31. Alternative 2B: Stone Revetment with 73-year Storm Design

- The design wave for the structure is $H_{73\ Yr.} = 13.4$ feet based on the average toe elevation near the improved revetment toe of elevation –4 feet NGVD.

- The cross-section of the revetment shown in Figure 23 consists of the construction of a revetment section with a crest width of 40 feet at elevation +25 feet NGVD, 1V:2H side slopes, and 12.6-ton quarrystone armor units extending from the crest down to the embedded toe.

- The bottom of the armor stone layer in the toe is located 12 feet below existing grade at the toe (average toe elevation at –4 feet NGVD).

- Three layers of 4-5 ton armor units are used atop the splash apron. It is assumed that some of these stones can be re-used in the proposed revetment from the present structure.

- Cross-sections of this revetment alternative along the existing profiles are shown in Figure 24.

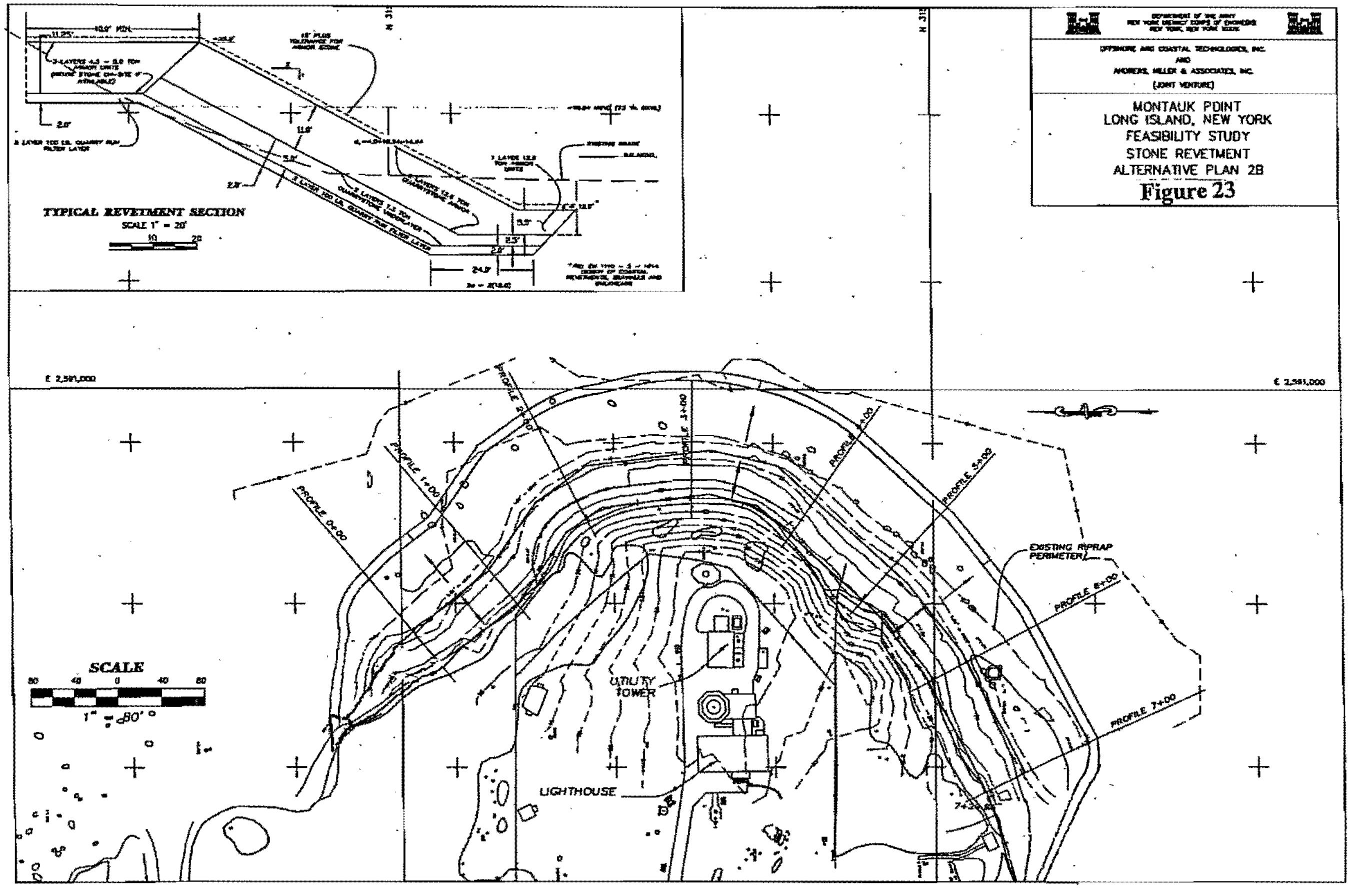
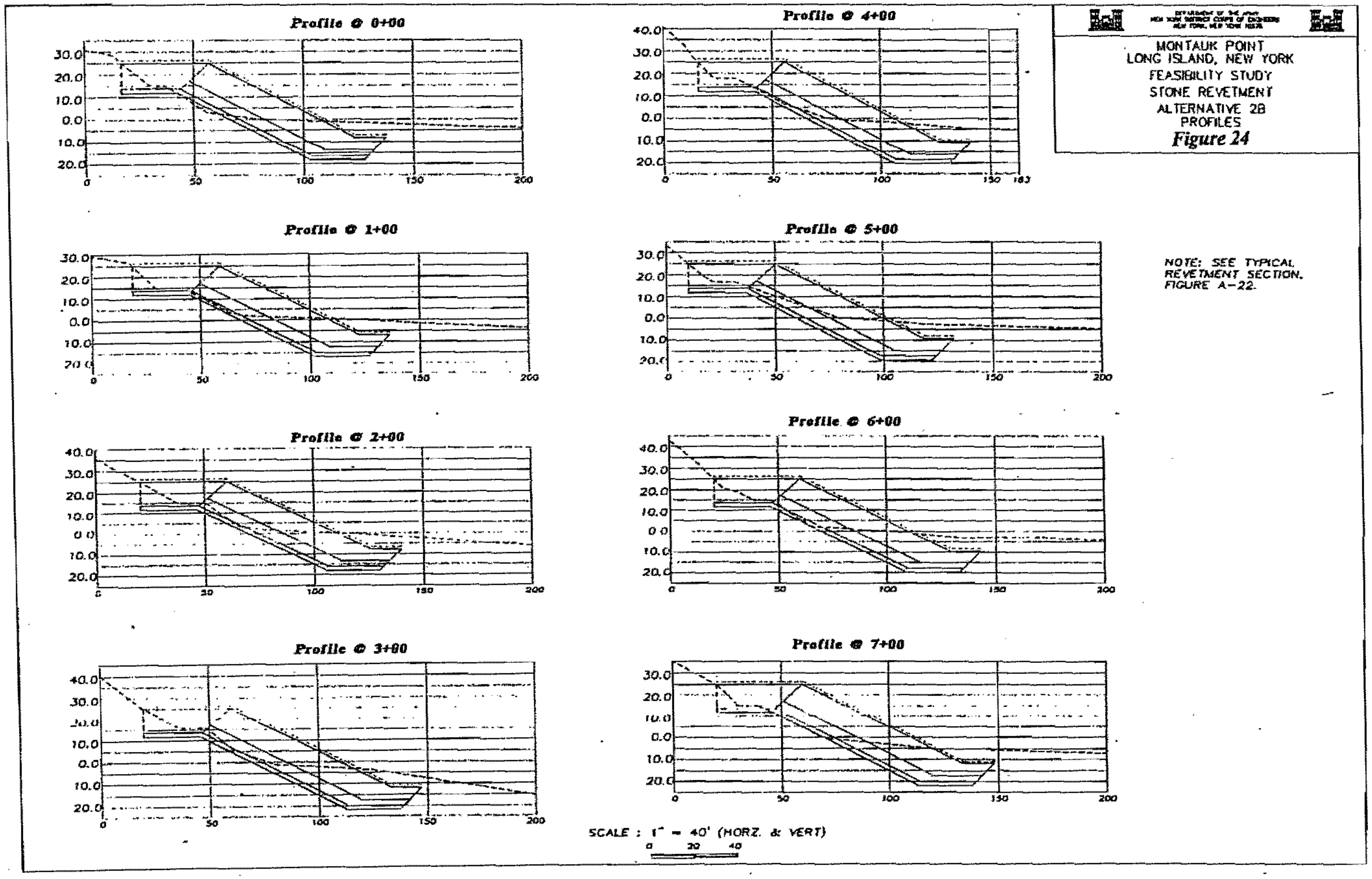

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS
NEW YORK, NEW YORK
OFFSHORE AND COASTAL TECHNOLOGIES, INC.
AND
ANDREWS, MILLER & ASSOCIATES, INC.
(JOINT VENTURE)
MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
STONE REVETMENT
ALTERNATIVE PLAN 2B
TYPICAL REVETMENT SECTION
SCALE 1" = 20'
10
20
11.25'
10.0' MIN.
2.0'
11.0'
5.0'
2.0'
2.5'
2.0'
5.5'
24.0'
E 2,591,000
E 2,591,000
N 315
N 315
PROFILE 0+00
PROFILE 1+00
PROFILE 2+00
PROFILE 3+00
PROFILE 4+00
PROFILE 5+00
PROFILE 6+00
PROFILE 7+00
EXISTING RIPRAP PERIMETER
UTILITY TOWER
LIGHTHOUSE
SCALE
80
40
0
40
80
1" = 80'

Figure 23



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MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
STONE REVETMENT
ALTERNATIVE 2B
PROFILES

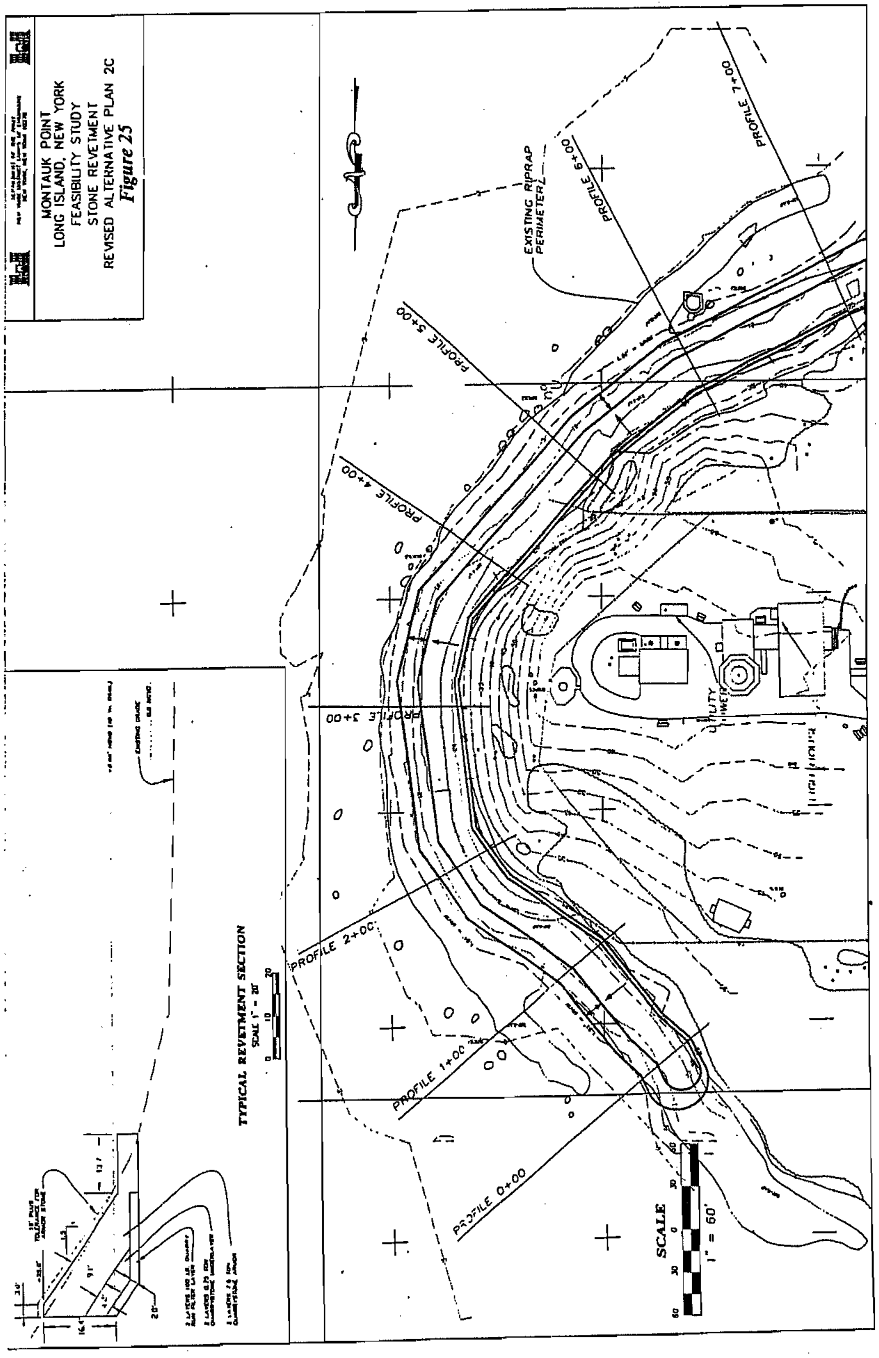
**Figure 24**

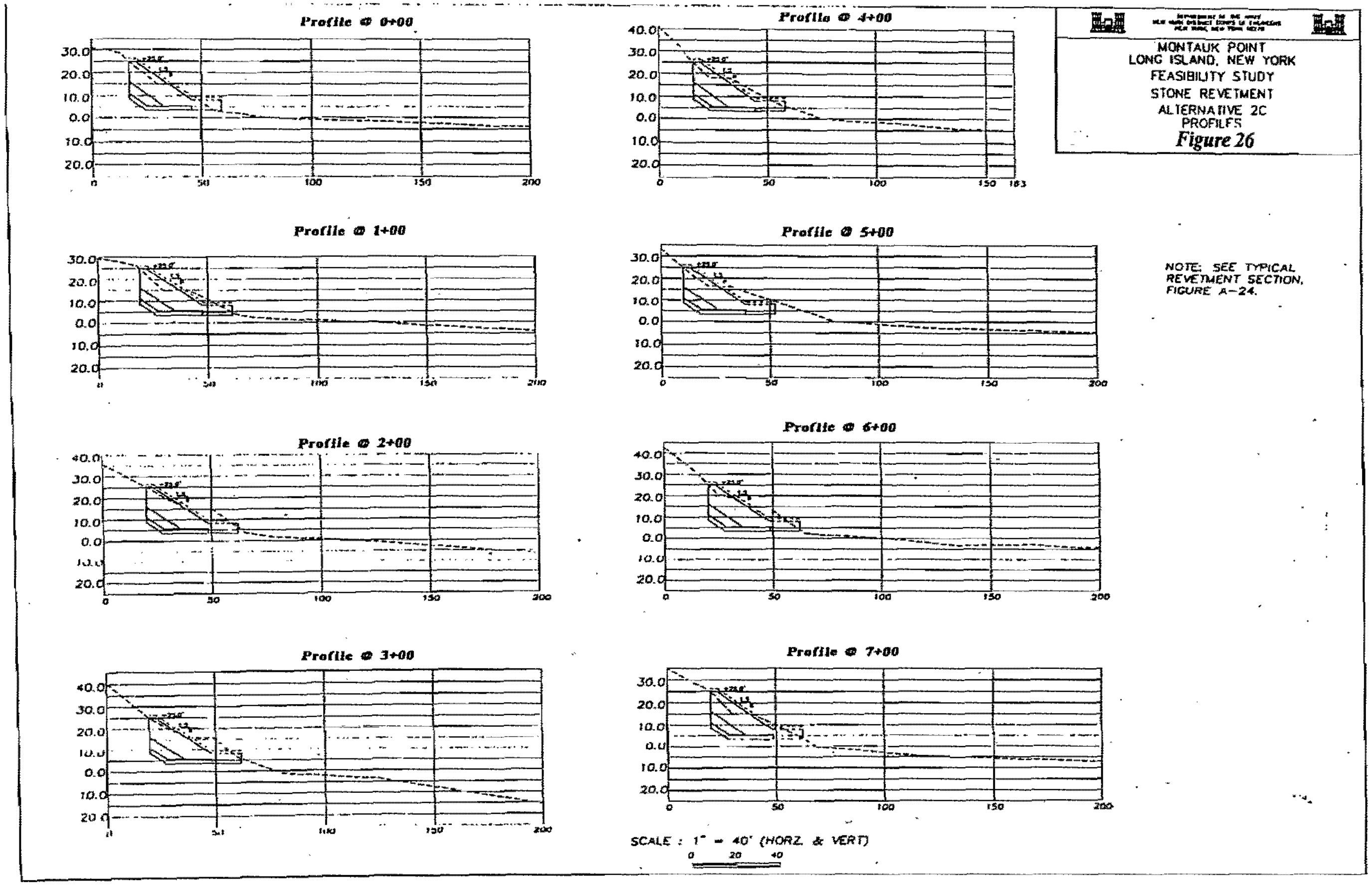
NOTE: SEE TYPICAL REVETMENT SECTION, FIGURE A-22.

## 32. Alternative 2C: Stone Revetment with 15-year Storm Design

- The design wave for the structure is $H_{15\ Yr.} = 9.2$ feet based on the average toe elevation near the improved toe of elevation –1 feet NGVD.
- The cross-section of the revetment shown in Figure 25 consists of a revetment section with a crest width of 3 feet at elevation +25 feet NGVD, 1V:1.5H side slopes, and 7.5-ton quarrystone armor units extending from the crest down to the toe.
- The toe will be built up from the existing toe with large stone and will not require an excavated buried toe. It is assumed that some stones can be re-used in the proposed revetment from the present structure.
- Cross-sections of this revetment alternative along the existing profiles are shown in Figure 26.

Since the costly buried toe is not essential for the 15-year storm design, a narrow berm was developed to provide better foundation on the existing toe stone. In order to construct the narrow berm, an offshore adjacent rubble mound stone temporary structure will be required from which land-based construction equipment will operate.


MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
STONE REVETMENT
REVISED ALTERNATIVE PLAN 2C
Figure 25
EXISTING RIPRAP PERIMETER
PROFILE 0+00
PROFILE 1+00
PROFILE 2+00
PROFILE 3+00
PROFILE 4+00
PROFILE 5+00
PROFILE 6+00
PROFILE 7+00
UTILITY TOWER
TYPICAL REVETMENT SECTION
SCALE 1" = 20'
SCALE
1" = 60'



MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
STONE REVETMENT
ALTERNATIVE 2C
PROFILES

*Figure 26*

## 33. Coastal Analyses of the 3 Stone Revetment Alternatives

### Wave Runup

Wave runup level, as input to overtopping, determined the design crest level of the structure. Table 8 presents the runup elevations for the revetment alternatives and the presently existing structure.

Table 8 - Runup Elevations for Existing Revetment and Improvement Plans

| RETURN PERIOD | RUNUP ELEVATION (PERMEABLE) FEET, NGVD | | | |
|---|---|---|---|---|
| **Years** | **Existing** | **Plan 2A 150-year** | **Plan 2B 73-year** | **Plan 2C 15-year** |
| **2** | 22.20 | 33.18 | 33.18 | 23.78 |
| **5** | 23.42 | 36.73 | 36.73 | 27.21 |
| **10** | 23.35 | 38.20 | 38.20 | 28.49 |
| **25** | 23.69 | 40.19 | 37.85 | 30.22 |
| **44** | 24.46 | 42.13 | 37.70 | 31.97 |
| **50** | 24.49 | 42.31 | 37.62 | 32.10 |
| **73** | 25.39 | 44.05 | 37.85 | 33.39 |
| **100** | 26.43 | 44.38 | 38.32 | 34.75 |
| **150** | 27.98 | 44.51 | 39.21 | 36.69 |
| **200** | 29.16 | 44.78 | 40.00 | 38.12 |
| **500** | 32.02 | 45.91 | 42.30 | 41.52 |

Runup is developed from representative composite slopes of the structures template. Therefore, these hypothetical values represent a smooth composite slope. The presence of the berm at a lower elevation (as with the existing revetment) and steeper composite slope (from a relatively narrow berm and shallow toe depth) reduces the runup, but not the overtopping rate above the berm crest, due to the large berm crest width of the improvement. The effect of a steeper slope and shallower structure toe cause the runup elevations associated with Plan 2C to be lower than those for the other plans.

The calculations indicate that runup elevations exceed the existing revetment crest (+18 feet NGVD) at all listed return periods using maximum design wave conditions. Field observations confirm that 'green water' frequently reaches the top of the revetment.

Figure 27 also confirms that wave runup (from the highest segment of the wave group for the more frequent storms, all the way to nearly all the waves on the 73-year return period storm) exceeds the crest elevation of the existing structure, from the 2-year through the 500-year storm, even when permeability is accounted for.

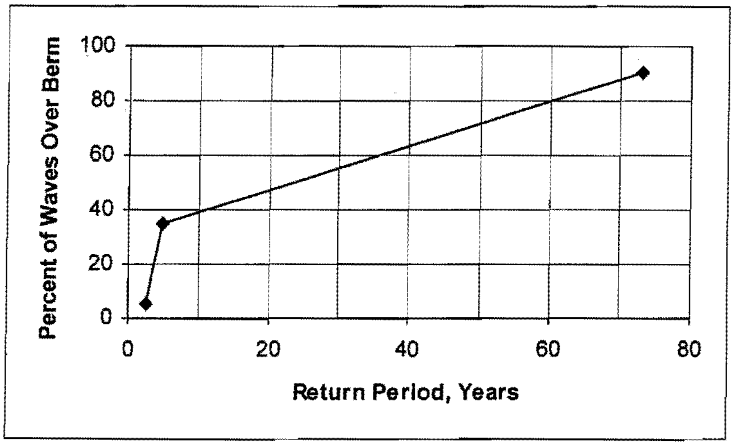


Figure 27- Percent of wave runup exceeding existing berm elevation

## Wave Overtopping

Wave overtopping occurs when the structure crest height is lower than the runup level. Overtopping discharge is a very important design parameter because it determines the crest level and the design of the upper part of the structure. In the Montauk Point case, overtopping must be limited at design storm levels so as to avoid failure of the revetment from the top (as observed in the field and in the model test for the existing structure). The relevant critical levels (based on Coastal Engineering Manual criteria from physical modeling of damages sustained with paved and unpaved revetments) at Montauk Point is 100 litres/s/m (0.1 cu m/s/m). This is a critical threshold for damage of vegetative terracing immediately above the revetment stone; however, lower levels of damage can be initiated at the 50 litres/s/m threshold.

Table 9 - Overtopping Rates for Existing Revetment and Improvement Plans

| RETURN PERIOD | OVERTOPPING RATES (LITRES/S/M) | | | |
|---|---|---|---|---|
| Years | Existing | Plan 2A | Plan 2B | Plan 2C |
| 2 | 17 | 1 | 2 | 12 |
| 5 | 41 | 1 | 4 | 24 |
| 10 | 90 | 3 | 8 | 48 |
| 25 | 266 | 6 | 18 | 120 |
| 44 | 589 | 10 | 33 | 227 |
| 50 | 728 | 11 | 37 | 274 |
| 73 | 1430 | 18 | 60 | 460 |
| 100 | 2903 | 27 | 96 | 780 |
| 150 | 7479 | 47 | 175 | 1517 |
| 200 | 16221 | 70 | 280 | 2560 |
| 500 | 130783 | 223 | 1060 | 8073 |

The results show that the critical level for significant damage initiation of the vegetative terracing is exceeded above a 200-year event for Plan 2A, a 100-year event for Plan 2B and greater than a 15-year event for Plan 2C. The existing structure exhibits damaging overtopping rates during events greater than a 10-year level.

Wave Reflection

Wave reflection affects the nearshore wave conditions immediately fronting the structure, and potentially along neighboring beaches. Incident energy is partly dissipated by wave breaking, surface roughness and porous flow through the stone structure.

Table 10 presents a comparison of reflection coefficients for the three Improvement Plans and the existing structure. This indicates that the reflected wave will be reduced at all return periods for all three final improvement alternative plans versus the existing structure because of the flatter structure slopes and more porous rock layering from larger stone sizes. The reductions range from 13-19% for Plans 2A and 2B and 3-5% for Plan 2C.

Table 10 - Reflection Coefficients for Existing Revetment and Improvement Plans

| RETURN PERIOD | REFLECTION COEFFICIENT | | |
|---|---|---|---|
| **Years** | **Existing Structure** | **Plans 2A and 2B** | **Plan 2C** |
| **2** | 0.57 | 0.46 | 0.54 |
| **5** | 0.57 | 0.45 | 0.54 |
| **10** | 0.57 | 0.47 | 0.55 |
| **25** | 0.58 | 0.48 | 0.56 |
| **44** | 0.59 | 0.49 | 0.56 |
| **50** | 0.59 | 0.50 | 0.56 |
| **73** | 0.59 | 0.50 | 0.57 |
| **100** | 0.59 | 0.50 | 0.57 |
| **150** | 0.59 | 0.51 | 0.57 |
| **200** | 0.59 | 0.51 | 0.57 |
| **500** | 0.60 | 0.52 | 0.58 |

## Wave Scour

Wave scour occurs at the toe of the structure due to the concentration of currents formed by the interaction of incident waves with the down rush from preceding waves. The extensive scour protection toe design included in the Final Improvement Alternative Plans 2A and 2B will prevent adverse scour (including both storm and long term).

## Adjacent Impacts

Potential longshore effects include the impact of the new structures on neighboring beaches. Because a revetment has been in place at Montauk Point for nearly 60 years, the sediment that would have become littoral supply adjacent beaches has been stabilized at the Point. The replacement of the existing structure with a new design would not alter that function. The seaward translation of the new structures (Plans 2A and 2B) results in the need for a transition revetment section (which has been included in the project costs) to prevent local erosion at the ends of the project where both wave diffraction and longshore sediment demand will tend to increase erosion at those areas under the improved condition.

## Slope Stability Analysis of Improvement Plans

Slope stability analysis was performed on Alternative 2B to evaluate "with project conditions". Figure 28 shows that the factor of safety for the critical failure surface is 1.46 through the revetment and 1.202 in the bluff above the revetment.

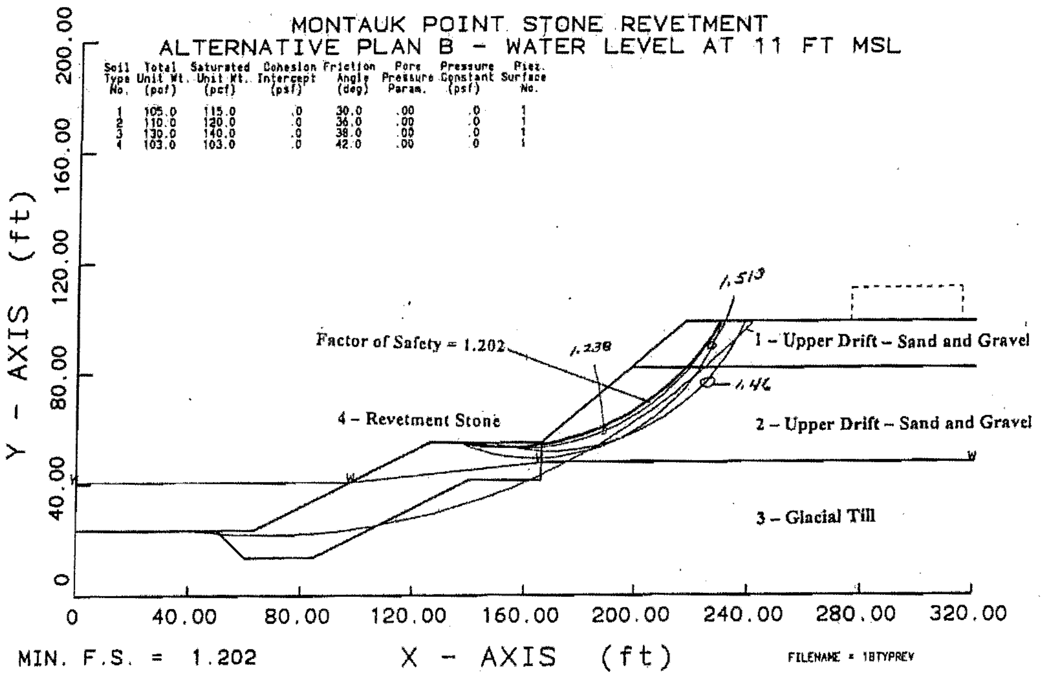


Figure 28 – Slope Stability Analysis for Stone Revetment Alternative 2B

This alternative was then examined for toe of slope saturation due to wave runup for a 100-year return period. The factor of safety for the critical failure surface through the revetment remained the same. The factor of safety for the critical failure surface through the bluff above the revetment decreased to 1.103 indicating that, for design storm exceedance, some repair above the revetment may be needed.

## 34. Performance Evaluation

- Alternative 2A – 150 year Storm Design

Based on the analysis of direct wave impact and runup/overtopping damages, Alternative 2A will provide protection from the 150-year storm event.

During this event, damages to the revetment due to direct wave impact are estimated to be between 0- to 5- percent, which is generally referred to as a no-damage condition. Wave overtopping during the 150-year storm event is limited to 47-litres/s/m, which is significantly below 100-litres/s/m, which is the estimated threshold of significant damage to unpaved promenades or reinforced vegetative terracing.

As a measure of uncertainty, if the 150-year water level is increased to include 0.7-feet of sea level rise in 50 years and ¾ standard deviation of storm surge, the overtopping rate increases to be 118-litres/s/m for the paved promenade. This rate is just slightly above the threshold of significant damage to unpaved promenades, but much less than the threshold of significant damage to paved promenades (200-litres/m/s), which is the case for the 150-year design with the 40-foot wide paved promenade berm crest. Therefore, there is a large safety factor including uncertainty throughout the period of analysis.

- Alternative 2B – 73 year Storm Design

Alternative 2B will provide protection from the 73-year storm event.

During this event, damages to the revetment due to direct wave impact are estimated to be between 0- to 5- percent (no-damage condition). Wave overtopping during the 73-year storm event is limited to 60-litres/s/m which is significantly below 100-litres/s/m, which is the estimated threshold of damage to unpaved promenades.

As a measure of uncertainty, if the 73-year water level is increased to include 0.7-feet of sea level rise in 50 years and ¾ standard deviation of storm surge, the overtopping rate is calculated to be 162-litres/s/m for the paved promenade, which is within tolerable limits. This rate is less than the threshold of significant damage to paved promenades, i.e. 200-litres/s/m. Therefore, including uncertainty throughout the period of analysis, there is a reasonable safety factor (greater than 75% certainty).

- Alternative 2C – 15 year Storm Design

Based on potential runup/overtopping damages, the level of protection provided by Alternative 2C, with an unpaved promenade (berm crest is only 3 feet wide), is estimated to be on the order of a 15-year storm event. The wave overtopping during this event is estimated to be 70 litres/s/m which is just below the threshold of damage to unpaved promenades. As a measure of uncertainty, if the 15-year water level is increased to include 0.7 feet of sea level rise and one standard deviation of storm surge increase, the overtopping rate is calculated to be 251-litres/s/m. This yields a 60% probability of significant damage to the unpaved promenade (overtopping in excess of 100-litres/s/m) and a 10% probability of structure failure (overtopping in excess of 200-litres/s/m) with uncertainty included.

## 35. Total Quantities & Annual Costs

All subsequent estimates are based on October 2004 price levels for labor, materials, equipment, 2000 topographic surveys and beach profiles. Quantities for the three alternative design levels of improvement have been developed from the detailed plans shown in the feasibility report, as well as detailed design data reflected in accompanying support documents. The quantities for the alternative revetment designs for the Montauk Point erosion control project were computed as follows and are presented in Table 11:

Table 11 – Initial Construction Quantities

| Materials | Alternative 2A 150-year protection Crest elevation +30 Ft. | Alternative 2B 73-year protection Crest Elevation +25 Ft. | Alternative 2C 15-year protection Crest Elevation +25 Ft. |
|---|---|---|---|
| Armor Stone (tons) | 57,100 | 46,700 | 15,600* |
| Armor Stone Rehandled (tons) | 19,100 | 19,300 | 1,000 |
| Underlayer (tons) | 23,700 | 18,600 | 1,000 |
| Bedding Stone (tons) | 12,100 | 11,100 | 11,500 |
| Excavation (cubic yards) | 34,200 | 32,000 | 15,000 |

** Includes construction of cofferdam offshore and reuse in revetment. Alternative cost also includes the disposal of 7,300 tons of unusable existing armor stone to be disposed on site at the structure toe. Also included is 8,000 square feet of temporary exposed bank protection during construction.*

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Studies indicate that with Alternatives 2A and 2B, damages to the revetment and the bluff would be reduced significantly and that damages from storm exceedence are greatly reduced compared to Alternative 2C, where storm exceedance damages are high.

Alternative 2A – 150 year Storm Design

- The economic evaluation of Alternative 2A (150-year storm design) with a revetment height of +30 feet NGVD considered the impacts of storm events ranging from a 2-year event to a 200-year event. Wave impact damages are initiated slightly at the 15-year return period storm and overtopping damages are initiated at the 200-year return period storm.
- The total first cost is $15,998,900, plus $1,057,000 for interest during construction, for a total investment cost of $17,055,900.
- The total annual cost of Alternative 2A is estimated to be $1,050,400. Refer to Engineering Quantities and Cost Appendix for more details.

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Alternative 2B – 73 year Storm Design

- The economic evaluation of Alternative 2B (73-year storm design) with a revetment height of +25 feet NGVD considered the impacts of storm events ranging from a 2-year event to a 200-year event.. Wave impact damages are initiated, slightly, at the 5-year storm event and minor overtopping damages are initiated at the 73-year storm event
- The total first cost is $13,722,900, plus $712,700 for interest during construction, for a total investment cost of $14,435,600.
- The total annual cost of Alternative 2B is estimated to be $889,300. Refer to Engineering Quantities and Cost Appendix for more details.

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Alternative 2C – 15 year Storm Design

- The economic evaluation of Alternative 2C (15-year storm design) with a revetment height of +25 feet NGVD considered the impacts of storm events ranging from a 2-year event to a 200-year event. Wave impact damage is initiated slightly at the 2-year return period storm and overtopping damage is initiated at the 15-year return period storm.
- The total first cost is $5,804,000, plus $301,400 for interest during construction, for a total investment cost of $6,105,400.
- The total annual cost of Alternative 2C is estimated to be $524,700. Refer to Engineering Quantities and Cost Appendix for more details.

Table 12 summarizes the First Costs and Annual Costs for Alternatives 2A, 2B, and 2C.

Table 12 – Stone Revetment – 3 Alternatives - Construction Cost Estimates

October 2004 Price Levels

FIRST COSTS & ANNUAL COSTS SUMMARY

| | Alternative #2A<br>150-year protection | **Alternative #2B**<br>**73-year protection** | Alternative #2C<br>15-year protection |
|---|---|---|---|
| Total First Cost | $ 15,998,900 | **$ 13,722,900** | $ 5,804,000 |
| Interest During Construction @ 5.375% | $ 1,057,000 | **$ 712,700** | $ 301,400 |
| Total Investment Cost | $ 17,055,900 | **$ 14,435,600** | $ 6,105,400 |
| Annualized Investment Cost Based on 50-year design life Annual interest of 5.375% | $ 988,900 | **$ 837,000** | $ 354,000 |
| Annualized Revetment Maintenance Cost | $ 61,500 | **$ 52,300** | $ 170,700 |
| **Total Annual Cost** | $ 1,050,400 | **$ 889,300** | $ 524,700 |

The NED plan was chosen based on the economic evaluation discussed in the next section of this report.

## 36. Economic Analysis

The feasibility study was conducted under the study authorities noted in this report. In addition, Section 110 of the National Historic Preservation Act of 1966, as amended (NHPA), imposes a duty to maintain and preserve historic properties. At the present time, this duty is presently borne directly by the Montauk Point Historical Society, the current owners of the Montauk Point Lighthouse complex. However, through the operation of a reversionary interest, as provided for in the land transfer (a quitclaim dated 18 September 1998 from the U.S. Coast Guard to the Montauk Point Historical Society), this duty ultimately falls on the Federal Government. Section 110 of the NHPA imposes duties only on federal agencies.

As a federal agency, the Coast Guard was required to preserve and maintain the property in accordance with the NHPA. The transfer of the property from the Coast Guard to the Historical Society would have been an adverse impact on the property under Section 110 of the NHPA, because the historic property would have passed to an entity, the Historical Society, that was not a Federal agency and therefore not required to adhere to the NHPA, removing the legal protection the historic property enjoyed under federal ownership. To remedy this adverse impact, the Coast Guard included a condition in the transfer agreement that requires the Historic Society to preserve/maintain the property under the NHPA, effectively making the Historical Society act as a Federal agency with regards to the preservation of the property.

Alternative ways to follow Section 110 of the NHPA at Montauk Point therefore include:

- Provide mitigation for adverse impacts following a storm event that causes damage to the bluff and other features of the historic property, or
- Take steps now to protect the integrity and significance of the historic property, thereby avoiding the costs of Section 110 compliance that would have been triggered by storm damage.
- Through a combination of Section 110 of the NHPA and the nature of the land conveyance, there is indeed a statutory duty to perform the cultural resources mitigation at Montauk Point. If triggered by coastal storm damage such mitigation would incur a cost; therefore, avoiding that cost should, therefore be counted as a benefit.

If the Federal government is not mandated to follow Section 110 of the NHPA and the nature of the land conveyance, then the most likely future without-project scenario is that the bluff will erode and the historic Montauk Point Lighthouse complex will collapse.

The economic analysis that follows below is based on this assumption.

The proxy used to place a depreciated replacement value of the historic Montauk Point Lighthouse complex is based on the calculations for the costs of cultural mitigation. Moving the Montauk Point Lighthouse complex, a National Register listed property, will potentially preserve the existing structures, but allow for the eventual destruction of the bluff point and buried cultural resources. These archaeological materials, which are associated with the historic and prehistoric use of the bluff, must be documented and recovered. Prior to moving the structures, each structure would need to be documented on engineering drawings and in photographs so that they can be rebuilt properly on the new site. Subsurface archeological excavations would be performed to recover artifacts both at the present lighthouse site and at the new site. Alternatively, all of these costs could be avoided by protecting the property from the storm damage.

### Existing Conditions

The lighthouse complex and the surrounding Montauk Point State Park are valued State properties. Montauk Point Lighthouse complex and the State Park annual attendance figures averaged 106,723 and 904,185 persons, respectively in the 1995-2002 period. The lighthouse complex does not have a parking lot, and visitors must use the state parking lot. The average attendance for the state park only is 797,462. These figures were obtained from Montauk Point Lighthouse and Montauk State Park offices. Recent census data indicate that the populations for Long Island and New York's five boroughs have increased by 8.4% in ten years. The population for the surveyed area increased from 9,931,776 (1990 Census) to 10,762,191 (2000 Census). The economic analysis assumes the lighthouse and state park attendance will remain stable.

### Without-Project Future Conditions

The Montauk Point Lighthouse complex sits on a high bluff underlain with glacial till, approximately 70-feet above Mean Sea Level (MSL). It is estimated that once the upper sections of the revetment that protects the bluff are displaced by a 15-year or greater storm event, the foundation soil underlying the displaced stone will become exposed and subject to subsequent erosion. To determine the extent of this erosion at the toe of the upper bluff above the damaged revetment that would cause significant bluff failure, a slope stability analysis was performed. The results of this analysis determined that for significant bluff failure, the damaged crest elevation of the revetment would have to degrade to approximately elevation +10 NGVD and the upper bluff toe at this +10 NGVD elevation recede horizontally approximately 10 feet. This is anticipated to cause approximately 26-30 feet of loss of the bluff crest which will immediately threaten the lighthouse facility at the most critical area to the southeast of the lighthouse. The period of time estimated for this condition to occur, subsequent to revetment failure, is an additional 10 years of long-term erosion at the upper bluff toe (at el. +10 NGVD). A decision tree analysis was applied to calculate the probability of revetment failure for any given year through the 50-year period of economic analysis due to a 15-year or greater storm event. When revetment failure occurs, the bluff crest will erode at an average rate of 3 feet per year. The lighthouse complex will be immediately threatened after 10 years, or 30 feet of erosion at the bluff crest.

## Proxy for Depreciated Replacement Value of Montauk Lighthouse Complex

The proxy used to place an economic value of the historic Montauk Point Lighthouse complex is based on the hypothetical calculations for the costs of cultural mitigation of the site. The economic analysis assumes that cultural mitigation of the site will be initiated after the revetment that protects the bluff is displaced. The estimated cost for moving the Montauk Point Lighthouse complex and complete cultural mitigation of the complex is $20 million. This figure does not take into account the required creation of raised grades landward of the present location of the lighthouse for the move, which would add an additional cost of $7 million. The raised grade would be necessary to maintain the lighthouse elevation because the existing bluff elevation decreases significantly as one move away from the shorefront. The overall mitigation process would take approximately six years to complete, with a total cost of $27 million.

## Local Costs Foregone

The lighthouse complex is situated on 3 acres of land, specifically a bluff that has an appraised value of $12 million. It is estimated that the top of the bluff will erode at a rate of 3 feet per year when the revetment fails. Because of the complexity of actually replacing the bluff surface, a prorated amount of the appraised value of land lost was used as a proxy for the local costs forgone for this loss in the without-project condition. The average annual local costs forgone are $74,100.

## Recreation Loss Value

Another without-project consequence of storm damage to the bluff would be loss of visitations to the lighthouse. Visitation losses associated with the lighthouse's closure were assessed using the Travel Cost Estimate of Willingness to Pay. The lighthouse has a log in which visitors indicate the places where they are traveling from during their visit. A recent sample from the log was used to estimate the round-trip distance from each origin. The values of losses are the costs in cents per mile to operate an automobile, plus the opportunity costs of time spent in travel and on site. Surveys were conducted to determine the number of visitors that make the trip to Montauk, New York exclusively to visit the lighthouse. Based on the survey, 47% of the people sampled indicated that visiting the Montauk Lighthouse complex was the reason they drove to Montauk, New York. The remaining 53% of the people indicated that visiting the Montauk Lighthouse complex was part of their itinerary on their visit to Long Island, New York. The travel costs attributed to this category were prorated at 25% of their total travel costs.

Lighthouse visitations will be lost when the existing revetment is damaged by a 15-year or greater storm event, followed by 10 years of erosion to the bluff. If the revetment is damaged in year 2005, the lighthouse visitations will be lost starting in year 2015. Since the base year is 2009, the lighthouse visitations will be lost from 2015 through 2058. The $3,040,200 generated per year from lighthouse visitations from 2015 through 2058 is discounted to the first year that visitations are lost, year 2015. This was done to convert 44 years of lost visitations into a one-year equivalent loss that will occur in 2015. Similar calculations converted the lost visitations into one-year equivalents losses that will occur in years 2016 through 2058. The average annual lighthouse visitations are calculated to be $882,700.

The Montauk Point Lighthouse complex resides within the Montauk Point State Park. The Montauk Point Lighthouse complex offers a unique experience that is not found elsewhere in the New York metropolitan area. Part of the state park experience is its connection with the lighthouse complex. There will be a reduction to the overall aesthetics and recreational value of the state park visitations if the lighthouse complex did not exist. The average annual reduced state park recreational experience would be $198,200.

### With-Project Conditions

Preliminary screening of various alternatives identified that the Stone Revetment Plan is the most feasible alternative both economically and environmentally in providing protection to Montauk Point and its vicinity. Three design levels were considered, the 15-year, 73-year, and 150-year alternatives, to determine the optimal plan. The three alternatives provide protection to the Montauk Point Lighthouse complex until storm exceedance starts to displace the armor stones at the upper portion of the stone revetment for each storm protection design. Residual damages were calculated for the three alternatives and used for plan evaluation.

The existing revetment has been in place since 1994. In the with-project condition, construction will commence in 2008 and will be completed by January 2010. The 15-year storm design, therefore, is pertinent through 2007, with the improved level of protection pertinent from 2008, thereafter. With-project damages were calculated for the following storm damage categories: Storm damage to the lighthouse complex, and local costs foregone for the land loss value due to erosion. With-project damages were also calculated for two recreation loss categories: lost lighthouse visitations, and loss of State Park visitation benefits.

### Benefits

Benefits are estimated to be annual damages in the without-project conditions minus any residual damages in the with-project alternatives. The benefits claimed are avoided storm damage costs when compared to the existing condition, specifically avoided loss of the lighthouse complex and its associated costs for the preservation of artifacts, local costs foregone for the loss of land value, and avoided lost visitation benefits to the lighthouse and to the State Park.

The project benefits for the three alternatives are summarized in Table 13 below. All benefits are discounted using a 5 $^3/_8$ percent interest rate and amortized over the 50-year period of analysis.

Table 13 - Benefit Summary (Oct. 2004 P.L., 5.375% discount rate)

| Description | Without-Project Damages | Residual Damages - 15yr storm design | Benefits - 15yr storm design | Residual Damages - 73yr storm design | Benefits - 73yr storm design | Residual Damages - 150yr storm design | Benefits - 150yr storm design |
|---|---|---|---|---|---|---|---|
| **Storm Damage Reduction** | | | | | | | |
| Lighthouse Complex | $518,452 | $318,655 | $199,797 | $33,617 | $484,835 | $15,732 | $502,720 |
| Local Costs Foregone | $74,100 | $60,402 | $13,698 | $19,226 | $56,520 | $12,636 | $61,464 |
| Subtotal | $592,600 | $379,100 | $213,500 | $52,800 | $541,400 | $28,400 | $564,200 |
| **Recreation** | | | | | | | |
| Lighthouse Visitation | $882,662 | $432,527 | $450,135 | $35,530 | $847,132 | $15,007 | $867,655 |
| Park Visitation | $198,153 | $97,100 | $101,053 | $7,976 | $190,177 | $3,369 | $194,784 |
| Subtotal | $1,080,800 | $529,600 | $551,200 | $43,500 | $1,037,300 | $18,400 | $1,062,400 |

Table 14 summarizes the annual cost for the stone revetment alternatives.

Table 14 - Cost Summary (Oct. 2004 P.L., 5.375% discount rate)

| Description | 15yr storm design | 73yr storm design | 150yr storm design |
|---|---|---|---|
| Total First Cost | $5,804,000 | $13,722,900 | $15,998,900 |
| Interest During Construction | $301,400 | $712,700 | $1,057,000 |
| Total Investment Cost | $6,105,400 | $14,435,600 | $17,055,900 |
| Annual Investment Cost | $354,000 | $837,000 | $988,900 |
| Annual Revetment Maintenance Cost | $170,700 | $52,300 | $61,500 |
| Total Annual Cost | $524,700 | $889,300 | $1,050,400 |

## Conclusion – NED Plan Selection

Planning Guidance Notebook, ER 1105-2-100, 22 April 2000, Chapter 3-4b(4)(a), reads in pertinent part,

> *"The Corps participates in single purpose projects formulated exclusively for hurricane and storm damage reduction, with economic benefits equal to or exceeding the costs, based solely on damage reduction benefits, or a combination of damage reduction benefits and recreation benefits. Under current policy, recreation must be incidental in the formulation process and may not be more than fifty percent of the total benefits required for justification. If the criterion for federal participation project cost sharing is met, then all recreation benefits are included in the benefit to cost analysis."*

Federal participation in this recreation benefit generating shore protection project is warranted since the recreation benefits are incidental, and when combined with, and limited to, an equivalent amount of primary hurricane and storm damage benefits, they produce an economically justified project.

One way to test this is shown in Table 15 below. Lines 1 and 2 shows the storm damage reduction benefits and incidental recreation benefits respectively. Line 3 shows the incidental recreation benefits limited to an equivalent amount of the storm damage reduction benefits. The incidental recreation benefits are limited because the storm damage reduction benefits must be at least 50 percent of the total benefits used for project evaluation. The sum of these two benefits is displayed in Line 4, and when compared to the annual project costs are used to determine if an alternative is economically justified. The 73-year and 150-year designs are economically justified because their net benefits are positive, and therefore have benefit-to-cost ratios (BCR) greater than one (Lines 6 and 7).

The 73-year design is the National Economic Development (NED) plan because it has the greatest net benefits (Line 6). All recreation benefits (Line 2) are included in the total benefits, total net benefits and final BCR (lines 8, 9 and 10) because the criterion for Federal participation project cost sharing with limited recreation benefits has been met.

Table 15 - NED Plan Selection (Oct. 2004 P.L., 5.375% discount rate)

| Description | 15yr Storm Design | *73yr Storm Design* | 150yr Storm Design |
|---|---|---|---|
| | | | |
| 1. Annual Storm Damage Benefits | $213,500 | **$541,400** | $564,200 |
| 2. Annual Recreation Benefits | $551,200 | **$1,037,300** | $1,062,400 |
| 3. Annual Recreation Benefits Used for Project Justification | $213,500 | **$541,400** | $564,200 |
| 4. Total Benefits Used for Project Justification | $427,000 | **$1,082,800** | $1,128,400 |
| 5. Annual Costs | $524,700 | **$889,300** | $1,050,400 |
| 6. Net Benefits | -$97,700 | **$193,500** | *$78,000* |
| 7. BCR | 0.8 | **1.2** | 1.1 |
| | | | |
| **8. Total Benefits** | | **$1,578,700** | |
| **9. Total Net Benefits** | | **$689,400** | |
| **10. Final BCR** | | **1.8** | |

## 37. The Selected Plan – Stone Revetment - Alternative 2B

Based on maximum net excess benefits, the selected plan consists of the construction of a stone revetment with a 73-year storm design (Figures 30, 31 and 32). Project features include:

- Stone revetment, 840-feet in length, with a crest width of 40-feet at elevation +25 feet NGVD, and 1V:2H side slopes.
- 12.6-ton quarrystone armor units extending from the crest down to embedded toe.
- Three layers of 4-5 ton armor units are used atop the splash apron. It is assumed that some of these stones can be re-used in the proposed revetment from the present structure.
- The bottom of the armor stone layer in the toe is located at a depth of 12-feet from the existing bottom.
- A heavily embedded toe is incorporated to protect against breaking waves, provide long-term stone stability, and scour at the toe of the structure. Stone sub-layers are specified in accordance with standard design procedures.

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The cost estimate for the construction of the revetment was approached from the viewpoint of heavy stonework and earthwork operations characterized by large cranes and excavators, loaders and haul trucks. Approximately 840-linear feet of revetment will be constructed along the Montauk Point shoreline.

Productivity considerations were based on the relative configuration of the existing revetment and bank, wave and tide conditions, stone size, placement criteria, distance of truck-delivered stone material from off-site and on-site stockpiles, access, haul roads, entrances, and construction easements.

A construction access berm will be constructed adjacent to the slope of the existing stone revetment ends. This construction will be completed on both the northerly and southerly ends of the revetment. The elevation of the access berms will be +8 feet NGVD. There is one access road, and one alternative access road, designated at each end of the revetment.

Two separate crews are anticipated to perform the work. One crew will operate on the northerly end and the other operating on the southerly end of the revetment. Each crew should have one large power excavator for stiff digging and one large crane for stone removal and placement. The excavation and stone placement construction will be conducted from the construction access berm at elevation +8 feet NGVD. No access via water is proposed. Excavation and stone placement will be performed by the same crew, as there is not enough room on the construction berm for two crews to work at one location concurrently.

Ten (10) 38-ton trucks with 16 to 23.5 cubic yard trailers are anticipated to be used for hauling the bedding, underlayer and armor stone from the quarry to the project site. Two (2) 25-ton (16 to 19 cubic yards) off-highway trucks are proposed to deliver stone from the stockpile area to the work area.

Excavated bottom material from the revetment toe area will be transported directly to a Dredge Material Placement (DMP) site on-site within the grounds of Montauk State Park using the 25-ton off-highway dump trucks. The exact site of the DMP area is to be determined.

It is assumed that about 19,300 tons of existing revetment stone will be re-used in the new revetment. Any unusable stone from the existing revetment will be placed overlying the restored ocean bottom after the buried toe is constructed.

It is estimated that the stone revetment would have a useful life expectancy of 50 years.

First costs include the charges arising from the construction of the stone revetment, as well as the costs of contingencies, engineering, design, supervision and administration, and are summarized in Table 16.

Table 17 provides the Fully Funded Costs for the selected plan initial construction escalated to the midpoint of construction, January 2009.

Table 16 – Cost Summary Details – Project First Cost

Revetment (October 2004 price level)

| | | |
|---|---|---|
| Mobilization, Demobilization | | $ 600,300 |
| Armor Stone | 46,700 tons | $5,944,000 |
| Armor Stone Rehandled | 19,300 tons | $1,304,700 |
| Underlayer Stone | 18,600 tons | $2,383,300 |
| Bedding Stone | 11,000 tons | $1,198,800 |
| Excavation | 32,000 cubic yards | $ 591,600 |
| **Sub-Total Revetment** | | **$12,022,700** |
| Lands & Damages | | $32,000 |
| Planning, Engineering & Design | | $630,000 |
| Construction Management | | $1,038,200 |
| **TOTAL PROJECT FIRST COST** | | **$13,722,900** |

## Table 17 - FULLY FUNDED COSTS

| | Project First Costs | | | | | Fully Funded Estimate | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Current MCACES Estimate<br>**Effective Pricing Level October 2004** | | | | | **Feature Mid Point: JANUARY 2009** | | | |
| | Account | Cost ($) | Contingency ($) | Contingency (%) | Total | % | Cost ($) | Contingency ($) | Total |
| 10 | Seawall & Revetment | $10,454,400 | $1,568,300 | 15% | $ 12,022,700 | 7.78% | $11,268,000 | $1,690,300 | $ 12,958,300 |
| 01 | Lands and Damages* | $30,000* | $2,000* | 7% | $32,000* | 18.42% | $35,500 | $2,400 | $37,900 |
| 30 | Engineering & Design | $547,800 | $ 82,200 | 15% | $630,000 | 18.42% | $648,700 | $97,300 | $746,100 |
| 31 | Construction Management | $902,800 | $135,400 | 15% | $1,038,200 | 20.99% | $1,092,300 | $163,800 | $1,256,100 |
| | **Total Project Cost** | **$11,935,000** | **$1,787,900** | | **$13,722,900** | | **$13,044,500** | **$1,953,900** | **$14,998,400** |

Note:
Acct 01, 30, 31 escalation using EC11-2-187 dtd 28 Apr 2005 Table A Class 1
*Acct 01 – Costs for lands has been determined to be $0, Administrative costs are $32k.

## 38. Policy Exemption for Private Non-Profit Landowner

The land that will be protected by implementation of this recommended project is deeded to the Montauk Historical Society (MHS). The MHS is a private, not for profit association that is not part of any state or local government. This land is held open, for use by all on equal terms, regardless of origin or home area. Existing Corps policy (ER 1165-2-130, ER 1165-2-123) indicates that there is no Federal interest in protection of a property owned by a single private non-profit entity. However, although the MHS is clearly a single, private landowner, they must, by deed restriction and State charter, act as a public entity akin to agencies of State and local governments. The MHS must accomplish a public education mission to stay in operation, must follow Federal National Historic Preservation requirements for maintenance work, and membership and enjoyment of the benefits of the facility and educational programs are open to all, with no restriction, for a fee. Under the deed and charter, the MHS cannot structure and constrain uses of the property, nor can anyone who cares to join the MHS and enjoy the benefits of the facility and water resources project be excluded.

In light of these facts, a waiver to the single landowner policy from the Assistant Secretary of the Army (Civil Works) was granted on 29 June 2005 allowing the completion of the feasibility study with a view towards pursuing a cost-shared construction project for Montauk Point, New York.

## 39. Project Construction Cost-Sharing

The cost-sharing for this project is 50% Federal and 50% Non-Federal (see Table 18).

Table 18 – Cost Apportionment

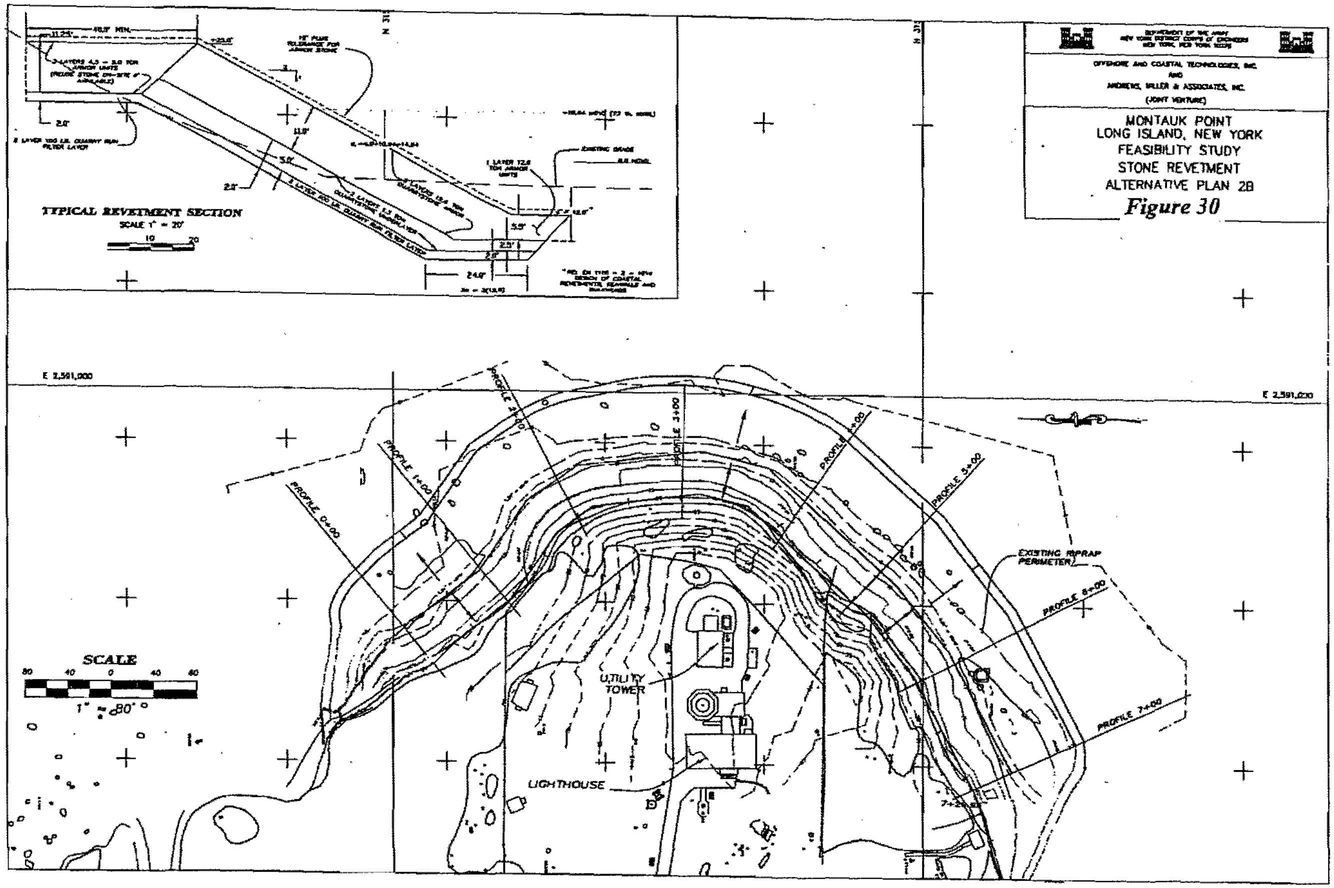
Cost-Shared Items

| | Federal Share 50% | Non-Federal Share 50% | Total Cost |
|---|---|---|---|
| Cash Contribution | $6,861,000 | $6,861,000 | $13,722,000 |
| Real Estate Lands * & Damages | $0 | $0 | $0 |

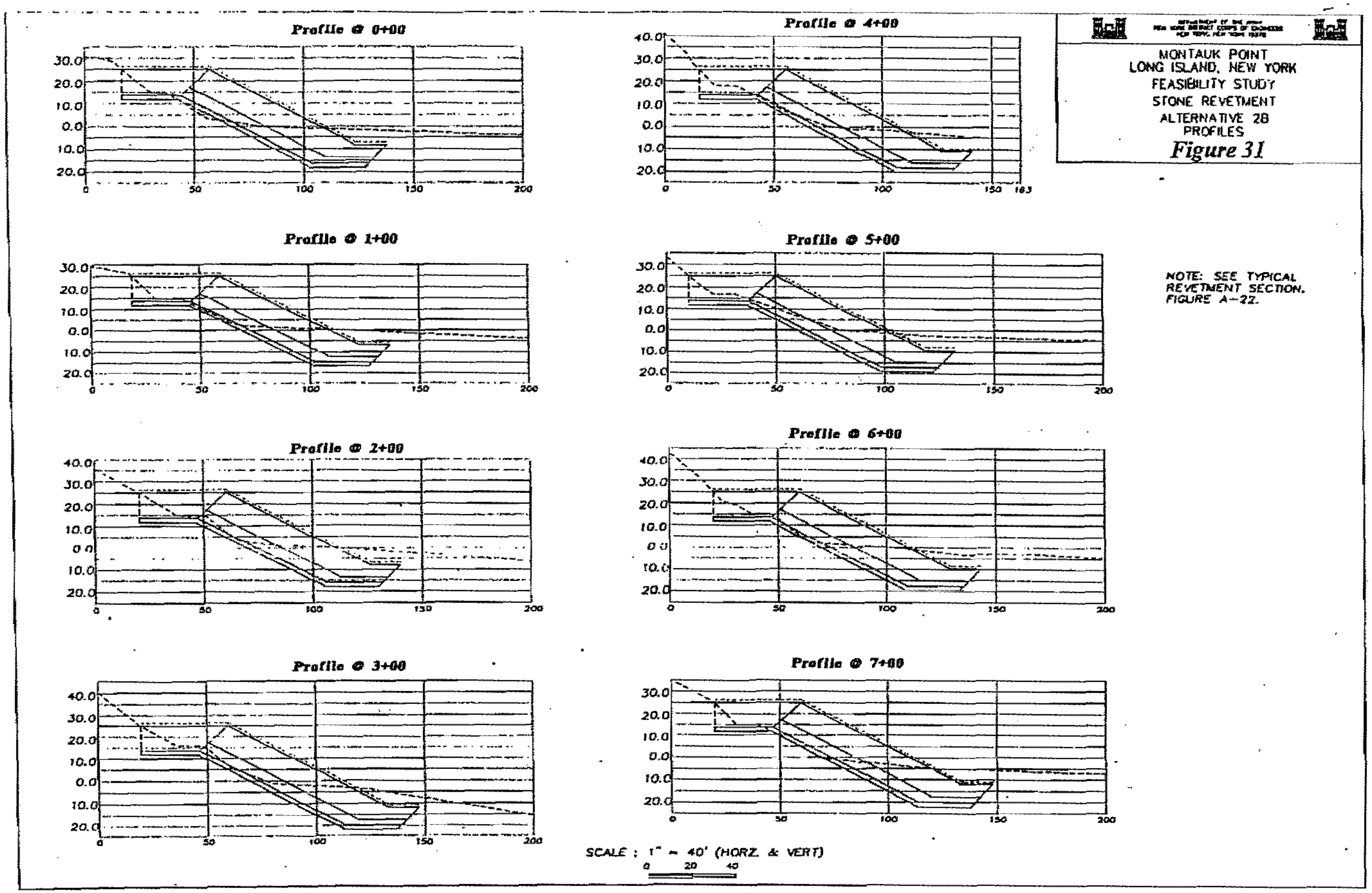
Non Cost-Shared Items

| | Federal Share 0% | Non-Federal Share 100% | Total Cost |
|---|---|---|---|
| Annual Revetment Maintenance | $0 | $52,300 | $52,300 |

** Value of easements to be obtained are estimated to be $0. Administrative and incidental costs associated with easements to be obtained are estimated to be $32k, and are included in cash contribution cost.*



MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
STONE REVETMENT
ALTERNATIVE PLAN 2B
*Figure 30*



MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
STONE REVETMENT
ALTERNATIVE 2B
PROFILES

Figure 31

NOTE: SEE TYPICAL REVETMENT SECTION. FIGURE A-22.

## Profile @ 5+00

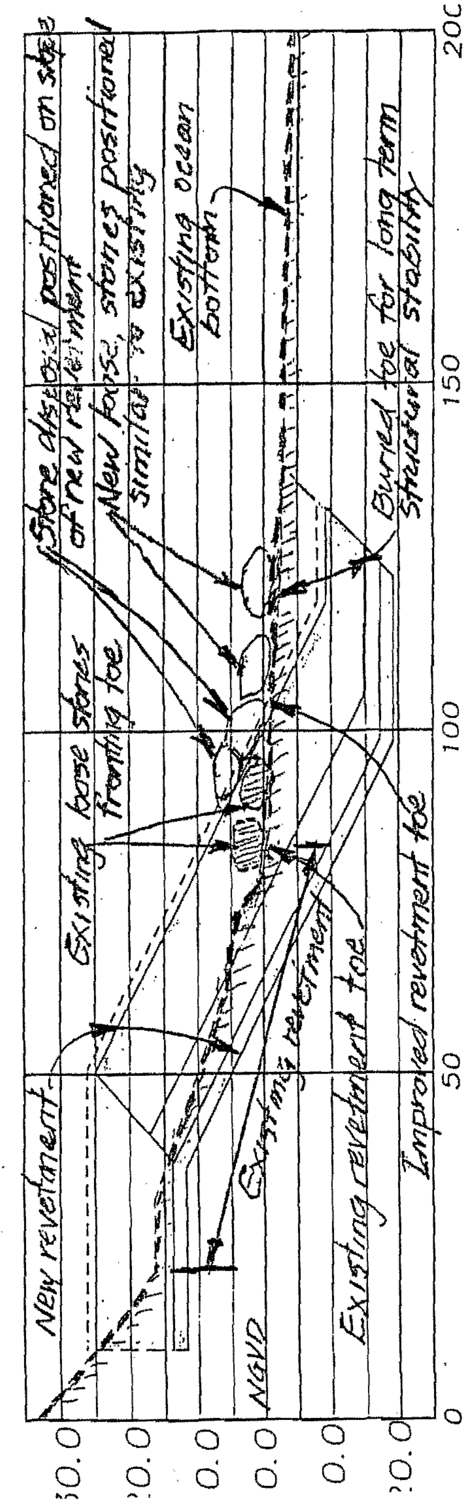


Figure 32

## 40. Environmental & Cultural Resources Impacts of The Selected Plan

An Environmental Impact Statement (EIS) has been completed and is enclosed with this feasibility report. The proposed work will have no significant impact on the quality of the environment in the project area. Most impacts associated with this project will be temporary, and none of the impacts are regarded as significant (refer to the EIS for additional information).

### Topography, geology and soils

Implementation of the revetment is expected to result in significant benefits to the existing topography by stabilizing the bluff and shoreline.

### Water Resources

The construction of the revetment would not impact regional hydrology or groundwater resources because the revetment construction would occur at the surface of the bluff and along the Montauk Point shoreline. Implementation of the proposed revetment is expected to result in significant long-term benefits to the existing hydrology and groundwater flow by stabilizing the bluff and shoreline.

### Surface Water

During construction of the revetment, a temporary increase in turbidity of nearby surface water is expected. However, the suspended materials would be expected to settle out quickly or would be rapidly transported away by the strong tidal currents. Following completion of in-water construction activities, water quality would be expected to quickly return to pre-construction conditions. No significant long-term impacts on surface water quality are expected.

### Wetlands

No direct or indirect impacts to freshwater wetlands, coastal ponds, or interdunal swales in the project area are expected due to construction of the stone revetment. The new revetment would essentially replace the existing revetment within the existing footprint. The minor, temporary and localized suspended sediment generated by revetment construction would quickly settle out of the water column, and would not result in significant sedimentation in the project area or the adjacent unvegetated marine wetlands.

### Wildlife

The Fish and Wildlife Coordination Act (FWCA) (16 USC 662(a)) provides that whenever the waters of any stream or other body of water are proposed to be impounded, diverted, the channel deepened or otherwise controlled or modified, the District shall consult with the U.S. Fish and Wildlife Service (USFWS), the Nation Marine Fisheries

Service (NMFS) as appropriate, and the agency administering the wildlife resources of the state. A FWCAR was submitted to the USACE by the USFWS (refer to Environmental Impact Statement - Appendix E). The FWCAR incorporates consultations with the NYSDEC and NMFS, regarding existing fish and wildlife resources, anticipated impacts, and recommendations for avoidance and minimization of impacts. Overall, the USFWS concluded the impacts to fish and wildlife resources occurring within the footprint of the proposed construction area would be minimal. The NYSDEC also concurred with the FWCAR's conclusions and recommendations.

### Benthic Resources

Construction of the project would impose a one-time, temporary impact on existing benthic communities at the nearshore area of the Project area. The USFWS's FWCAR concluded that, due to the amount of data supporting the rapid recovery of benthic organisms, there will be limited impacts to the subtidal benthic community as a result of project implementation except in areas of direct stone placement where infaunal communities would be replaced with epifaunal communities.

### Finfish and Shellfish

Construction of the project would impose a one-time, temporary impact on the existing finfish and shellfish species at the nearshore area of the project area. The USFWS concluded within their FWCAR that negative impacts to finfish are not expected as a result of implementation of the project. Similar to the finfish species in the project area, recolonization by shellfish species is expected to occur after completion of the proposed project.

### Essential Fish Habitat (EFH)

Temporary impacts on EFH are predicted during periods of active construction. Habitat would be temporarily degraded during construction, as a result of elevated suspended sediment levels, temporarily lowering visual feeding efficiency, and irritating gill tissue. However, the suspended sediments are expected to settle quickly out of the water column. Therefore, no long-term adverse impacts on the water quality aspects of EFH are expected.

### Birds

The project would result in the temporary disturbance to those species of birds that may utilize the existing revetment for resting, however the new revetment would mimic the old revetment in material and design and immediate reestablishment of resting use is expected. Negative impacts to pelagic seabirds are not expected due to the high mobility and use of deeper water habitats by these species. Following construction, bird species are expected to resume their normal habits consistent with post-construction habitat availability in and within the vicinity of the project area.

### Mammals

Construction of the proposed project could have minor short-term impacts on terrestrial mammal populations occurring in the area. Construction equipment traveling over terrestrial habitat could result in the temporary disturbance of habitat and possible mortality of less mobile, burrowing, and/or denning species of mammals during construction activities. The return of ground dwelling species may be reduced, depending on the level of soil compaction that results from construction equipment traveling over terrestrial habitat. Construction activities may also cause the temporary and permanent displacement of more mobile species due to increased human activity and habitat alterations. All of these potential impacts are expected to be of minimal significance because vegetated environments would not be impacted by the project. Following construction, wildlife species are expected to resume their normal habits consistent with post-construction habitat availability in and within the vicinity of the project area.

### Federal Species of Concern

Although several species of Federally listed endangered and threatened species of animals and plants can be expected to occur in the general vicinity of the project area at any time, no impacts to these species are expected to occur as a result of construction of the project. The FWCAR concluded that no Federally-listed or proposed endangered or threatened species under the jurisdiction of the USFWS are known to exist within the project impact area and that no habitat in the project area is currently designated or proposed critical habitat in accordance with the provisions of the Endangered Species Act.

### State Species of Concern

Although animal and plant species are unlikely to be impacted by the proposed project, the District will conduct pre-construction surveys for state-listed plants and birds and will coordinate with the NYSDEC regarding proper survey protocols as recommended in the USFWS's FWCAR. Further coordination with the NYSDEC would be initiated regarding recommendations to minimize and avoid disturbance if listed species are encountered.

### Economy and Income

The project is expected to have a beneficial, long-term effect on the economic characteristics associated with the project area through the protection of Montauk Point from inevitable future erosion and storm damage. Such protection would preserve the bluff top and the Lighthouse complex for continued use by seasonal and permanent residents, and would result in a continuing contribution by the diverse recreational facilities located within the project area to various aspects of the local economy, including the continued demand for seasonal housing, restaurants, and local businesses in support of the recreational uses of the project area. .

### Cultural Resources

Based on the results of previous cultural resource investigations, several of the archaeological sites uncovered around the Lighthouse are eligible for inclusion on the National Register of Historic Places (NRHP) under several of the prescribed criteria. Furthermore, the entire Lighthouse Complex itself is eligible as a National Register District, possessing integrity and significance based upon the characteristics of location, setting, feeling, association and design, including "a significant concentration, linkage, or continuity of sites, buildings, structures, or objects, united historically or aesthetically by plan or physical development." Because the Lighthouse property possesses all of these elements, the District encourages the Montauk Point Historical Society to apply for this status.

Construction of the project will not significantly impact the buried cultural resources that are located at the Lighthouse complex, and, in fact, will help to preserve the cultural resources that have been identified by reducing the potential for further erosion of the bluff face. However, it is the recommendation of the District that archaeological monitoring be conducted during the construction phase of the project. Archaeological monitoring during the removal and replacement of the revetment stones will ensure that buried archaeological materials are not disturbed. If previously unidentified archaeological materials are uncovered during construction, the on-site archaeologist would evaluate their significance. If any identified archaeological sites are determined to be potentially eligible for the NRHP, work will be halted and consultation with the New York State Office of Preservation will occur. Upon completion of consultation, if a finding of no-significance is determined, the project will continue after the materials are recorded.

### Land use and zoning

Construction, operation, and maintenance of the revetment would not have any direct or indirect impacts on the existing land use and zoning in the project area. The existing land uses in the area would not change as a result of the project. Zoning designations would not be changed, nor would any homes or businesses be removed or displaced.

### Coastal Zone Management

As required under the Federal Coastal Zone Management Act of 1972, the District reviewed the proposed Project in relation to the applicable policies of the New York State CMP and determined that it is consistent with all relevant policies. The New York State CMP Consistency Statement is provided as Appendix F of this EIS.

### Hazardous, Toxic and Radioactive Wastes (HTRW)

No impacts to any HTRW sites are expected to occur as a result of the proposed project because no sites have been identified in the project area. The District would implement standard guidelines for the storage and cleanup of hazardous materials in the project area during construction. In addition, as recommended by the USFWS, an oil-spill contingency plan would be developed and coordinated prior to any construction.

### Navigation

Construction and replacement of the existing revetment is limited to the nearshore area of the project area. Due to the proximity of the revetment to the shore and the absence of Federal or state navigational channels near the project area, no navigational channels would be impacted as a result of the proposed project. Construction of the proposed project would have a long-term beneficial impact in securing the integrity of Turtle Hill Plateau where the Lighthouse and associated facilities presently stand.

### Aesthetic and Scenic Resources

Long-term impacts to aesthetic and scenic resources resulting from the construction of the revetment are expected to be of minimal significance to natural and manmade landscapes. The proposed project would be consistent with the existing revetment structure in the project area and would result in very low levels of change in the surrounding landscape that would not attract undue visual attention.

Short-term impacts to aesthetic and scenic resources during the construction phase are also expected to be of minimal significance. However, the District recognizes that construction equipment operating and traveling through the project area during the 2-year construction period could have a negative effect on the scenic resources as well as the relatively quiet and peaceful setting normally provided by Montauk Point State Park. As a result, the District has coordinated with the Montauk Historical Society and NYSOPRHP to develop a plan that would minimize impacts to these aesthetic resources. Currently, the plan includes limiting the time of day when equipment and heavy-duty trucks access the area to off-peak visitation hours. This would reduce the number of encounters that visitors would have with construction equipment traveling to and from the staging areas and revetment. Although these off-peak hours have not yet been determined, a seasonal schedule would be developed in coordination with the Montauk Historical Society and NYSOPRHP.

### Recreation

Construction of the project would result in short-term, direct impacts to recreational uses, such as use of pedestrian trails and the revetment for fishing, by temporarily limiting and/or blocking access to the beachfront and the existing revetment. These short-term, direct impacts would primarily affect recreational fishing because surfcasting from the existing revetment is a popular activity at Montauk Point. As a result of this potential impact, the District has coordinated with the Montauk Surfcasters Association and the New York Sport Fishing Federation to develop a plan that would minimize impacts on access to the revetment by fishermen during construction and enhance access after construction. The District has developed a construction schedule that will allow fishermen limited access to the revetment area during the initial stages of construction.

Both organizations understand the importance of ensuring that there is a strong, stable, and long-lasting revetment wall at Montauk Point and offered their full support of the project. Access impacts during construction would be reduced by allowing limited access to the current revetment for fishing during the construction period to the maximum extent practicable, without causing a safety hazard. By initiating construction on the south end of the revetment while having a delayed construction start date on the north end of the revetment, a few additional months of access to the revetment by fishermen would be possible. However, eventually the entire revetment and staging areas immediately adjacent to the northern and southern ends of the revetment would need to be closed to the public. During this time, fishermen would still be able to fish from the adjacent beach areas.

The Surfrider Foundation, Long Island Chapter, raised concerns regarding the impact of the proposed project on recreational surfing. In response to the Surfrider Foundation's concerns, the District performed modeling to determine the potential effect of implementation of the proposed project on offshore waves. The results of this modeling determined that the reflection coefficient for the existing revetment ranged from 0.30 to 0.33, whereas the reflection coefficient for the proposed revetment would range from 0.25 to 0.28, an approximate 15 percent reduction from that of the existing revetment. This reduction is due to the milder front slope and the greater porosity of the thick layers of randomly placed stone of the proposed revetment. Based upon the modeling results, the District believes that implementation of the proposed project would have little to no impact on the quality or surfability of the waves in the offshore waters of Montauk Point, and may, in fact, have less impact than the existing structure.

Overall, implementation of the stone revetment alternative would not result in a significant short-term loss of recreational use of Montauk Point. Although the revetment wall would be closed to the public, the Turtle Hill plateau and adjacent beach front areas would remain open and usable by the public. Long-term impacts on recreation due to implementation of the proposed project are considered to be beneficial, primarily as a result of the long-term preservation of Montauk Point State Park and the Lighthouse complex.

### Transportation

The stone revetment alternative is expected to have limited, short-term impacts to transportation within the project area. Such impacts would be associated with construction of the revetment, and would include the added presence of construction related vehicles through Montauk Point State Park, and along access roads from the bluff top down to the shoreline. Construction-related vehicles are expected to include slow-moving, heavy-duty construction equipment, as well as worker's vehicles. The added presence of construction-related vehicles may result in increased traffic and impediments to normal traffic flow in the project area. To help alleviate this impact during construction of the project, flagmen would be available and construction signs would be posted. In addition, the District has coordinated with the Montauk Historical Society and NYSOPRHP to develop a plan that would limit the time of day when equipment and heavy-duty trucks access the area to off-peak visitation hours. This would reduce congestion along the Montauk State Park Highway (the only road in and out of the park). Although these off-peak hours have not yet been determined, a seasonal schedule would be developed in coordination with the Montauk Historical Society and NYSOPRHP. Following construction, the stone revetment alternative is not expected to have any impacts to transportation conditions in the Project area. In addition, all roads would be monitored during the construction phase and returned to their pre-construction condition.

Air Quality

General Conformity under the Clean Air Act, Section 176 has been evaluated for the project described above according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this proposed project because total direct and indirect emission of from this project/action have been estimated that Ozone (NOx & VOC's) 19.66 tons are below the conformity threshold value established at 40 CFR 93.153(b) of 25 tons per year, and the proposed project/action is not considered regionally significant under 40 CFR 93.153(i). No short-term or long-term impacts to air quality are expected to occur as a result of construction or maintenance of the stone revetment alternative.

Noise

Project construction would result in a minor, temporary increase in noise generation as a result of the use of construction equipment. After construction, the stone revetment is expected to have no impact on noise.

Unavoidable adverse environmental effects

The construction of the project would result in certain unavoidable adverse impacts on the environmental resources located within the project area. Temporary and localized adverse environmental effects that may occur during construction include: an increase in traffic, an increase in noise levels due to construction equipment, an increase of turbidity and sedimentation into water resources during construction, loss of less mobile wildlife including shellfish and other benthic organisms, and disruption of aesthetic, visual, and recreational resources.

However, implementation of the project is expected to generate numerous long-term beneficial impacts that would offset temporary adverse environmental impacts. These long-term beneficial impacts include the protection of the most vulnerable portion of the bluff area from failure, offering protection to the Turtle Hill plateau, the Lighthouse and associated structures, and other historically important resources. This protection would provide long-term protection to the socioeconomics of the area through the preservation the aesthetic, visual, historic, and recreational appeal that the project area currently offers. In addition, implementation of the project is expected to offer protection to valuable interdunal pond communities that exist along the northern shore of Montauk Point.

## 41. Real Estate Plan

The construction of the new revetment will require three tracts ecompassing two individual affected ownerships, namely the Montauk Historical Society (a not-for-profit educational institution that administers the Montauk Lighthouse Museum and which obtained title to same via a quitclaim deed from the United States of America dated 18 September 1998 (one tract), and the State of New York (two tracts). Reference Figures 33 and 34 for required real estate easements.

The two State-owned tracts are located along the shoreline at the base of the cliff, adjacent to either side of the Montauk Historical Society property. Approximately 1.81 acres of land is required for the revetment. In addition, approximately 2.33 acres will be required for 2 temporary work areas adjacent to the revetment. Access to the Project site will be via existing State roads (Montauk Highway) and local interior roads on either Sponsor-owned or Montauk Historical Society lands, including portions of the planned Temporary Work Areas (1.37 acres). The Sponsor will be responsible for obtaining the required real estate interests.

The project is not expected to require any facility or utility relocations, nor any relocation of displaced persons, residences, businesses or farms under the provisions of Public Law 91-646. Similarly the project does not require acquisition of real property interests for borrow areas, nor will disposal areas will be required for any purpose.

A summary of the acreage needed for the Project and the uses thereof is as follows:

Table 19 – Real Estate Summary

| Interest | Acreage |
|---|---|
| Perpetual non-Standard Revetment Easement | 1.81 acres |
| Temporary Work Area Easement: | 3.70 acres |
| Total: | 5.51 acres |

Under the doctrine of "offsetting benefits" as applied to the construction of a stone revetment to protect the underlying fee owners' upland and improvements (i.e., the Montauk Point Lighthouse Complex and the adjacent State-owned lands) the value of the easement estates to be obtained and the land to be provided directly by the Sponsor is estimated to be Zero ($0) dollars. The administrative and incidental costs associated with the noted easements to be obtained is estimated to be $32,000.

Insofar as Montauk Historical Society, the landowner of the single easement tract to be acquired, holds title to its land under a Quitclaim Deed from the United States of America and is a "willing seller," no condemnations are anticipated. The landowner, Montauk Historical Society, is strongly supportive of the project.

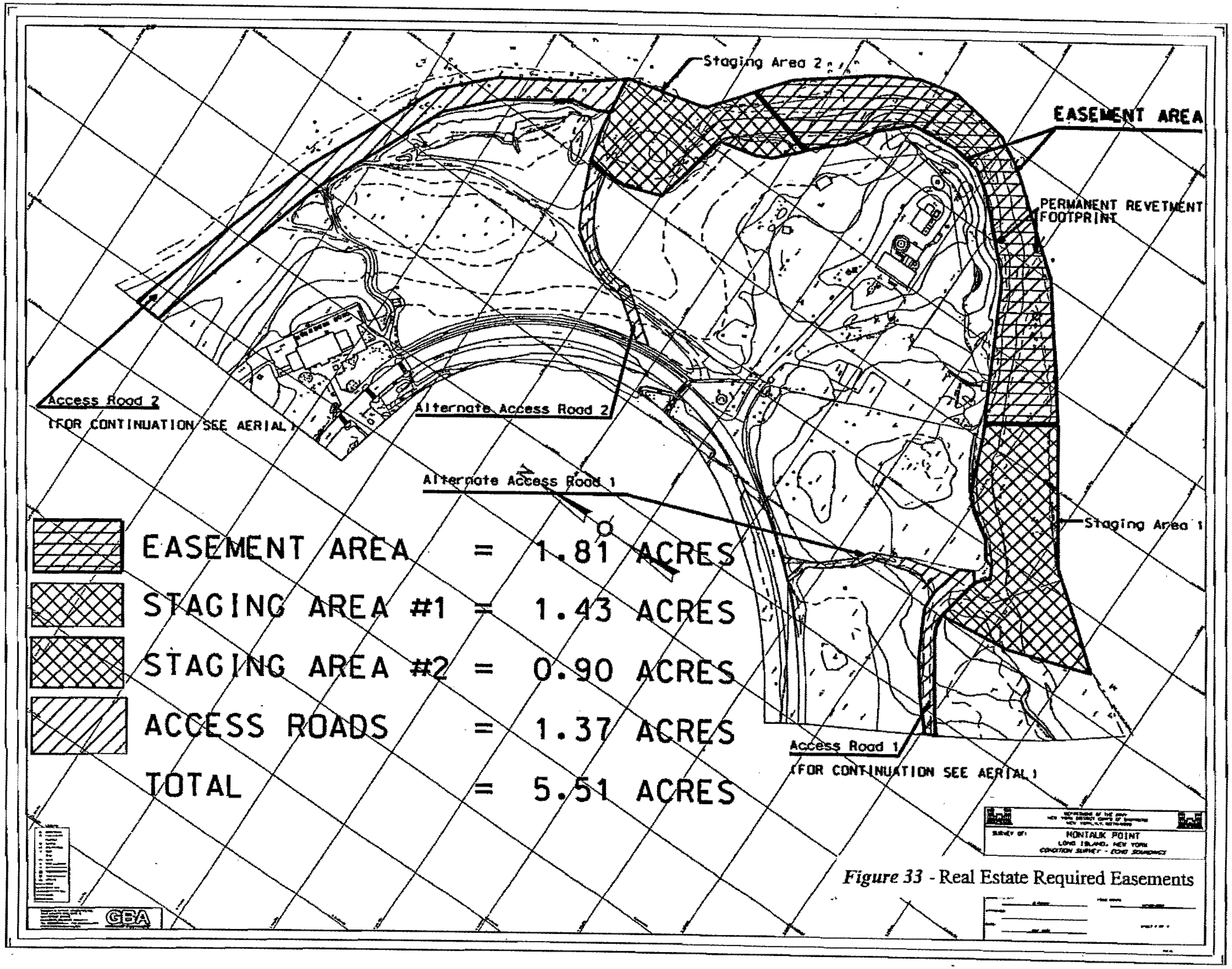


*Figure 33* - Real Estate Required Easements

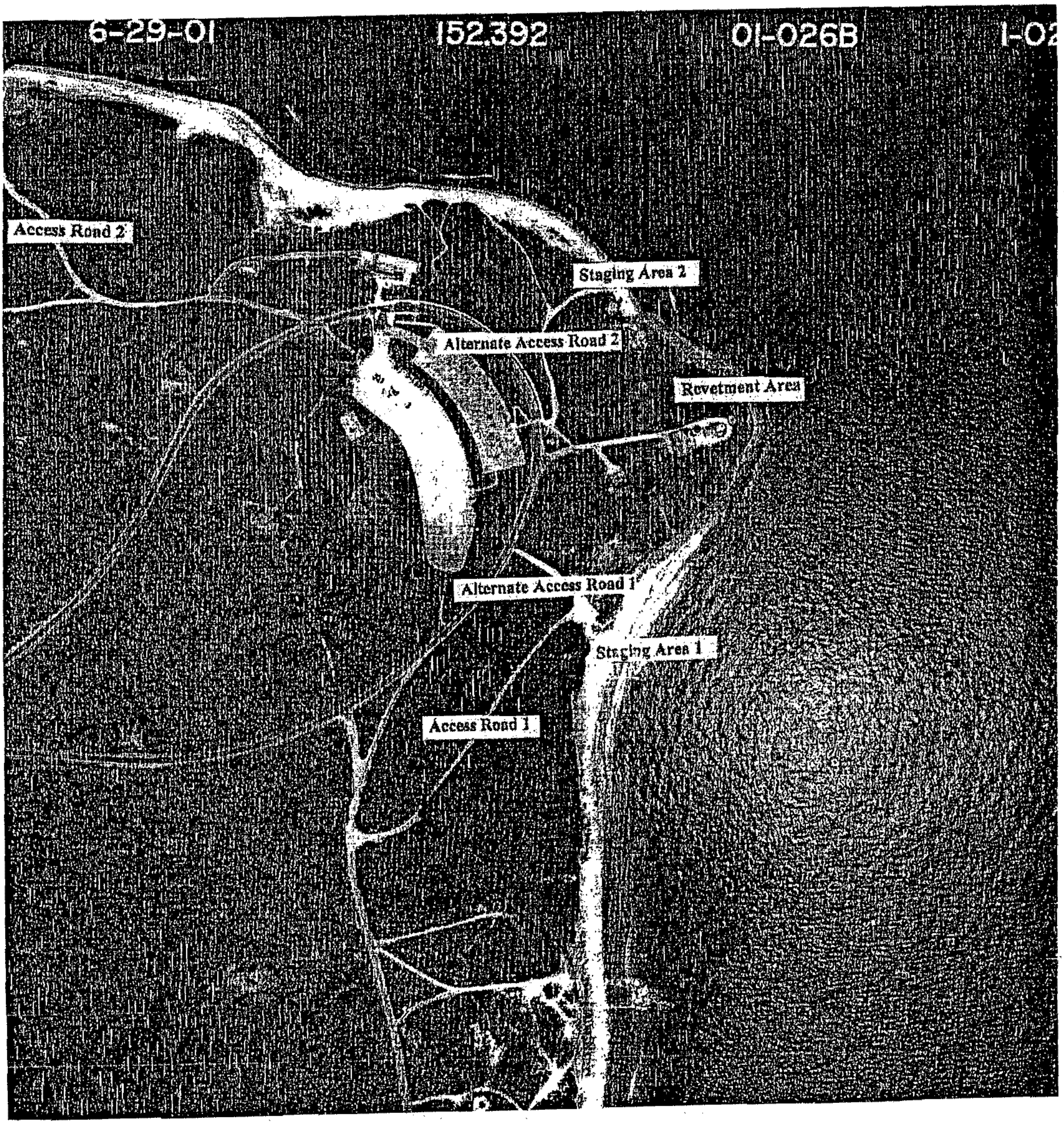


*Figure 34* – Real Estate Required Easements (Aerial Map)

## 42. Project Construction Schedule*

The Design Phase (Planning, Engineering and Design) is anticipated to be initiated in February 2006 and to be completed by September 2007. The estimated time of construction is 2-years. Construction is anticipated to commence January 2008 and be completed by January 2010.

* *NOTE: The project schedule shown below assumes that Federal funding is provided by Congress, as has been done in the past.*

### Completion of Feasibility Report – 6 months

| | |
|---|---|
| August 2005 | Draft Report & Draft EIS – public & agency review |
| October 2005 | Final Report & Final EIS |
| December 2005 | Report Approval and Authorization to Proceed PED |
| January 2006 | Execution of Design Agreement with Sponsor |

### Planning, Engineering & Design Phase – 20 months

| | |
|---|---|
| February 2006 | Value Engineering |
| | Design Documentation Report (Engineering)<br>Plans & Specifications Initiation - Design & Review<br>Coordination – Environmental, Permits, Real Estate<br>Execute Project Cooperation Agreement with Sponsor<br>Completion of Final P&S<br>Real Estate Acquisition |
| September 2007 | BCO Certification |

### Construction Contracting Phase – 4 months

| | |
|---|---|
| October 2007 | Construction Contracting - Advertise for Bids |
| January 2008 | Award Contract |

### Project Construction – 2 years

| | |
|---|---|
| January 2008 | Notice to Proceed – Initiation of Construction |
| | Construction of Project |
| January 2010 | Project Completion |

## 43. Operation & Maintenance Requirements – Non Federal Sponsor

An Operations and Maintenance Manual will be developed prior to construction, which will detail the local operations of the proposed project. As per ER 1110-2-2902, the following is presented to cover the operation, maintenance, repair, rehabilitation and replacement plan for the project: Pertaining to coastal structures:

### Operation and Inspection

Insure the proper functioning of all features requiring operation or adjustment as prescribed in the operations and maintenance manual. Inspect the structures incorporated into the shore protection project (such as, but not limited to, groins, revetments, seawalls, bulkheads, breakwaters, closure structures, and sand bypassing systems) prior to the storm season, immediately following each major storm, and otherwise at intervals not exceeding 90 days. During such inspections, be certain that:

(a) Post storm condition surveys are made as required by the operations and maintenance manual.
(b) No loss, displacement, or cracking of cap stone has occured which affects the stability of the structure.
(c) No undue settlement has occurred which affects the stability of the structure.
(d) There are no encroachments upon the structure that might endanger the structure or hinder its function or repair.
(e) Care is being exercised to prevent accumulation of trash and debris adjacent to the structures.
(f) No toe scour or flanking erosion exist which may endanger stability or functioning of the structure.
(g) All drainage systems on the bluff are in good working condition.
(h) All vegetative plantings covering the bluff slope above the revetment are in good condition.
(i) No excessive loss of materials such as bedding stones, underlayer stones or armor units exist that may endanger stability or functioning of the structures.
(j) No floating plant or boats are allowed to lie against or tie up to the structures unless they are designed for such use or it is necessary for repair efforts.

### Maintenance

The possibility of one coastal storm closely following another requires that coastal structures, particularly those which provide storm protection, be maintained to the extent practicable in a state of readiness. Measures to eliminate unauthorized encroachments and to effect repairs found necessary by inspection shall be undertaken immediately. All repairs shall be accomplished by methods acceptable to the District Commander or an authorized representative.

## 44. Local Cooperation

The NYSDEC, Montauk Historical Society and NYS Parks have been fully involved in project discussions and public meetings throughout plan formulation. A kick-off meeting was held June 2000 to introduce the project, review the study process, and perform a site visit. A public Environmental Scoping Meeting was also held November 2001. The Corps participated in many meetings throughout the study process, both formal and informal, that focused upon the problem at Montauk Point and its proposed alternatives. These meetings have been held with NYSDEC officials as well as with Federal, State and local agencies. There have been separate meetings with representatives of the Surfrider Foundation, who have opposed the project in spite of analysis for this study concluding no significant adverse effects are to be expected to surfing with the project in place.

The project sponsor, the New York State Department of Environmental Conservation (NYSDEC), the Montauk Historical Society, and NYS Parks are in full support of the selected plan of improvement. There is strong local, public and Congressional support for the project.

The project sponsor is prepared to execute a Design Agreement, for the completion of the plans and specifications phase, which will reflect the recommendations of this Feasibility Report.

The project sponsor shall be required to comply with all applicable Federal laws and policies and other requirements. A fully coordinated Project Cooperation Agreement (PCA) package (to include sponsor's financing plan) will be prepared subsequent to the approval of the feasibility phase, which will reflect the recommendations of the Feasibility Study. The non-Federal sponsor has indicated support of the recommendations presented in this Feasibility Report and the desire to execute a PCA for the recommend plan.

The local sponsor shall be required to:

(1) Enter into an agreement which provides, prior to construction, 25 percent of pre-construction engineering and design (PED) costs;
(2) Provide, during the first year of construction, any additional funds needed to cover the non-federal share of PED costs;
(3) Provide all lands, easements, and rights-of-way and perform or ensure the performance of any relocations determined by the Federal Government to be necessary for the initial construction, periodic nourishment, operation, and maintenance of the project.
(4) Provide, during construction, any additional amounts as are necessary to make its total contribution equal to 50 percent of initial project costs assigned to storm damage.
(5) For so long as the project remains authorized, operate, maintain and repair the completed project, or functional portion of the project, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government.

(6) Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the Non-Federal Sponsor, now or hereafter, owns or controls for access to the project for the purpose of inspecting, operating, maintaining, repairing, replacing, rehabilitating, or completing the project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Federal Government shall relieve the Non-Federal Sponsor of responsibility to meet the Non-Federal Sponsor's obligations, or to preclude the Federal Government from pursuing any other remedy at law or equity to ensure faithful performance;

(7) Hold and save the United States free from all damages arising from the initial construction, periodic nourishment, operation, maintenance, repair, replacement, and rehabilitation of the project and any project-related betterments, except for damages due to the fault or negligence of the United States or its contractors;

(8) Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

(9) Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended, 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the initial construction, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the Non-Federal Sponsor with prior specific written direction, in which case the Non-Federal Sponsor shall perform such investigations in accordance with such written direction;

(10) Assume complete financial responsibility for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the initial construction, periodic nourishment, operation, or maintenance of the project;

(11) Agree that the Non-Federal Sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, and repair the project in a manner that will not cause liability to arise under CERCLA;

(12) If applicable, comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for the initial construction, periodic nourishment, operation, and maintenance of the project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

(13) Comply with all applicable Federal and State laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; all applicable Federal labor standards requirements including, but not

limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a *et seq.*), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 *et seq.*) and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c *et seq.*)); and Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12), requiring non-Federal preparation and implementation of flood plain management plans;

(14) Provide and maintain necessary access roads, parking areas, and other public use facilities, open and available to all on equal terms;

(15) Recognize and support the requirements of Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element; and

(16) Do not use Federal funds to meet the non-Federal sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is expressly authorized by statute.

## 45. Financial Analysis of the Non-Federal Sponsor

The New York State Department of Environmental Conservation (NYSDEC) has stated its intention to act as the non-Federal partner and has requested that funds for design be included in the upcoming New York State Budget. NYSDEC has successfully served as the non-Federal partner on numerous projects within the New York District. In view of their past performance as a partner, it is the assessment of the District that the NYSDEC has more than adequate financial capability to fund its obligation for project construction.

## 46. Conclusion & Recommendations

Conclusion: If allowed to continue, progressive instability of the Montauk Point bluff would result in the irrecoverable loss of the historic Montauk Point Lighthouse and its associated structures, along with archaeological resources. The implication would be the total loss of all historical properties, both buried and above ground. Once this information is lost, it can never be recovered, and future study of the complex would be impossible. The alternative plans developed for this feasibility report are superior to the no action plan as they provide substantial storm damage protection.

The alternative plans included five significantly different measures: stone revetment, offshore breakwater with beach fill, T-groins with beach fill, beach fill, and relocation of the lighthouse. The stone revetment is the most reliable and cost effective structural solution. Because of the steep terrain in the area, the cost of relocation is prohibitive. In addition, relocation would have adverse effects on the surrounding archeological resources, would degrade existing habitats and historic views, and also effect recreational use of the area. Also, a replacement light tower would have to be constructed, as the lighthouse, in its current location, continues to serve as a functioning aid to navigation.

Therefore, the selected plan consists of the construction of a stone revetment with a 73-year storm design (Alternative Plan 2B). This level of design was chosen based on an economic optimization of a wide range of designs to reduce the risk of losses due to storm damages.

- Stone revetment, 840-feet in length, with a crest width of 40-feet at elevation +25 feet NGVD, and 1V:2H side slopes.
- 12.6-ton quarrystone armor units extending from the crest down to embedded toe.
- Three layers of 4-5 ton armor units are used atop the splash apron. It is assumed that some of these stones can be re-used in the proposed revetment from the present structure.
- The bottom of the armor stone layer in the toe is located at a depth of 12-feet from the existing bottom.
- A heavily embedded toe is incorporated to protect against breaking waves, provide long-term stone stability, and scour at the toe of the structure. Stone sub-layers are specified in accordance with standard Corps design procedures.

The selected NED plan is also the locally preferred plan. The local sponsor, New York State Department of Environmental Conservation is willing to provide all items of local cooperation, and is in full support of the selected plan.

The proposed work will have no significant impact on the quality of the environment in the project area. Special consideration was given to the effects of the selected plan on fishing, surfing, and cultural experiences. Most impacts associated with this project will be temporary, and none of the impacts are regarded as significant.

The land that will be protected by implementation of this recommended project is deeded to the Montauk Historical Society (MHS). The MHS is a private, not for profit association that is not part of any state or local government. This land is held open, for use by all on equal terms, regardless of origin or home area. Existing Corps policy indicates that there is no Federal interest in protection of a property owned by a single private non-profit entity.

However, although the MHS is clearly a single, private landowner, they must, by deed restriction and State charter, act as a public entity akin to agencies of State and local governments. The MHS must accomplish a public education mission to stay in operation, must follow Federal National Historic Preservation requirements for maintenance work, and membership and enjoyment of the benefits of the facility and educational programs are open to all, with no restriction, for a fee. Under the deed and charter, the MHS cannot structure and constrain uses of the property, nor can anyone who cares to join the MHS and enjoy the benefits of the facility and water resources project be excluded.

In light of these facts, New York District requested a waiver to the single landowner policy from the Assistant Secretary of the Army (Civil Works) and was granted an exception allowing the completion of the feasibility study with a view towards pursuing a cost-shared construction project for Montauk Point, New York.

The first cost of the selected plan is estimated to be $13,722,000 at October 2004 price levels. The total benefits attributed to this selected plan are estimated at $1,578,700 while the annual costs are $889,300. Therefore, the benefit to cost ratio is 1.8 to 1, with total net benefits of $689,400.

The cost-sharing for construction of this storm damage reduction project is as follows:

| | |
|---|---|
| 50% Federal Share | $6,861,000 |
| 50% Non-Federal Share | $6,861,000 |
| Total Project First Cost | $13,722,000 |

An annual revetment maintenance cost of $52,300 will be a 100% Non-Federal expense.

Recommendations: I have reviewed and evaluated, in light of the public interest, the information related to storm damage reduction at Montauk Point, New York. I find that the selected NED plan of improvement, the stone revetment, as developed in this report is based on a thorough analysis and evaluation of the various practical alternative courses of action for achieving this project's objectives.

I recommend authorization of the selected stone revetment plan for Montauk Point, with such modifications thereof as in the discretion of the Commander, HQUSACE, as may be advisable.

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program, nor the perspective of highest review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementing funding. However, prior to transmittal to Congress, the sponsor, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Richard J. Polo, Jr.
Colonel, U.S. Army
District Engineer

# APPENDIX A:  ENGINEERING & DESIGN

# Storm Damage Reduction - Feasibility Study
# Montauk Point, New York

## DRAFT ENGINEERING AND DESIGN
## APPENDIX A

Prepared For:

U.S. Army Corps of Engineers
New York District

October 2005

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# Erosion Control Feasibility Study
# Montauk Point, New York

## 1. Description of Project Area and Vicinity

A-1 Montauk Point is located in Suffolk County, approximately 125 miles east of New York City. The point separates the Atlantic Ocean to the south from Block Island Sound to the north. (Figure A-1). The Montauk Point Lighthouse acts as a junction marker for ships headed for New York Harbor or Long Island Sound.

A-2 The Montauk Point Light Station was authorized for construction in 1792 by President George Washington. Construction was initiated in June 1796 and completed in November 1796 at a cost of $22,300. The lantern is about 80 feet above the ground. The lantern was lit with sperm oil until the 1860's, kerosene until the 1940's and, finally, electricity with a 300,000-candlepower lamp.

A-3 When the light was completed it was 300 feet from the edge of the cliff. Presently the lighthouse is less than 120 feet from the edge of the bluff and other major structures are within 50 feet of the bluff edge. Continued erosion has been recognized as a problem for many decades and various efforts have been made to stabilize the shoreline with varied success.

A-4 The study area includes the historic Montauk Point Lighthouse that sits on a high bluff underlain with glacial till, approximately 70 feet above Mean Sea Level (MSL). The study area includes steep slopes and shorelines surrounding the bluff, detailed in Figure A-2.

A-5 The critical area of study consists of the bluff from the southwest side of the point to the northwest side of the point, covering about 900 feet of shoreline. The ownership of most of the property was recently transferred from the U.S. Coast Guard to the Montauk Historical Society, surrounding property owned by New York State. The reader is referred to the Real Estate Appendix for further information on ownership of the lands and restrictions to uses.

A-6 The bluff and beach along this entire area are considered to be critical elements of the stability of the lighthouse. Erosion control structures are required to protect the bluff faces from the forces of oncoming waves.

A-7 As with any coastal project, updrift and downdrift areas need to be examined and considered in the formulation of a shore protection plan. In this case, it is estimated that the area of concern consists of 2300 feet of shoreline, extending from the pivotal point of shoreline orientation of the adjacent bluff to the south to a beach area to the north. The entire area must be considered in order to prevent adverse impacts from this project.

# Montauk Point, New York
# Site Location

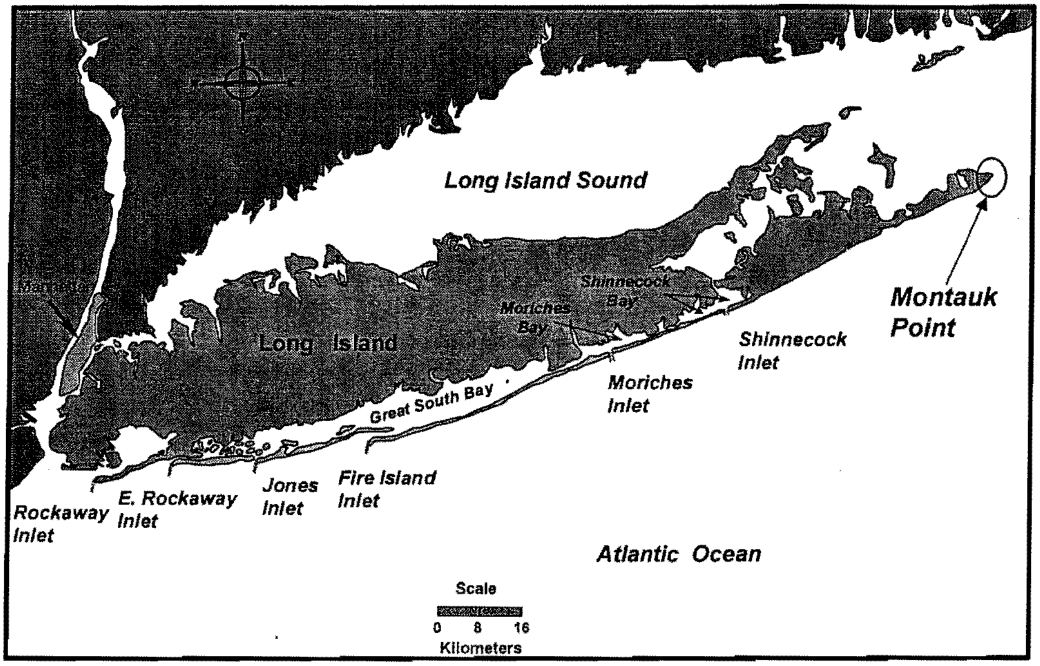
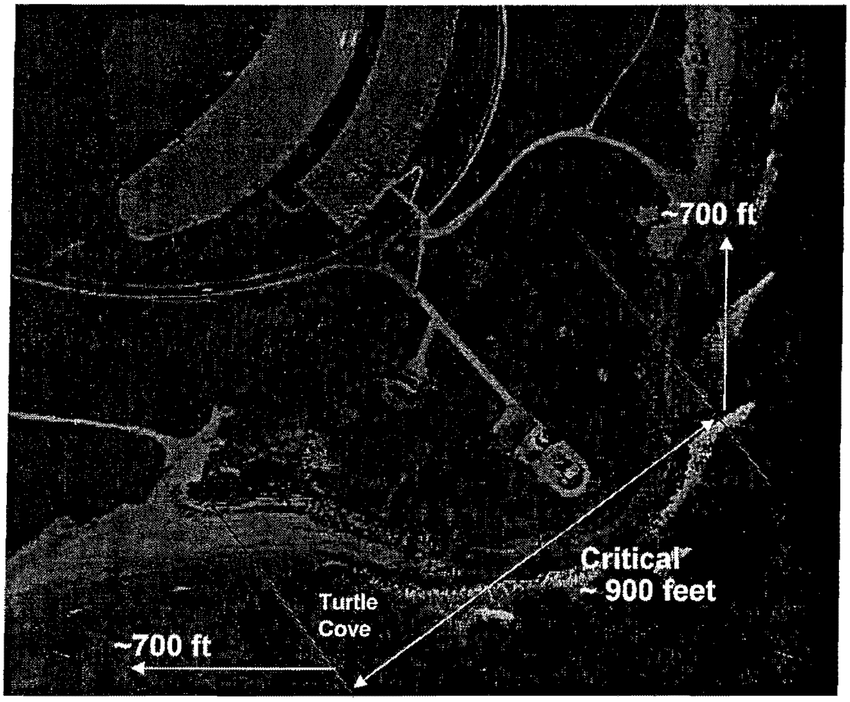


Figure A-1. Site Location



**Study Area**

Figure A-2. Study Area

## 2. Coastal History and Status of Project Area

A-8 A brief history of the shore protection treatments is as follows:

1792 The lighthouse is authorized by George Washington on land previously used by Montaukett Indians. The shoreline is approximately 200 feet seaward of the present (2001) position

1946 A 700-ft stone revetment is constructed at the bluff toe, with vegetative plantings along the upper half of the cliff (New York District, 1944). The crest elevation is +20 ft MSL, tapering down to +15 ft MSL at both ends. The crest width is 23 feet with a core and double armor layer of 4 to 8 ton stone. The base layer is 8 ton stone. Since its construction, this entire seawall has completely failed and is now 10 to 70 feet seaward of the existing bluff toe. Most of the stone is at an elevation of about mean high water, with remnants present as rubble along the southern extent of the present structure toe.

1960's Department of Transportation places rubble over the edge of the bluff just to the south of the lighthouse. After the October 1991 storm, the rubble slides down the slope due to scouring of the bluff toe. Most of the rubble is subsequently cleared away during the construction of the revetment in 1992 (see below).

1971 The first terracing project is constructed along the bluff slope by Ms. Georgina Reid. The construction is on U.S. Coast Guard property just north of the lighthouse.

1972 U.S. Coast Guard places gabions along about 280 feet of the point above the failed 1946 seawall along the toe of the bluff. The gabion system subsequently settles gradually and the crest is of insufficient elevation (only up to about +15 feet MSL) to provide protection. It is significantly damaged by the Halloween Storm of 1991.

1980's Terracing and beach grass plantings continue through the 1970's and 1980's. The vegetation includes beach grasses, bushes, seedlings, shrubs and wildflowers up to five feet in height. Dense foliage occupies most of the north end of the point. The lower east side of the bluff is reshaped to a more stable angle, terraced with lumber and secured by steel stakes to provide a flat surface for the beach grass. The vegetation appears to hold the bluff face against the forces of ground seepage, rainfall and runoff. Terracing efforts subsequently deteriorate due to the impacts of major storms in the early 1990's.

1990 The Montauk Historical Society and the New York State Department of Parks and Recreation construct a revetment along Turtle Cove, south of the lighthouse. A 6-ft deep, 15-ft wide trench is excavated for the toe of 263 lineal feet of revetment. Geotextile fabric is placed in the trench and a base layer of 50-pound stone is placed on the fabric. Up to 14,000 pound stones are placed on the base stone up to an elevation of +20 feet MSL. The revetment subsequently settles to a crest elevation of +5 to +10 feet MSL during the October 1991 storm and is no longer adequate as a shore protection structure.

1992 After severe erosion due to Hurricane Bob and the Halloween Storm of 1991 (The Perfect Storm), a new revetment is constructed by the U.S. Coast Guard landward of the old revetment. An emergency construction effort commences along about 300 feet of shoreline. The crest elevation is +25 feet MSL, with 1-3 ton stones placed on the slope above a 14 foot wide berm crest at elevation +18 MSL of a single 10 ton armor layer, which slopes down to the existing toe (generally on stone from the 1946 failed revetment). The Montauk Historical Society constructs a 150 foot long structure along the eastern section of Turtle Cove. The design is similar to the Coast Guard section but 5 to 10 ton stone is used.

1993 New York District Reconnaissance Study determines sufficient economic justification and Federal interest to continue study.

Because the present shore protection measures, (somewhat similar to the 1946 revetment that failed), were not designed to withstand significant storm events over a substantial duration, i.e. lack of a buried toe, inadequate stone size, and insufficient overtopping protection, it is expected that the revetment now in place will fail in the foreseeable future.

## 3. Existing Drainage

A-9 Montauk Point Lighthouse is located on a knoll with the surrounding topography sloping away from the lighthouse steeply. The site consists predominately of vegetative cover with some pavement and roof areas. The site is well vegetated and contains slopes of up to 40 percent grade. Slope lengths are short and show little sign of past erosion.

A-10 A site reconnaissance was done with Greg Donohue, Erosion Control Specialist of the Montauk Historical Society, to locate and assess the effectiveness of known drainage facilities. Drainage facilities at the site consist of roof drains, a slotted drain and bluff terraces.

A-11 The site can be divided into three primary drainage areas. The first area is the bluff area surrounding the lighthouse. Runoff from this area flows over the bluff to the Atlantic Ocean. The second area is located south of the lighthouse between the bluff and the concrete driveway leading to the lighthouse. Runoff from this area flows southwest towards the Atlantic. The third area is located north of the lighthouse driveway and runoff from this area flows north towards Long Island Sound.

A-12 The current surface drainage pattern is illustrated on Figure A-3. Sources of runoff at the site include lawn areas, building roofs and paved areas. The site contains minimal facilities for the collection and conveyance of storm water.

A-13 Runoff from the lawn areas flows to the Atlantic Ocean via uncontrolled overland flow. No conveyance channels are utilized in directing runoff from lawn areas to specific discharge points. Since most of the slopes within the lawn area are relatively short, runoff can be expected to exist in the form of sheet flow. However, due to the vegetated condition of the unimproved areas of the site, runoff velocities are low enough to prevent rills from developing on sloped areas.

A-14 The bluff has been terraced and vegetated to reduce the erosion of the bluff face. In addition to the vegetated terraces, rock outlets have been constructed in areas prone to concentrated flow conditions due to natural drainage patterns or groundwater discharge.

A-15 Roof drains from the museum have outlets along the slopes surrounding the structure. Although a source of concentrated flow, the roof drain outlets do not appear to cause adverse impacts to the grassed slopes. The roof drains are open and free of sod buildup at the outlet points. Two outlet points, consisting of 4-inch PVC pipe, are located on the north side of the museum. A third discharge point, located on the south side of the museum, discharges water from the roof drains on the south side of the building. Additionally, some of the roof drains discharge to the lawn area without being conveyed away from the buildings with discharge pipes.

A-16 Roof drains from the communications tower outlet to cisterns located on the south side of the building. It could not be determined, through observation and interviews with museum personnel, where the discharge point for the cisterns is located. It is assumed that the cisterns tie into the discharge for the roof drains on the south side of the museum.

A-17 East of the lighthouse a four-inch diameter drain is located on the concrete apron between the lighthouse and the communications tower. Although the capacity of this type of drain is low, excess runoff produced by large rainfall events can overtop the drain and discharge to the lawn area. No signs of erosion due to this anticipated condition were evident during the site reconnaissance.

A-18 Runoff from the concrete driveway leading to the lighthouse is contained within concrete curbs and is directed to a 3-inch slotted drain (trench drain) near the admissions booth. The discharge point for the slotted drain was not visible due to heavy vegetation. Regardless, this drain is insufficient to handle the amount of runoff from the concrete driveway. Additionally, the slotted drain is clogged with dirt and debris and appears to be nonfunctional. Evidence of an existing erosion channel was observed north of the slotted drain. This erosion channel is located between the walking path that leads to the beach and the fence that surrounds the site. The channel is currently obscured by dense brush, which may aid in stabilizing the gully. It is expected that during large rainfall events the area near the admissions booth will become inundated with water. This condition can lead to concentrated flow conditions that may produce an erosion channel.

A-19 An analysis of runoff potential was conducted to assess the adequacy of the slotted drain (Sub-Appendix A-2). Runoff potential was compared to the assumed capacity of the existing drain. It was found that the slotted drain is capable of handling runoff from a ten-year rainfall event. The adequacy of the drain is contingent on the proper maintenance of the structure. Due to the condition of the drain it was assumed that the inlet capacity of the grate controls the overall capacity of the drain. Manufacturer data approximating the configuration of the in-place drain was used to estimate the capacity of the drain.

A-20 Generally, the drainage facilities at the site appear to be adequate and cause no adverse impacts to the surrounding area. Little evidence of past erosion was observed at the site. Routine maintenance of the drainage facilities and vegetation is needed to prevent occurrence of erosion in the future.

A-21 Routine maintenance of the drain is needed to prevent clogging. Replacement of the slotted drain with a structure less prone to clogging, such as a shallow catch basin, is advisable. A replacement catch basin could be outlet in the existing erosion gully. It is recommended that a rock apron or other energy dissipating devise be installed at the end of the outlet pipe to prevent additional erosion caused by concentrated flow. Maintenance of vegetation is important for continued drainage control in all areas subject to runoff. However, these drainage improvements are beyond the scope of this project since it relates to a surface runoff problem that does not adversely affect the proposed improvements.

A-22 The drainage capacity is not in need of upgrading for events greater than a 10-year return period because the combination of the 10-year event drainage capacity and the infiltration rate of the sandy soil have historically prevented any serious erosion from happening during events with return periods greater than 10 years.

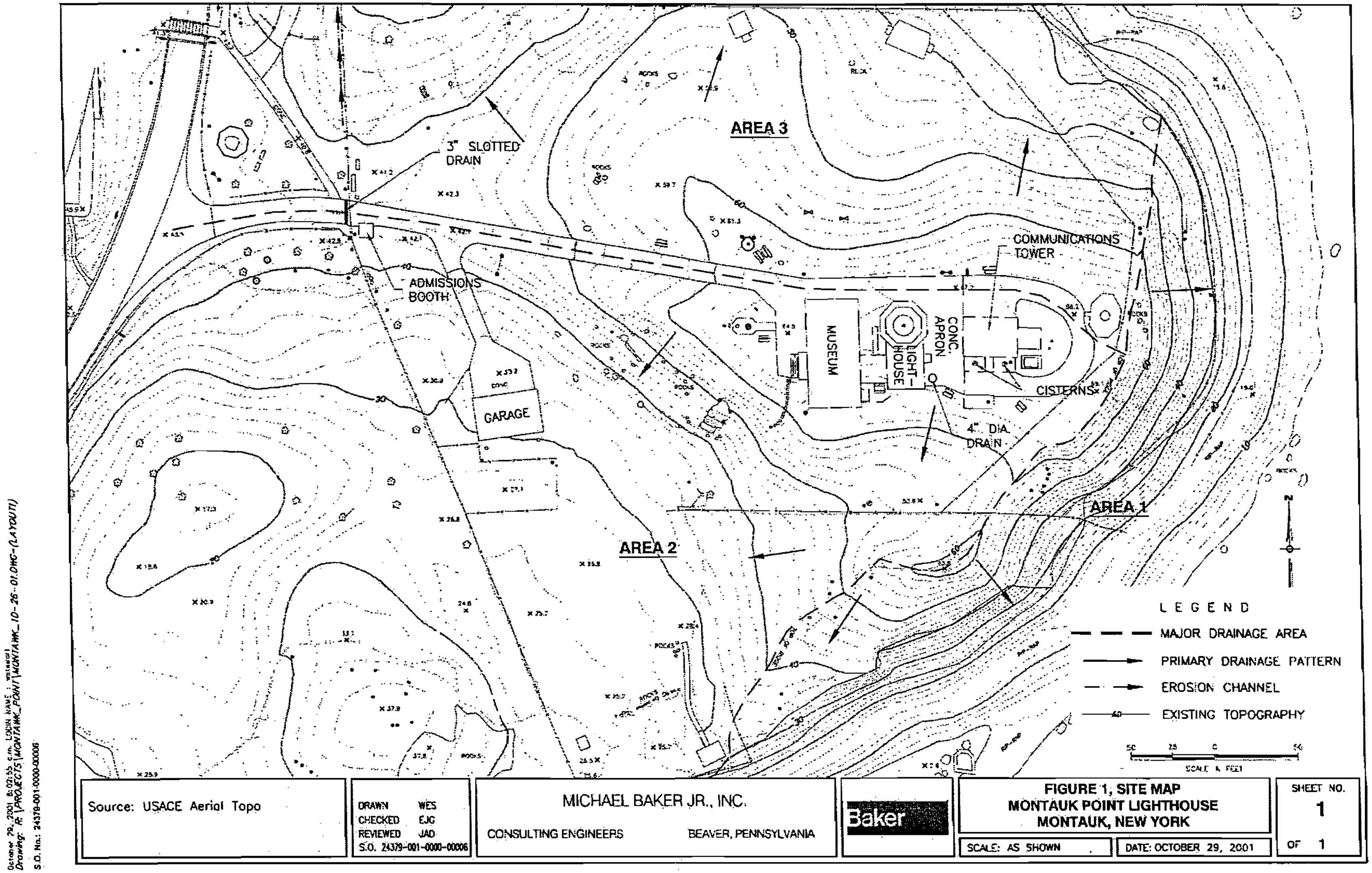


Figure A-3. Site Plans and Drainage

# 4. Geotechnical Investigation

## *4.1 Subsurface Exploration Program*

A-23 A subsurface exploration program was conducted at Montauk Point lighthouse to assess the subsurface conditions of the site. Test borings were advanced using hollow stem augers in conjunction with split spoon sampling. Standard penetration testing in accordance with ASTM D1586 was performed by recording blow counts on the split spoon sampler. Correlation between the number of blows required to drive the sampler one foot and soil strength parameters can be made.

A-24 Three test borings were proposed for the subsurface exploration at the site. Two borings, intended to be advanced to a depth of 85 feet, were located atop the bluff in the vicinity of the lighthouse. These two borings were to be advanced using continuous split spoon sampling in the top ten feet and split spoon sampling on five-foot centers to the termination depth. A third boring, on the beach area, was to be advanced to a depth of 20 feet using continuous split spoon sampling. The borings were logged with respect to blow counts and soils classified according to USCS visual-manual classification methods ASTM D2488.

A-25 Test Boring TB-1 was drilled northeast of the lighthouse between the communications tower and the bluff. The initial attempt in advancing this boring was met with refusal at 23 feet. The boring was relocated approximately 10 feet west and attempted again. The second attempted reached a depth of 31 feet before meeting refusal. Refusal was likely due to cobbles, boulders, or dense gravel. Following the second attempt it was decided to move to the second boring.

A-26 Test boring TB-2 was drilled just southeast of the lighthouse tower. The boring was advanced to at depth of 49.5 feet before encountering refusal. Refusal was defined as less than 0.1 foot of spoon advance for greater than 100 blows. The boring was then relocated approximately 15 feet west and attempted again the boring was advanced to 41 feet. The relocated boring was advanced to 41 feet.

A-27 Boring TB-3 was proposed near the toe of the bluff southwest of the lighthouse location. Six attempts were made to advance this boring to the termination depth. The large amount of cobbles and boulders contained in the beach sand prevented the boring from being advanced more than 2.5 feet in any of the attempted locations.

A-28 Test boring logs are shown in Sub-Appendix A-3 including log locations.

A-29 Laboratory testing including sieve analysis (ASTM D1140), Atterberg Limits (ASTM D4318), gradation (ASTM C136) and moisture content (ASTM D2216) were completed in a geotechnical laboratory on two sets of samples. The first set were spoon samples taken from borings TB-1 and TB-2 in the soils above the glacial till. The second set was bag samples taken during the geophysical investigation from the till exposed in eroded faces at Montauk. The test results are shown in Sub-Appendix A-3.

## *4.2 Geophysical Investigation*

A-30 To supplement the drilling program, provide a continuous profile across the bluff, and assist in estimating soil conditions beneath the revetment, NDT Engineering, Inc performed a geophysical study on November 27, 2001. The geophysical study utilized seismic refraction and electrical resistively profiling methods to provide a continuous profiling of subsurface layers including the Montauk till surface and the groundwater table.

A-31 The geophysical survey consisted of placing two seismic lines on the site and producing energy waves with a seis-gun device. The velocity of the seismic waves was recorded with a seismograph device linked to a series of geophone receivers spaced evenly along the length of the seismic line.

A-32 A copy of the NDT report with seismic results is included in Sub-Appendix A-6. It should be noted that NDT presents data relative to surface not NGVD. A plot of the seismic results converted to elevation is also in Sub-Appendix A-6.

A-33 The refraction data indicate a velocity contrast at a depth of approximately 50 feet on both lines SL-1 and SL-2. This contrast was interpreted as the interface between an upper layer of sand and gravel and a lower layer of relatively compact glacial till. The resistivity data also indicated a contrast at this depth and is interpreted as the presence of a true or perched water table near the upper surface of the till. Two thin surface layers were also revealed by the resistivity data, interpreted as relatively dry sand and gravel. Underlying this material, but above the water table, is sand and gravel with some silts and clays, containing sufficient moisture to decrease the resistivity. The lowest layer, coincident with the till layer shown by the seismic data, indicates the influence of increased water content. The top of the till is indicated by a jump in velocity from 1600 to 6000 fps indicating an increase in soil density.

A-34 The interpretation of the resistivity data at the top of the till appears to be inconsistent. Although the resistivity interface appears at the same depth for both lines and coincides with the top of the till, it is opposite in magnitude. That is, the change from the upper layer to the lower layer is from 106 ohm-meters to 90 ohm-meters on Line SL-1 and from 31 ohm-meters to 133 ohmmeters on Line SL-2.

A-35 These results confirm the basic layering scheme presented in the USACE *Reconnaissance Report: Montauk Point, New York*, 1993. That report described a three layer model, consisting of Montauk Till at the base, overlain by (lower) stratified Hempstead Gravel (composed of distinct strata of sand, silt and clay) and a surface layer (upper) Hempstead Gravel (composed of cohesionless fine sand with little silt). The Montauk Till is contained within a complex of deposits referred to as the "lower drift" in *Eastern Long Island Geology*, by Les Sirkin, 1995. The Hempstead Gravel is presumed to be a member of the "upper drift". The significance of this is that the lower drift was extensively deformed by subsequent glacial activity. All of Turtle Hill, on which the lighthouse stands, is a slump block that remained after the retreat of the glacier. Furthermore, the Hempstead gravel would be expected to contain "rip-ups" or inclusions of the lower drift, considerably complicating the stratigraphy and distorting the contact between the two drift deposits. Therefore, the somewhat uneven contact shown in the refraction results is not unexpected. The presence of “rip-ups”, seen in the beachfront cliffs on site, further complicates interpretation of all subsurface information. This may not be, then, just a simple case of two or three horizontal layers.

A-36 For stability modeling, however, the interface revealed by the refraction results, combined with a presumed water table indicated by the resistivity model, should be adequate for the current level of investigation. The soil unit parameters described under "Stability Analysis" are reasonable engineering properties based on current knowledge. The cementation noted in gathering the samples is reported as a phenomenon of "case hardening" by salt rinds upon exposure to sea spray and is not inserted into the stability model.

## 5. Erosion

### *5.1 Processes*

A-37 Bluff erosion is caused by a number of forces. At the toe of the bluff, erosional forces include:

- Astronomical and storm tides that allow waves and tidal currents to gradually erode the toe of the bluffs that were exposed with no underlying stone.
- Waves and currents that serve to mobilize and transport sediments away from the shoreline. As the bluff toe erodes and steepens, the upper bluff collapses and slides into the ocean. There is also a net loss of beach material due to littoral transport.

A-38 Erosion forces also act on the upper parts of the bluff. These sources of erosion include:

- Water collecting in upland wetlands and ponds and then seeping slowly toward the sea, both on the surface and through the soil. Seepage exits on the face of the bluffs, further loosening and moving soil down the bluff face.
- Wave spray and runup eroding the bluff face by saturating and washing away sediment.
- Rain eroding the sloped bluff face during storms by impinging upon the sediment and washing out large amounts of soil to the beach below. A lack of vegetation on the bluff face could allow the rain and surface water to act directly on the soil. Because of adequate vegetation on the bluffs at Montauk Point, this is not presently happening but could occur in the future if plant cover decreases.
- High coastal winds, which add to the erosion process. Winds will blow loose soil from the face of the bluffs and will cause trees and taller vegetation to sway back and forth, which in turn loosen the soil at their base.

### *5.2 Storm-Induced Erosion Rates*

A-39 Because of the steep slopes and high elevations associated with the bluffs at Montauk Point, storms can cause some bluff failure and erosion of soil. In the 1993 Reconnaissance Report, a site survey described erosion measurements that were made in June 1992. The survey indicated that the unprotected (beach fronted) bluff immediately to the north of the lighthouse eroded 20 feet and the unprotected (beach fronted) bluff 800 feet north of the lighthouse receded about 30 feet during the October 1991 storm.

A-40 Long term erosion rates along two cross sections using reported historic shorelines and aerial photography were analyzed (Figure A-4). The data was plotted in cross-section view (Figure A-5) and averaged as shown in Figure A-6. The historical long-term shoreline recession rate was found to be 2.2 feet per year for the beach and bluff toe and 1.2 foot per year for the top of the bluff (New York District, 1993). In the past 125 years of record, the bluff has receded 150 feet and beach has receded about 330 feet. Erosion rates since 1993 in critical areas of erosion are not pertinent due to the construction of a successfully performing revetment at this region which is curtailing shoreline retreat. It has been estimated that the average annual erosion rate for the bluff and beach is 6 cubic yards per foot per year, resulting in a total of 5,000 cubic yards of erosion per year in the critical erosion area. The historic data shows that the beach recession rate adjacent to the revetment has been reduced by about 50% since the construction of coastal structures, whereas the bluff recession has stabilized at about 25% of the pre-1945 revetment recession rate due to the terracing construction above the revetment.

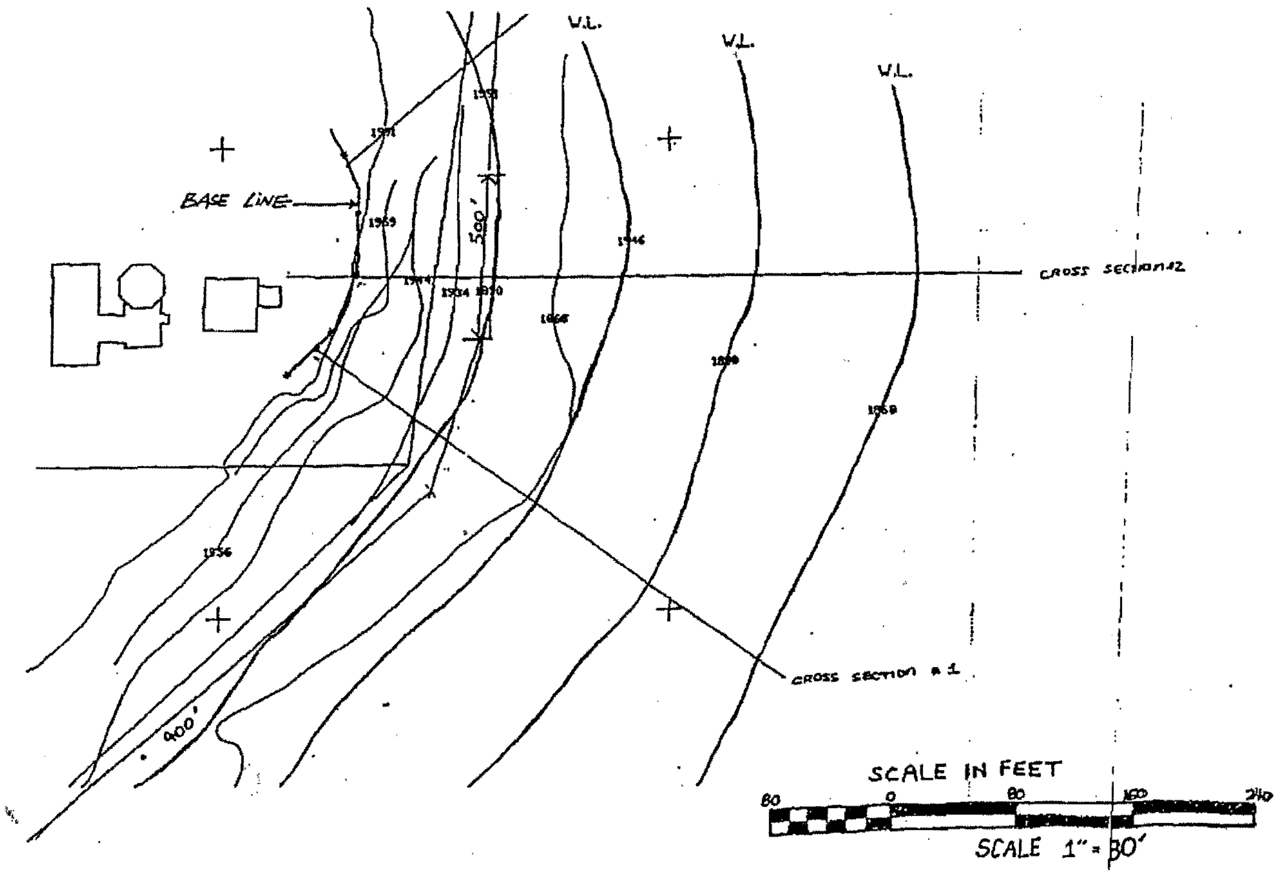
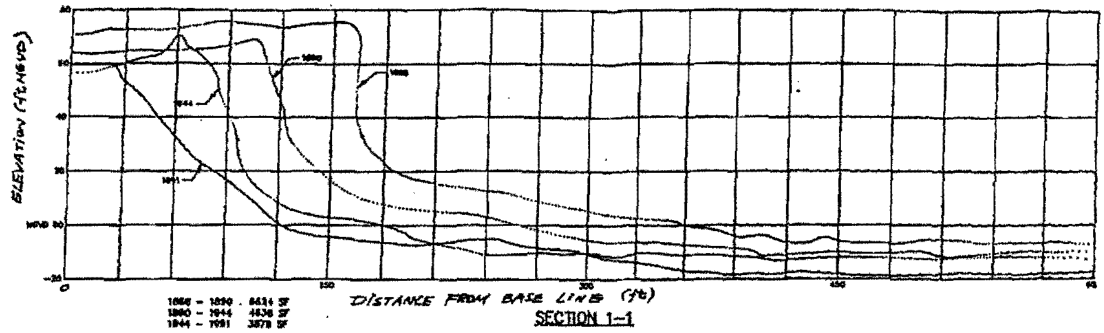
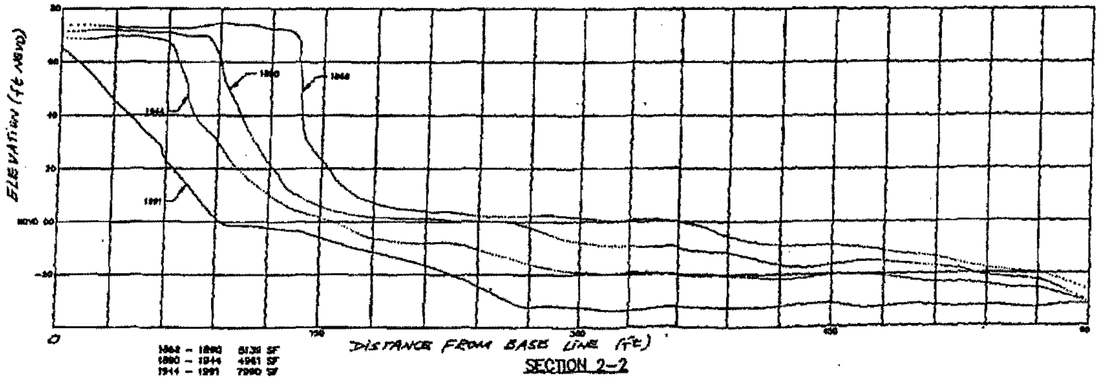


Figure A-4. Shoreline Changes 1865-1992 (New York District, 1993).



SECTION 1-1



SECTION 2-2

**Figure A-5. Shoreline Changes along cross sections shown in Figure A-4.**

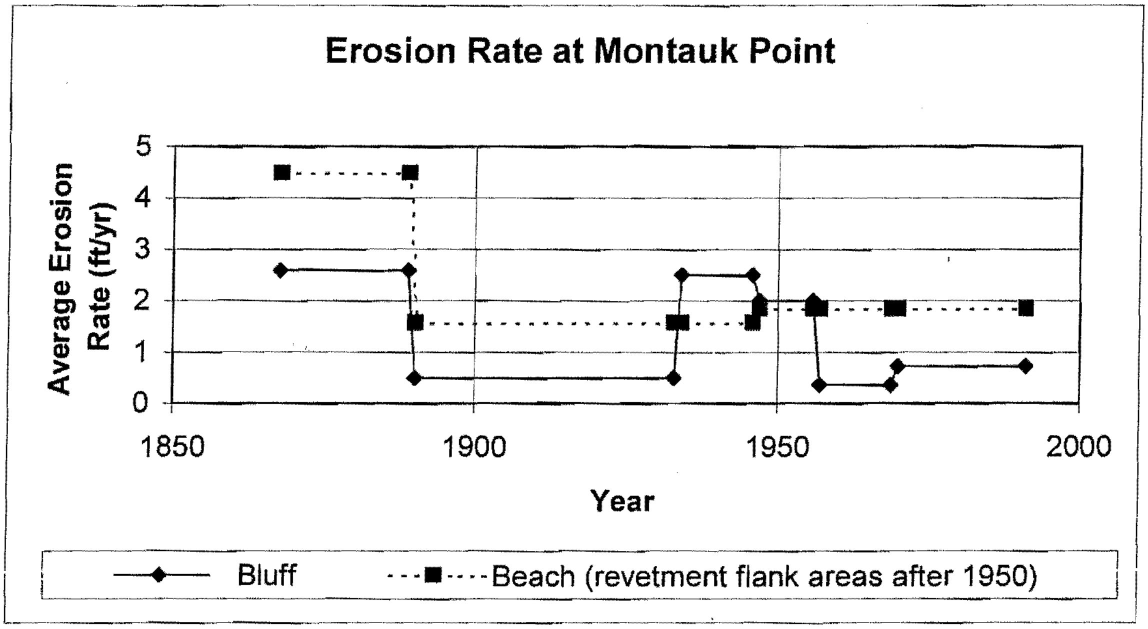


**Figure A-6. Average Erosion Rates Since 1868 at Montauk Point (New York District, 1993)**

## 6. Waves and Water Forces

### *6.1 Waves*

A-41 The basis for developing wave characteristics for Montauk Point was an excerpt from a report entitled "Fire Island to Montauk Point Reformulation Project (FIMP), Moffatt & Nichol, June, 2000". The basis of that analysis was the Army Corps of Engineers Wave Information Study, 1976-1994, with adjustments made as necessary based on "observed behavior of longshore transport" as described in a CHL Progress Report dated January 1997. The wave transformation data used by Moffatt & Nichol for the FIMP study used the offshore WIS waves at Stations 75 & 77, and the CHL-modified Stations 79 and 80 for the 1976-1994 time period.

A-42 The offshore WIS waves were transformed to the boundary of a nearshore wave model for the Montauk Point area. The model was used by CHL for shoreline change predictions in the January 1997 report. The Moffatt & Nichol report provides tables of wave height/direction distributions. The largest waves at Montauk arrive from the ESE to SSW direction range, with periods of 9-15 seconds.

A-43 The hindcasted wave peaks were tabulated in a letter to OCTI from Rebecca Brooks of the Coastal Engineering Research Center dated 14 March 1996 and are compared to measurements obtained from the NOAA website at Buoy 44025 in Table A-1. The only years of overlap between measurements and the hindcast are 1991-1993 and include some significant events.

**Table A-1. Comparison of measured and hindcasted wave characteristics**

| Event | Measured Peak Wave Height, Hmo (ft) | Hindcast Peak Wave Height, Hmo (ft) | Measured Wave Period, Tp, (s) at Peak | Hindcast Wave Period, Tp, (s) at Peak | Measured Wave Direction, Dm, (deg) at Peak | Hindcast Wave Direction, Dm, (deg) at Peak |
|---|---|---|---|---|---|---|
| 12/11/92 | 30.5 | 18.7 | 12.5 | 12.0 | 83 | 133 |
| 11/28/93 | 21.3 | 18.7 | 11.5 | 12.0 | 151 | 144 |
| 8/19/91 | 19.0 | 18.4 | 16.7 | 13.0 | 64 | 148 |
| 1/5/92 | 20.3 | 16.1 | 9.1 | 14.0 | 59 | 133 |
| 3/14/93 | 23.9 | 15.4 | 14.3 | 10.0 | 155 | 122 |
| 3/4/93 | 19.7 | 15.1 | 10.0 | 10.0 | 60 | 126 |

A-44 Table A-1 indicates that the hindcasted wave height information for storms is, on average, 5.4 feet lower than measured, the periods are 0.5 seconds lower, and the directions average about 39 degrees more toward the southeast. These differences are due to a variety of details related to the numerical modeling of waves; however, for purposes of this study it should be noted that extreme waves are, on average about 5.4 feet lower than measured with significantly higher deviation (8 to 12 feet) at the high end of the distribution. These differences, however, become less of a concern in areas such as Montauk Point where the design waves are depth-limited. Note that the hindcast reports an event on 9/9/91 that does not appear in the buoy record, and the list of extreme hindcasted heights did not show a peak from the Halloween Storm of October 1991.

A-45 Table A-2 presents extreme wave heights estimated by Moffatt & Nichol at the 32.8-ft contour irrespective of wave direction based on storm stages developed by CHL in 1996 for the Fire Island to Montauk Point Study. These stages were updated by CHL in 1998 as developed in Section 6.3 (Table A-6) and resulted in no change in the offshore wave development.

**Table A-2. Extreme storm statistics produced by the Fire Island to Montauk Reformulation Study.**

| Return Period (yrs) | Significant Wave Height (ft) at WIS Station | Storm Stage (ft, NGVD) | Max. Breaker Height (ft) (-32.8 ft NGVD contour) | Design Significant Wave Height (ft) -32.8 ft depth | Wave Period (s) |
|---|---|---|---|---|---|
| 2 | 17.13 | 4.53 | 29.12 | 16.18 | 13.00 |
| 5 | 20.57 | 5.38 | 29.79 | 16.55 | 13.15 |
| 10 | 21.03 | 5.81 | 30.12 | 16.73 | 14.48 |
| 25 | 21.56 | 6.33 | 30.53 | 16.96 | 16.13 |
| 44 | 21.99 | 6.77 | 30.87 | 17.15 | 17.10 |
| 50 | 22.11 | 6.92 | 30.99 | 17.22 | 17.37 |
| 73 | 22.49 | 7.42 | 31.38 | 17.43 | 18.11 |
| 100 | 22.83 | 7.94 | 31.78 | 17.66 | 18.66 |
| 150 | 23.26 | 8.63 | 32.32 | 17.96 | 19.44 |
| 200 | 23.62 | 9.12 | 32.70 | 18.17 | 20.04 |
| 500 | 24.70 | 10.63 | 33.88 | 18.82 | 22.23 |

A-46 For development of design waves, it was determined that the waves will be depth-limited at the location of the revetment. Three approach lines (cross-sections) were developed using the most recent (2001) topographic and hydrographic surveys over which the waves at the –32.8 ft contour were transformed (Figures A-7 and A-8). The approach lines are very similar in profile view, and wave transformation model test runs indicated that the nearshore wave characteristics are all virtually identical adjacent to the revetment. Therefore one cross-section (SE) was used for detailed wave transformation modeling. The nearshore model SBEACH was employed to perform the wave transformation because it is a one-dimensional model that includes surf zone processes that are very important in this exposed environment.

A-47 Nearshore design waves were also developed for comparative purposes using the spectral model STWAVE. Boundary wave spectra were developed using the extreme significant offshore wave heights (Col. 2, Table A-2) and wave periods (Col 7, Table A-2) along with waves from the East and South-Southeast per Table A-1. Some storm wave directions in Table A-1 are more from the East-Northeast but those data were measured at Buoy 44025 where there is more exposure to the Northeast. At Montauk, the presence of more northerly exposure is blocked, so the worst storm waves would be more from the East to South-Southeast. For each wave case, the appropriate water level was added to the water depths based on the CHL extreme storm surges presented in the Section 6.3.

A-48 Table A-3 presents the results of the calculations for significant wave heights at the toe of the present structure based on the two numerical models employed. The differences in results at the structure toe are due to slightly different representations of the bottom profile and the wave breaking processes.

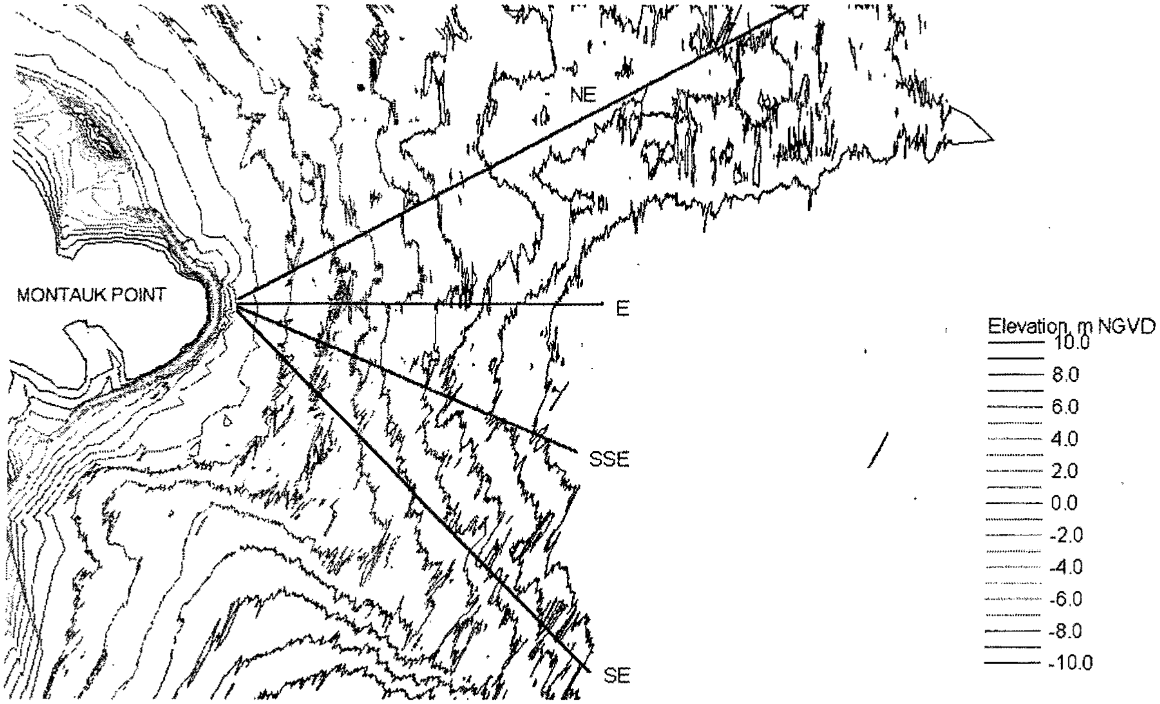


**Figure A-7. Location of Beach Profile Lines Considered for SBEACH Wave Transformation Analysis**

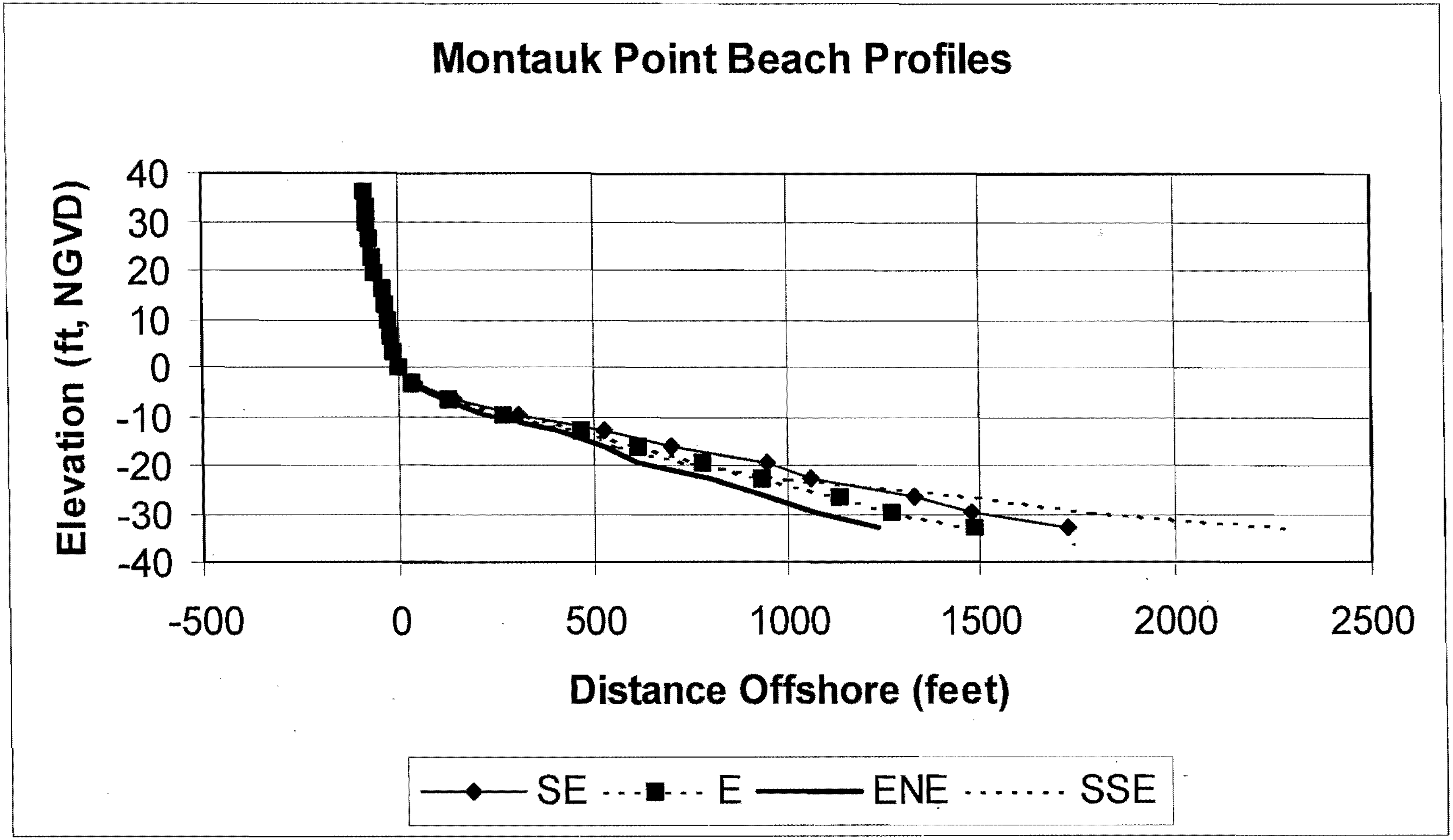


Figure A-8. Beach Profiles Considered for Wave Transformation Analysis

**Table A-3. Without-Project Storm Significant Wave Heights at Toe of Revetment**

| Storm Return Period (years) | Wave Height at Toe (ft) | Wave Height at Toe (ft) | Local Wave Direction for Storms from E | Local Wave Direction for Storms from SSE |
|---|---|---|---|---|
| | SBEACH | STWAVE | Deg from due E | Deg from due E |
| 2 | 4.36 | 3.27 | +5 | -22 |
| 5 | 4.82 | 4.75 | +5 | -27 |
| 10 | 5.05 | 5.19 | +5 | -25 |
| 25 | 5.41 | 5.86 | +5 | -26 |
| 50 | 5.77 | 6.35 | +5 | -27 |
| 72 | 6.05 | 6.55 | +5 | -27 |
| 100 | 6.40 | 6.80 | +5 | -27 |
| 500 | 7.87 | 8.77 | +5 | -29 |

(Note that wave directions are from STWAVE. At Turtle Cove, the wave directions are –12 deg for Easterly storms and –60 deg for South-Southeasterly storms)

### *6.2 Tidal Currents*

A-49 Tidal currents play a role in transporting sediment along the beach. At a location such as Montauk Point, flows pass around the point as the astronomical tidal wave enters Long Island Sound to the north and the Atlantic Ocean to the south. Currents are very strong along the toe of the revetment and likely enhance the transport of fine sediments that are winnowed from the bluff face after being mobilized and sorted by waves.

A-50 The Tidal Current Tables published by the National Ocean Service provide maximum ebb and flood tidal currents for locations 1.2 miles east and 1 mile northeast of Montauk Point. The currents are summarized in Table A-4.

**Table A-4. Published Tidal Current Information for the Montauk Point area.**

| Location | Maximum Flood Speed | Maximum Flood Direction | Maximum Ebb Speed | Maximum Ebb Direction |
|---|---|---|---|---|
| **1.2 miles east of Montauk Point** | 2.8 kt | 346 deg | 2.8 kt | 162 deg |
| 1.0 miles northeast of Montauk Point | 2.4 kt | 356 deg | 1.9 kt | 145 deg |

### *6.3 Water Levels*

A-51 Astronomical tide statistics were reviewed from two sources: the New York District's Reconnaissance Report for Montauk Point, and NOAA Benchmark Sheets for Montauk Point (Fort Pond, New York). The tidal statistics are generally within 0.31 feet for all relevant tidal datums, with the NOAA statistics higher than those used in the reconnaissance report. Using the relationship between current Mean Sea Level and NGVD29, the NOAA tidal datums were referenced to NGVD29 and are shown in Table A-5.

**Table A-5. Tidal statistics for Montauk Point.**

| Level | Elevation, MLLW feet (NAN, 1993) | Elevation, MLLW feet (NOAA, 2001) | Elevation, NGVD feet (NOAA-0.8') |
|---|---|---|---|
| Mean Higher High Water (MHHW) | 2.4 | 2.60 | 1.80 |
| Mean High Water (MHW) | 2.0 | 2.31 | 1.51 |
| Mean Sea Level (MSL) | 1.2 | 1.24 | 0.44 |
| Mean Low Water (MLW) | | 0.18 | -0.62 |
| Mean Lower Low Water (MLLW) | 0.0 | 0.00 | -0.80 |

A-52 The Coastal and Hydraulics Laboratory (CHL, 1998) refined the storm surge levels for the Fire Island to Montauk Point Reformulation Project that were presented in Table A-2. Those levels, which included a tabulation of stage-frequency values for the combination of tropical and extratropical storms, are added to the astronomical Mean Sea Level to produce total water levels shown in Table A-6. However, the storm stages from Table A-2 (plus setup) are very close to the updated values from Table A-6 and, for continuity with the offshore wave development (from Table A-2), will be used for wave design.

A-53 The highest observed water level, according to NOAA recorded water levels at Montauk, was +7.90 feet NGVD recorded in 1954. However, this water level was taken offshore and did not include the significant impact of wave setup (refer to Table A-6).

**Table A-6. Storm tide statistics developed by the Coastal and Hydraulics Laboratory**

| Return Period (years) | Combined Storm Surge (Tropical plus Extratropical), NGVD feet | Combined Storm Surge + Astronomical MSL, NGVD feet | Wave Setup (from FIMP) | Storm Surge + Wave Setup + Astronomical MSL, NGVD feet | Utilized Storm Stage * + Wave Setup NGVD feet |
|---|---|---|---|---|---|
| 5 | 4.76 | 5.20 | 2.72 | 7.92 | 8.10 |
| 10 | 5.34 | 5.78 | 2.88 | 8.66 | 8.69 |
| 25 | 6.14 | 6.58 | 3.19 | 9.77 | 9.52 |
| 50 | 6.73 | 7.17 | 3.42 | 10.59 | 10.34 |
| 100 | 7.33 | 7.77 | 3.57 | 11.34 | 11.51 |
| 500 | 10.29 | 10.73 | 3.88 | 14.61 | 14.51 |

* From Table A-2.

## 7. Scour, Runup, Overtopping, and Wave Attack Forces for Without-Project Conditions

A-54 The toe of the existing stone revetment consists of stone overlying stiff glacial till. The scour mechanisms associated with glacial till and stone are not predictable using numerical models. Therefore a physical model was built to assess failure mechanisms. In that model, both a sand and hard bottom were tested. For the sand bottom tests, sand was placed on a fixed (hard bottom) floor at the toe of the structure and was allowed to move through a 1.5-hour (prototype) storm condition. A trough 40 feet wide and 4 feet deep formed in the same indicating that sand or even small rocks could be eroded during a storm, however, this is not the general condition of the existing revetment toe. It should be noted that observations at the site and discussions with Mr. Greg Donohue indicate the firm glacial till, covered with a thin veneer of sand, is much more resistant to erosion than the sand in the physical model.

A-55 Using the offshore wave and corresponding water level conditions listed in Table A-2, wave runup levels were calculated using the method outlined in the Coastal Engineering Manual (1998) from van der Meer and Janssen (1995) for a revetment with a composite slope. An average structure slope of 1:1.25 is estimated from topographic data.

A-56 Because the revetment toe is glacial till and generally overlain with stone, it is expected that toe scour will be minimal during a given storm event but would be subject to some, but not significant, long-term scour. The runup (average of the highest 2%) due to the maximum breaking wave at the toe of the revetment ranges from 22.2 feet NGVD during a 2-year event to 32.0 feet NGVD during a 500-year event. Based on the topography (Figure A-3) data collected in 2001, it appears that the revetment is overtopped along its entire length by the upper 2% of wave runups during all storm events listed. This is consistent with observations of Greg Donohue that wave runup on the order of several feet deep occurs along the fence at the top of the revetment, which varies as low as elevation +20 feet NGVD.

**Table A-7. Without-project, maximum runup and potential for overtopping.**

| Storm Return Period (years) | Max. Water Level at Toe w/Wave Setup (ft, NGVD) | Breaking Wave Height (ft.) Based on SPM fig. 7.4 * | Max. Runup Level (ft, NGVD) | Revetment Overtopped | Revetment Threatened |
|---|---|---|---|---|---|
| 2 | 7.1 | 7.50 | 22.2 | Entirely | No |
| 5 | 8.1 | 8.37 | 23.4 | Entirely | No |
| 10 | 8.7 | 8.82 | 23.4 | Entirely | No |
| 25 | 9.5 | 9.57 | 23.7 | Entirely | Yes |
| 50 | 10.2 | 10.32 | 24.5 | Entirely | Yes |
| 100 | 11.5 | 11.38 | 26.4 | Entirely | Yes |
| 500 | 14.5 | 13.00 | 32.0 | Entirely | Yes |

* Toe at el.(–)1 ft NGVD

## 8. Slope Stability Analysis

### *8.1 General Information*

A-57 The till exposed in the wave cut bluffs surrounding Montauk Point is a well graded mixture of boulders, sand, gravel, and underlying silt preconsolidated by the weight of glacial ice (Figure A-9). It has a long stand up time for near vertical slopes but gradually erodes and fails with time under annual rainfall and runoff (Figure A-10). Under large magnitude wave actions with high storm surges, the dense till will be scoured and result in toe failures of the mid to upper bluff above the revetment for the till and overlying granular soils.

A-58 To simulate the pattern of erosion and slope failure, stability runs were accomplished of PCSTABL6 software using layer elevations from the borings and the results of the geophysical survey. Assumed soil parameters were derived from the standard penetration tests and observed composition of the till (phi = 38 degrees) and the overlying sand and gravel (phi = 30 to 36 degrees). Cohesion was assigned a value of zero due to the lack of plasticity and small percentage of clay size particles.

A-59 PCSTABL6 uses, in this application, the Bishop method of slices along with an iterative process for generation of potential failure surfaces. This iterative process identifies those critical failure circles with the lowest factors of safety.

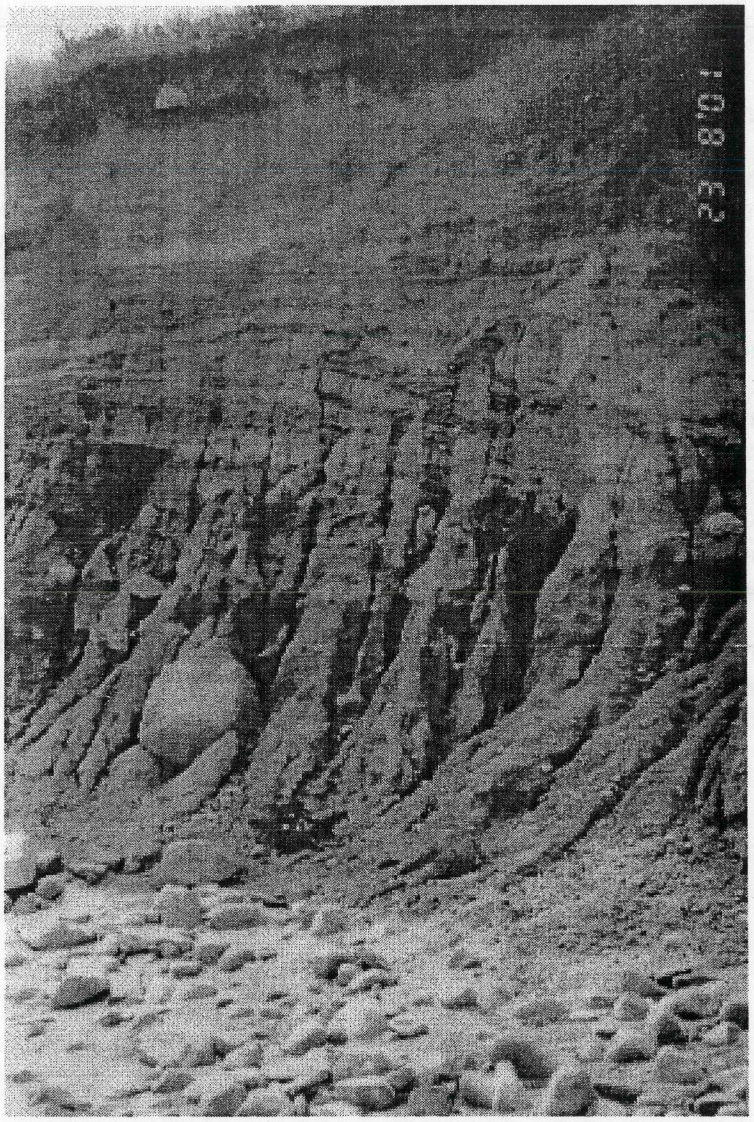


Figure A-9. Typical bluff cross-section with glacial till at Montauk Point.

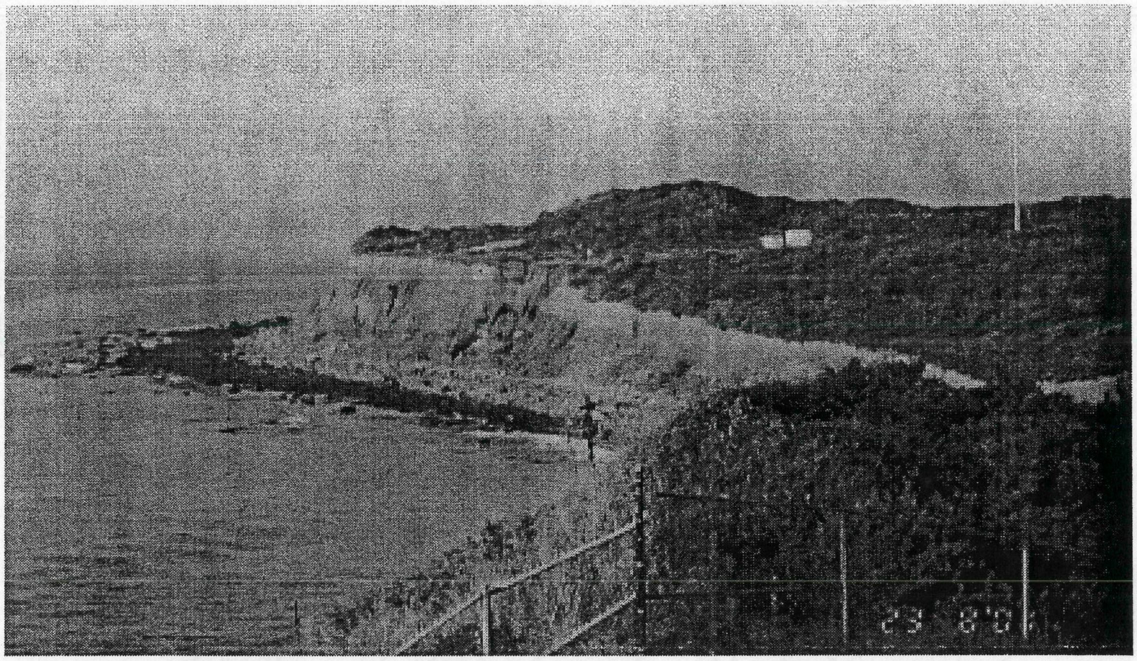


**Figure A-10. Eroded bluff south of Turtle Cove with wave-eroded toe and consequent bluff failure.**

### *8.2 Existing Conditions*

A-60 The stability analysis of existing conditions were performed on the three cross sections located on Figure A-11 and shown on Figures A-12 to A-14. These sections represent the steepest slopes that are near and surrounding the lighthouse. Section A-A is the steepest of the three sections. The stability analysis on each section indicates that the slopes and the present conditions are at equilibrium with little or no safety margin. This is indicated by a Factor of Safety (FS) of approximately 1.0 for Sections A-A and B-B. The upper parts of the slopes, which are near the angle of repose for the granular soils, show the highest potential for failure if existing conditions are even slightly disturbed. At Section A-A (Figure A-12), the upper slopes would consistently fail if terracing and vegetation stabilization measures, maintained by the Montauk Point Historical Society, were not practiced.

A-61 However, a much larger failure surface and volume of material starting at the shoreline also has a low FS (1.094) in section A-A and can fail with external disturbance, however is unlikely to occur due to the very dense nature of the soils near the toe of the bluff below el. +15 ft. NGVD +/-.

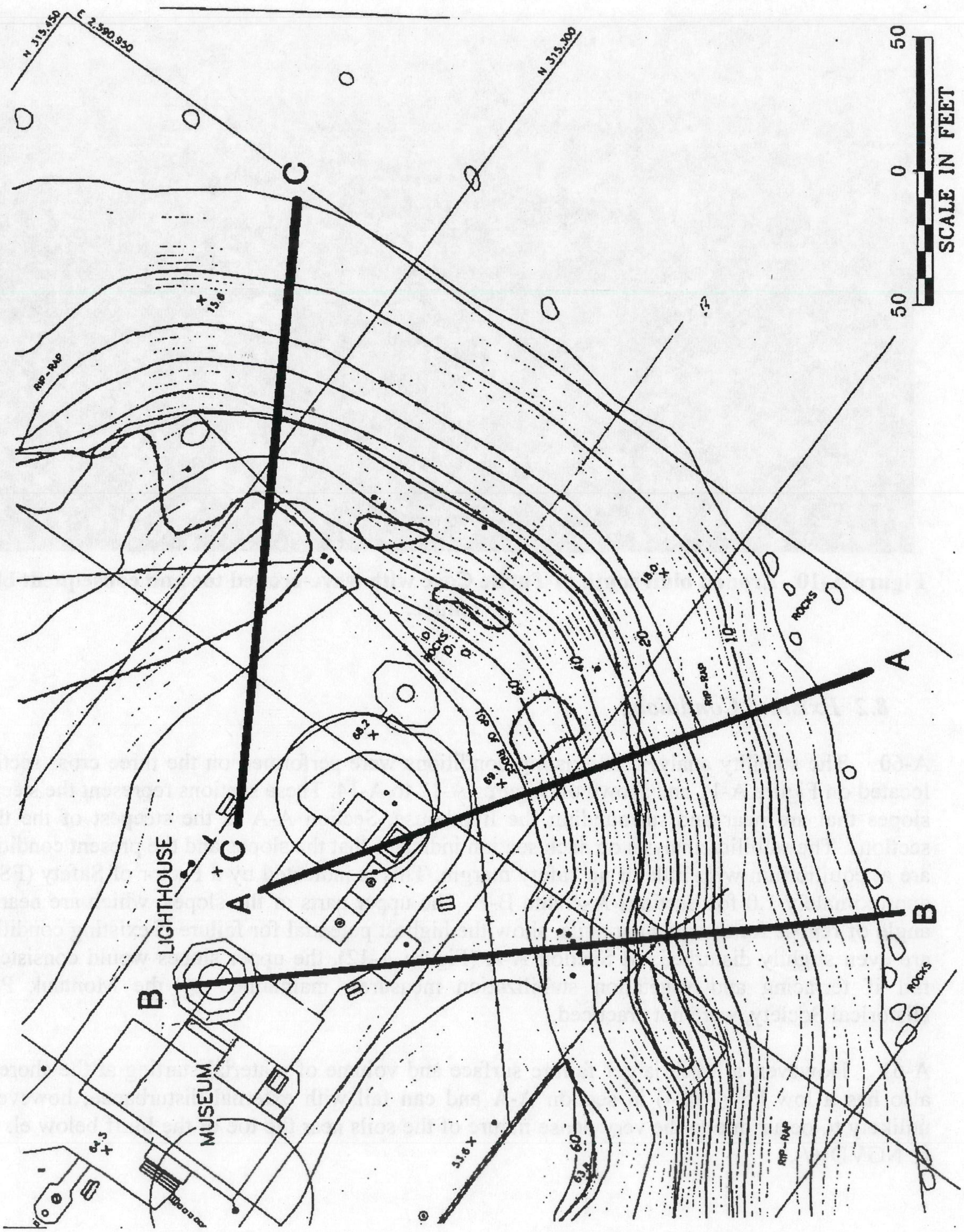
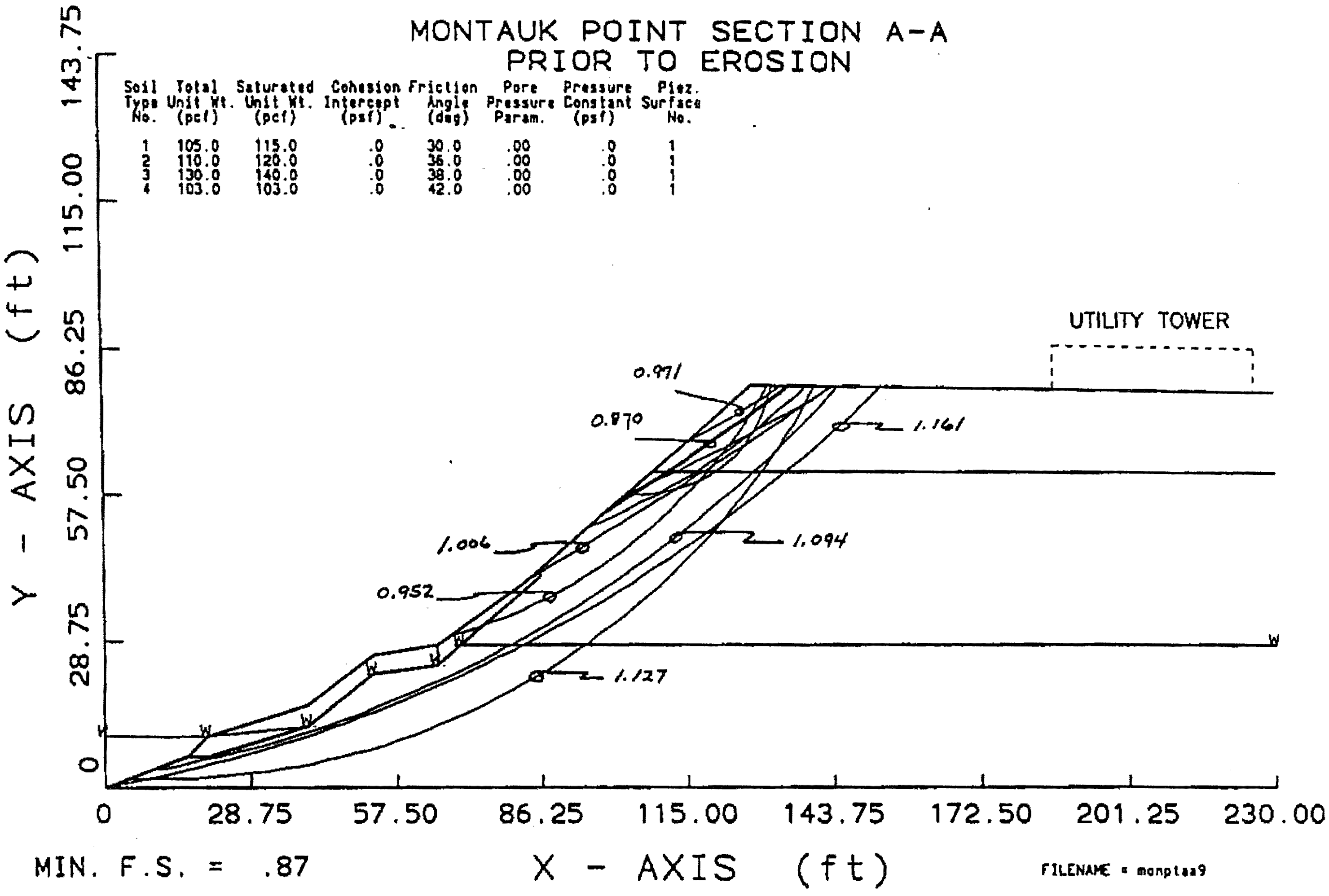
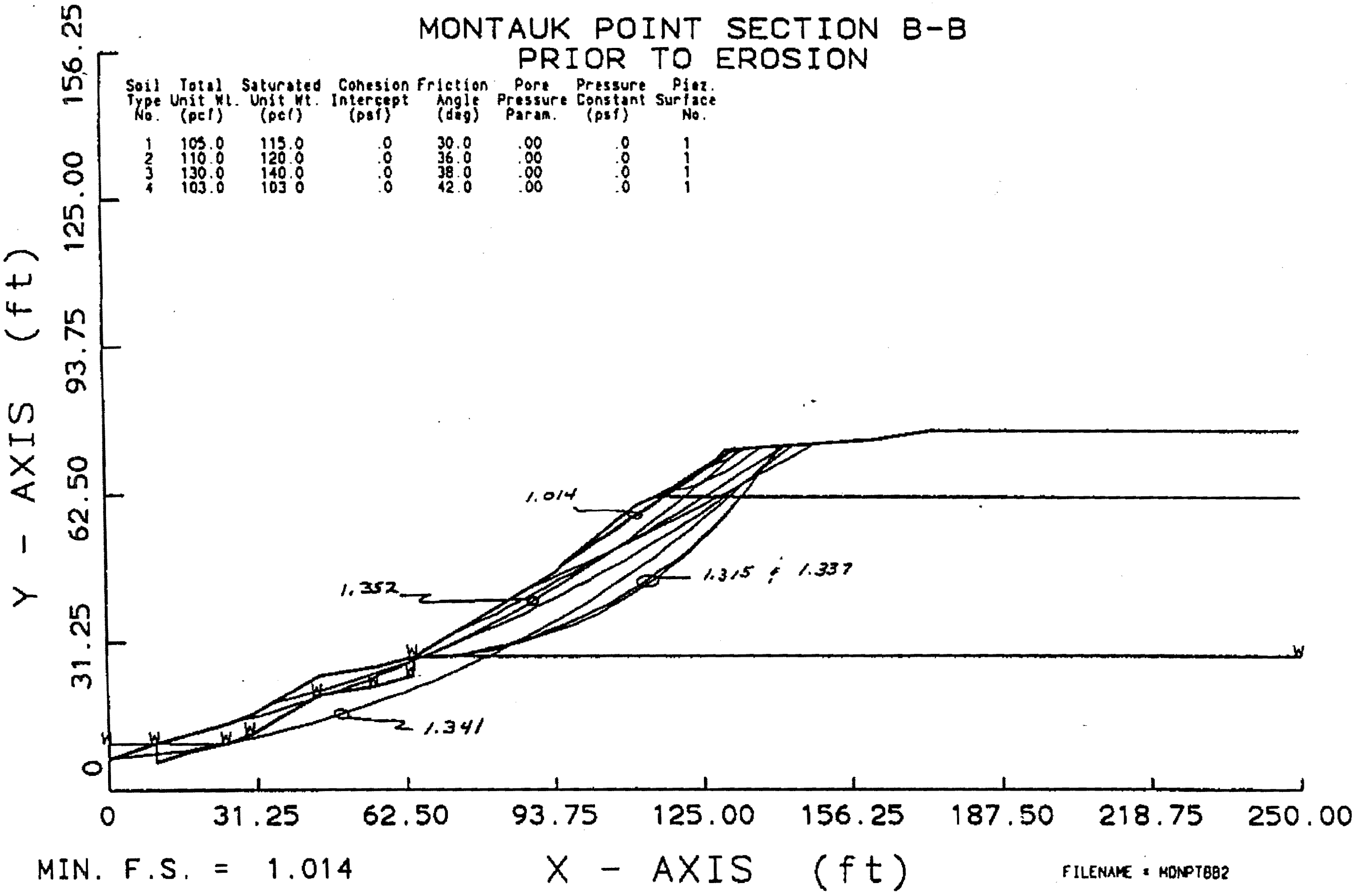


Figure A-11. Locations of cross-sections for slope stability modeling.



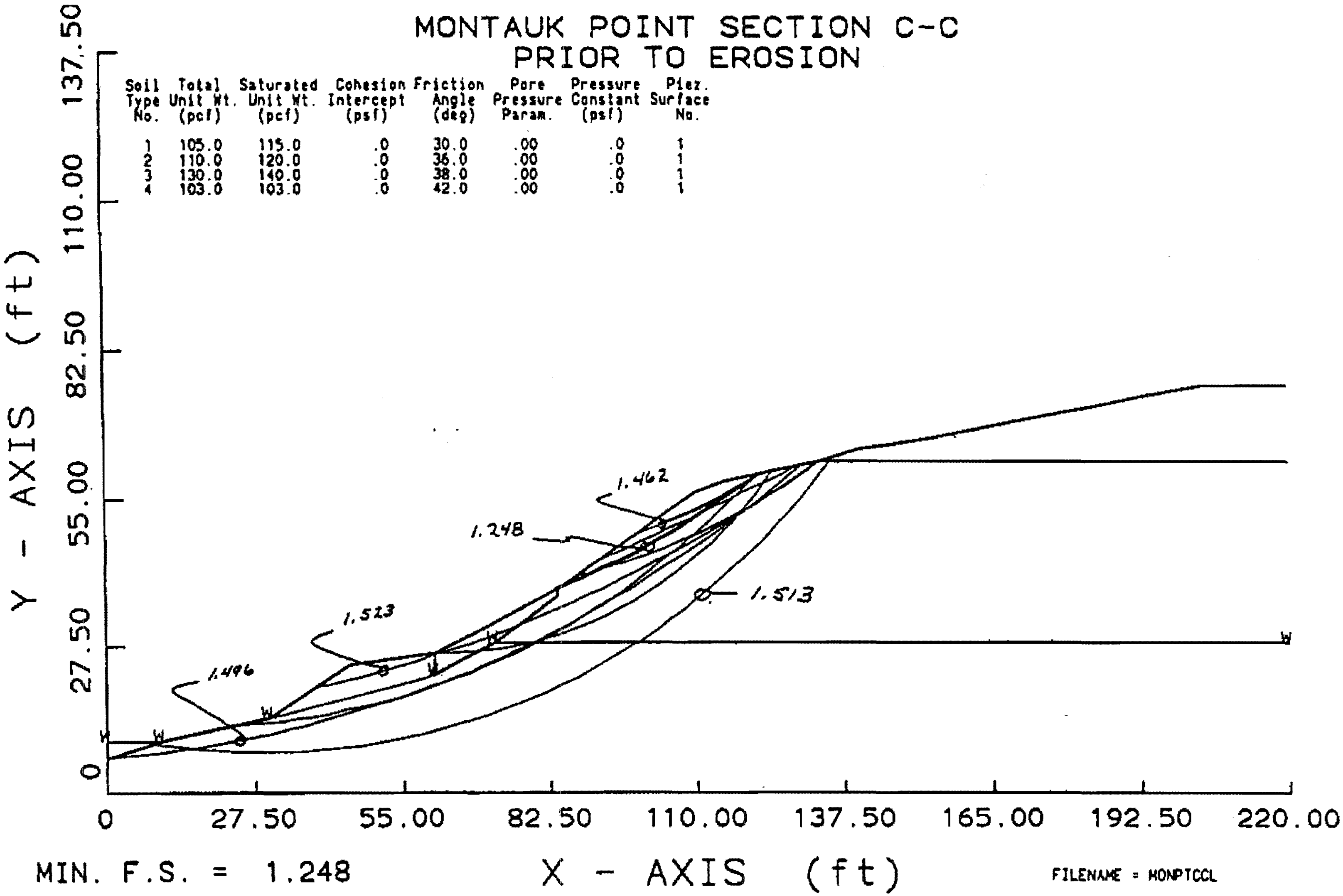
| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| 1 | 105.0 | 115.0 | .0 | 30.0 | .00 | .0 | 1 |
| 2 | 110.0 | 120.0 | .0 | 36.0 | .00 | .0 | 1 |
| 3 | 130.0 | 140.0 | .0 | 38.0 | .00 | .0 | 1 |
| 4 | 103.0 | 103.0 | .0 | 42.0 | .00 | .0 | 1 |

Figure A-12. Slope stability model results for existing conditions, Section A-A.



| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| 1 | 105.0 | 115.0 | .0 | 30.0 | .00 | .0 | 1 |
| 2 | 110.0 | 120.0 | .0 | 36.0 | .00 | .0 | 1 |
| 3 | 130.0 | 140.0 | .0 | 38.0 | .00 | .0 | 1 |
| 4 | 103.0 | 103 0 | .0 | 42.0 | .00 | .0 | 1 |

Figure A-13. Slope stability model results for existing conditions, Section B-B.



| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| 1 | 105.0 | 115.0 | .0 | 30.0 | .00 | .0 | 1 |
| 2 | 110.0 | 120.0 | .0 | 36.0 | .00 | .0 | 1 |
| 3 | 130.0 | 140.0 | .0 | 38.0 | .00 | .0 | 1 |
| 4 | 103.0 | 103.0 | .0 | 42.0 | .00 | .0 | 1 |

Figure A-14. Slope stability model results for existing conditions, Section C-C

## 9. Without-Project Future Conditions

A-62 Three possible failure modes are considered in determining the remaining life of the existing shore protection structure. The failure modes are: toe erosion at the base of the revetment that would lead to toe stone instability and revetment collapse; wave action dislodging lighter than required armor stones prevalent and interspersed on the revetment surface; and wave runup and overtopping that would dislodge the revetment crest stones and lead to revetment collapse. The exact elevation of the toe of the present structure is not well defined, but is estimated from photographs such as Figure A-1-8 in Sub-Appendix A-1 and spot elevations in recent topographic surveys obtained by the New York District in 2001. It is noted that failure of the revetment would be followed by bluff failure, which would then threaten the lighthouse. Revetment failure alone will not cause the immediate catastrophic failure of the lighthouse, since the slope stability of the bluff after revetment failure still has a factor of safety greater than > 1.0.

A-63 The recession of the bottom profile for the beach front flanking the revetment is less than the maximum (due to a differing shoreline orientation) based on historical recession rates below the water line. A corresponding sea level rise (0.01 ft/yr) and profile horizontal recession (approximately 1 ft/yr historically, but which will diminish in the future) for the beachfront flanking the revetment is included. For the revetted area, the recession rates are assumed to be negligible due to the presence of the revetment (recession of the upper part of the profile is assumed, based on performance, to be arrested by vegetative shore protection measures). In addition, erosion immediately adjacent to the revetment will diminish below the historical 1 ft./yr rate due to the sheltering effect of the existing revetment, and thus, will negate flanking potential.

A-64 Three modes of failure can occur individually or in combination. Because of the uncertainty in predicting the impacts of these three modes of failure (i.e. stone displacement from wave impacts due to undersized stone, erosion of the toe foundation soil (hardened till), or displacement of stone on the upper part of the revetment due to wave runup and overtopping) a physical model was performed. The primary mechanism expected to cause bluff failure is the effect of waves, including direct impact and runup/overtopping, on the armor stone. Large-scale slope failure (i.e. that initiated at the shoreline or structure toe) is not expected to occur due to the presence of glacial till and large amounts of stone overlying the soils.

### *9.1 Failure of Armor Layer Due to Wave Forces*

A-65 When the water level is elevated by both astronomical tide and storm surge, waves impact the armor stone. Although the present armor stone is resistant to smaller waves, large waves can be expected to damage and dislodge the armor, resulting in the failure of the structure. The existing structure is not a recommended type of cross-section, since it only consists of one layer of tightly interlocked stones of varying size, and has no buried toe. Because of the associated uncertainty in stone performance under storm conditions, a physical model was constructed to replicate the existing revetment as closely as possible in terms of variance of stone size and degree of interlocking. The model tested storm waves ranging from the 2-year return period to the 100-year return period range and very minor displacement of armor stone on the revetment slope was observed. The model included areas of undersized stone interlocked among larger armor units and no failure was observed for the range of waves tested. Thus, this failure mode is not considered pertinent.

### *9.2 Failure of the Structure Toe Due to Erosion*

A-66 The physical model was not able to exactly replicate the condition of the dense foundation soil (glacial till of widely-varying gradation overlain with a thin veneer of sand) at the revetment toe, but these conditions in the model were simulated with a hardened bottom. In addition, based on eyewitness accounts from continuous observation over extended periods of time, including severe storms, both storm-induced and long-term toe erosion are considered to be relatively minor in terms of toe stone instability. Although some long-term erosion does occur in the revetted area, it is difficult to compute or otherwise quantify realistic rates. Maintenance practices will tend to protect the base of the structure, and the predominance of dense, glacial till overlain by stone will significantly retard toe erosion. Therefore, the toe erosion mode of failure is not considered pertinent.

### *9.3 Failure Due to Overtopping.*

A-67 Additional stability analyses were performed to model the reduction of the height of the upper revetment due to wave overtopping and the subsequent wave scour of the underlying soils of a failed revetment. These analyses were performed for three cases; the existing revetment height to an elevation of +18 feet MSL, a revetment height of +14 feet MSL after lowering by initial upper revetment failure, and the failed revetment with a height of +10 feet MSL. These analyses, combined with the physical model results that show upper revetment failure to below elevation +10 MSL, indicated that under the latter conditions, the top of the slope would recede landward a distance of approximately 26 feet subsequent to failure of the revetment between elevations +10 feet MSL and +18 feet MSL. The slope profile changes are presented on Figure A-15.

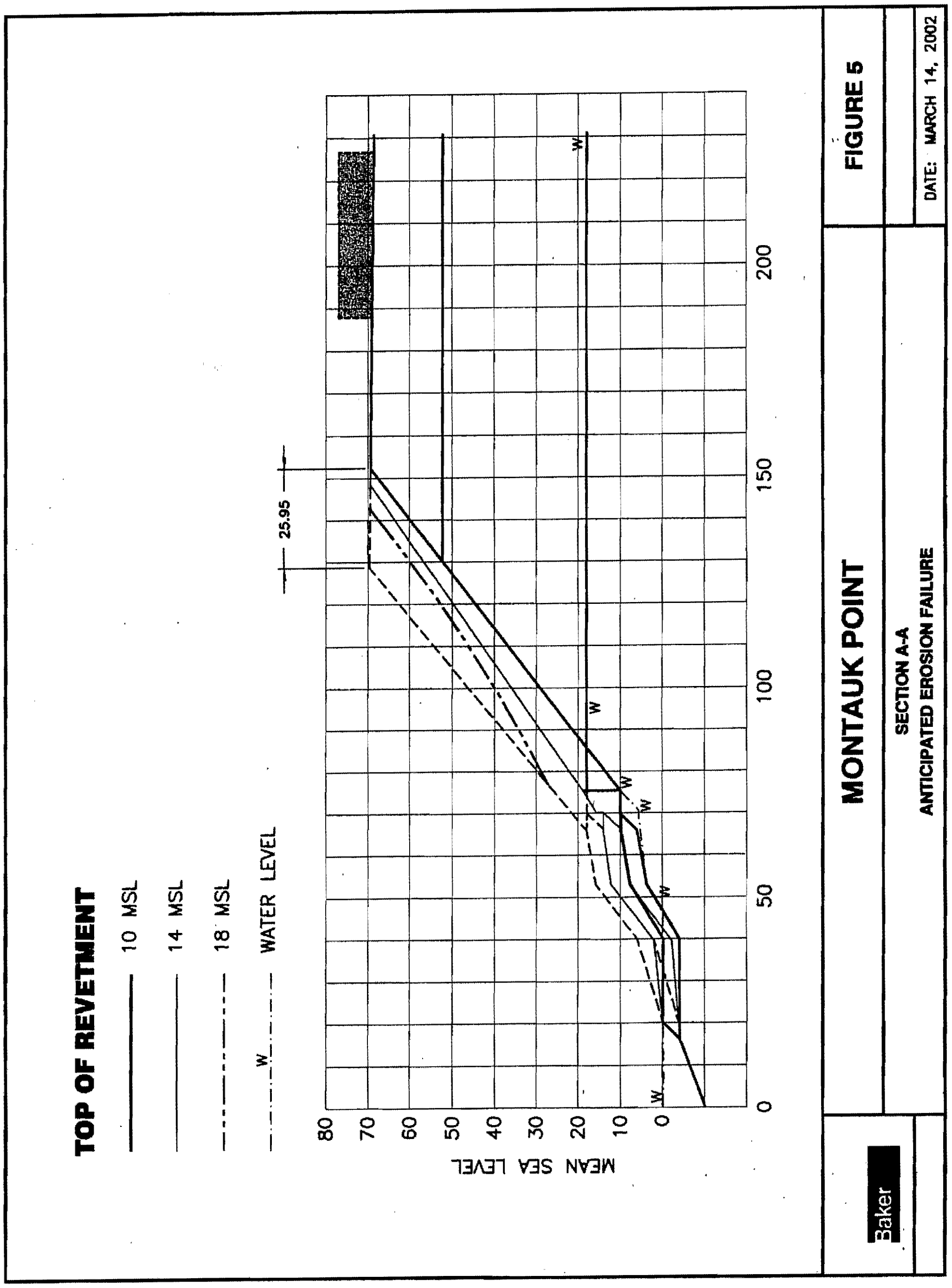


Figure A-15. Slope stability for without-project future conditions.

A-68 The recession of the glacial till behind the failed revetment will be wave eroded, whereby the till slumps, the upper slope slumps, and the cycle is repeated over several years time. The eventual result is the migration of the Turtle Hill bluff until the slope face reaches and undermines the utility tower, lighthouse, and associated structures. Based upon historic recession rates, the upper bluff toe (at +10 ft NGVD) will recede the approximate 10 feet necessary to cause bluff failure, to directly threaten the lighthouse structures, over a period of 8-10 years after the upper sections (above el. +10 feet MSL) of the revetment are displaced.

### *9.4 Findings*

A-69 The physical model was tested for wave runup and overtopping of the revetment for an approximately 2-year return period storm through an approximately 100-year return period storm. Based on the results of the model test, it was determined that stone displacement, from overtopping of the revetment crest, occurs between a 10-year return period storm and a 20-year return period storm, say a 15-year return period storm. This result is substantiated by a semi-empirical analytical method to determine damage threshold exceedance from overtopping (Coastal Engineering Manual 1997 Part VI).

A-70 Since the last storm experience at Montauk Point of this significance was in 1993, there is a likelihood (60% probability) that this 15-year return period storm will occur by the year 2006 to cause significant damage (at least 25% damage level) to the revetment itself. Once the upper sections of the revetment are displaced in the year 2006, the foundation soil underlying the displaced stone will become exposed and subject to subsequent erosion.

A-71 To determine the extent of erosion of the toe of the upper bluff above the damaged revetment that would cause significant bluff failure to threaten the stability of the lighthouse structure, a slope stability analysis was performed. The results of this analysis determined that for significant bluff failure, the damaged crest elevation of the revetment should degrade to approximately +10' NGVD (indicated by the physical model from a 10 year return period to a 20 year return period storm) and the upper bluff toe at that elevation recede horizontally approximately 10 feet. This should cause about 30 feet of loss of the bluff crest and immediately threaten the lighthouse facility at the most critical area to the southeast of the structure.

A-72 The period of time estimated for this condition to occur, subsequent to 2006, is an additional 8-10 years which results from long-term erosion at the upper bluff toe (elevation +10 feet NGVD) with no significant storm occurrence, or from an approximately 10-year return period storm which has a likelihood of occurrence (60% probability) by the year 2015.

A-73 Design revetment concepts for future protection of the area must also consider appropriate transition and tapers to preclude any erosion-induced discontinuities.

A-74 For design of storm protection alternatives, Table A-8 provides water levels and wave characteristics. The design breaking wave height listed in Table A-8 is calculated using Figure 7-4 (SPM 1984) at a bottom elevation of –4' NGVD at the improved revetment toe. The present structure toe is at a bottom elevation of about –1' NGVD, making the design breaking waves slightly lower than those listed in the table.

## Table A-8. Water Level and Wave Characteristics

| Return Period (yrs) | Offshore Significant Wave Height (ft) | Storm Stage (ft, NGVD) | Storm Stage plus Wave Setup (ft, NGVD) | Design Breaking Wave Height (ft) at Revetment Toe (ft) (-4' NGVD) | Wave Period (s) |
|---|---|---|---|---|---|
| 2 | 17.13 | 4.53 | 7.07 | 10.1 | 13.00 |
| 5 | 20.57 | 5.38 | 8.10 | 10.9 | 13.15 |
| 10 | 21.03 | 5.81 | 8.69 | 11.4 | 14.48 |
| 25 | 21.56 | 6.33 | 9.52 | 12.2 | 16.13 |
| 44 | 21.99 | 6.77 | 10.16 | 12.8 | 17.10 |
| 50 | 22.11 | 6.92 | 10.34 | 12.9 | 17.37 |
| 73 | 22.49 | 7.42 | 10.94 | 13.4 | 18.11 |
| 100 | 22.83 | 7.94 | 11.51 | 13.9 | 18.66 |
| 150 | 23.26 | 8.63 | 12.31 | 14.6 | 19.44 |
| 200 | 23.62 | 9.12 | 12.86 | 15.1 | 20.04 |
| 500 | 24.70 | 10.63 | 14.51 | 16.5 | 22.23 |

# 10. Development of Alternatives

## *10.1 General Approach*

A-75 Alternatives that are feasible approaches to storm protection and shoreline stabilization need to address both present and future needs. The present need is to eliminate the threat of erosion and to provide acceptable levels of protection from the impacts of wave attack and storm recession.

General requirements include:

- Meet the needs and concerns of the public within the study area
- Respond to the public desires and preferences
- Be flexible to accommodate changing economic, social and environmental patterns and changing technologies
- Integrate with and be complementary to other related programs in the study area
- Implement with respect to financial and institutional capabilities and public consensus
- Conform with USACE environmental operating principles

Specific requirements include:

- Protect Montauk Point and vicinity, including the historic lighthouse and associated facilities from erosion, environmental degradation, and coastal storm damage
- Reduce the threat of future bluff instability including those due to wave attack and erosion from ocean impacts
- Provide a cost effective approach for bluff protection
- Prevent the aggravation of erosion in adjacent areas
- Maintain proper stone interlocking for bluff protection

A-76 There are a variety of constraints on a possible solution, thereby limiting the number of feasible solutions.

Technical constraints include:

- Plans must represent sound, safe and acceptable engineering solutions taking into account the overall littoral system effects
- Plans must be in compliance with Corps of Engineers regulations
- Plans must be realistic and state-of-the-art while not relying on future research
- Plans must provide bluff protection
- Plans must provide features that minimize the effect of shoreline erosion processes

Economic constraints include:

- Plans must be efficient, make optimal use of resources and not adversely affect other economic systems
- Average annual benefits must exceed the average annual costs

Environmental constraints include:

- Plans must avoid and minimize environmental impacts to the maximum degree practicable
- Plans must consider mitigation or compensation for a potential impact when identified

Regional and Social constraints include:

- All reasonable opportunities for development within the project scope must be weighed, with consideration of state and local interests
- The needs of other regions must be considered and one area cannot be favored to the detriment of another
- Plans must maintain existing cultural resources to the maximum degree possible, and produce the least possible disturbance to the bluff
- Plans must maintain or improve recreational fishing and surfing experiences

Institutional Constraints include:

- Plans must be consistent with existing federal, state and local laws
- Plans must be locally supported and signed by local authorities in the form of a local cooperation agreement, guarantee for all items of local cooperation including possible cost sharing
- Local interests must agree to provide public access to the beach in accordance with Federal and state guidelines and laws
- The plan must be fair and find overall support in the region and state.

A-77 Criteria for evaluating preliminary alternatives will include appropriateness to site conditions, compliance with New York State Coastal Zone Management criteria, effectiveness of protection, impacts on environmental and cultural resources, and annual cost (including interest during construction and maintenance).

## *10.2 Alternatives*

### PRELIMINARY ALTERNATIVE 1 – Repair Structure On As-Needed Basis (No Action Plan)

A-78 The No-Action Plan (no Federal action through the Corps of Engineers) would consist of a continuation of the Without-Project condition. If allowed to occur, progressive instability of the bluff would result in the irrecoverable loss of the Turtle Hill Plateau, the lighthouse, and its associated structures, along with archaeological resources.

A-79 Efforts by the Montauk Historical Society to control the erosion are expected to continue, but in the absence of a comprehensive shore protection project, experience shows that their efforts have not solved and would not solve the long-term problem of significant damage to the existing structure complex with associated threat to the lighthouse from large storm events over an extended period of time (e.g. 50 years). It is estimated that emergency repair costs will continue to be required and there would also be costs to investigate and curate historically significant resources in threatened bluff areas. However, the emergency repair over an extended period of time is not anticipated to provide adequate protection to the lighthouse and bluff, and will therefore leave them vulnerable to failure from storm damage due to expected design exceedance of these limited actions.

A-80 If the lighthouse was lost, the Coast Guard would have to construct a new navigation aid to replace the lighthouse. While the No Action plan fails to meet objectives and needs of the project area, it does provide the basis from which project benefits are measured.

A-81 It is estimated that the present revetment structure is susceptible to damage from a greater than 10-year storm frequency event but periodic damage will occur during lesser events. It is assumed that the Montauk Historical Society will do repairs as they are needed, but ultimately will not be able to keep the structure intact without efforts to upgrade the structure design.

### PRELIMINARY ALTERNATIVE 2 – Stone Revetment

A-82 A riprap stone revetment was developed for long term erosion control as shown in Figure A-16. The plan consists of 840 feet of revetment protection. The protection covers the most vulnerable bluff area that would directly endanger the lighthouse complex due to bluff failure without the project.

A-83 The revetment was designed based on the Engineering Manual 1110-2-1614 "Design of Coastal Revetments, Seawalls and Bulkheads." A heavily embedded toe shall be employed to stand against breaking waves at the toe of the structure. As shown in Figure A-16, the revetment section features a 40' wide crest at +25' NGVD, a 1V:2H side slope, and 12.6-ton quarrystone armor units extending from the crest down to the embedded toe. Three layers of 4-5 ton armor units are used to construct the splash apron. Filter cloth and sublayers are specified in accordance with standard Corps of Engineers design procedures. The estimated first cost for the stone revetment is $14,843,000, including 20% contingency, engineering and design, and construction management, as shown in Table A-9.

A-84 Revetments are a proven method of shore protection in this area and have a record of acceptance by state and local authorities. Revetment alternatives such as this can utilize much of the stone to be removed, already on site in the existing structure, thus making good use of existing resources. The cross section can be slightly modified to allow access for fishermen to areas close to the water. It is not expected that a new revetment will change present surfing conditions in any way.

## PRELIMINARY ALTERNATIVE 3 – Offshore Segmented Breakwater with Beach Fill

A-85 The purpose of an offshore breakwater is to reduce the storm wave height offshore of the revetment toe, thus reducing the wave impact force and runup elevation on the bluff. Shoreline recession would be reduced with the construction of an offshore breakwater. The existing revetment and terracing of the upper bluff would provide a reasonable level of protection with the offshore breakwaters in place.

A-86 As shown in Figure A-17, the breakwater would be a rubble mound structure located about 200 feet offshore at about the –8 ft NGVD contour. Beach fill would be placed from about the MHWL out to the breakwaters to provide additional toe protection to the existing revetment. Approximately 200,000 cubic yards of beach fill would be placed to a berm elevation of +11 ft. NGVD. The required renourishment quantity is estimated at 100,000 cubic yards, every 3 years. The sand is assumed to be acquired via a 4,000 cubic yard hopper dredge from Borrow Area IV, seaward of Shinnecock Inlet, as identified in the Fire Island to Montauk Point Reformulation Study. Three separate structures would be built, two being 300 feet in length and one 500 feet in length, with the longest facing the more severe southeasterly direction. The openings between the structures would allow some tidal circulation but also may induce some dangerous currents concentrated in the gaps.

A-87 The breakwater design is based on present Corps guidelines. As shown in Figure A-17, the crest is placed at +7.5 ft. NGVD, which is the 73-year water level without wave setup. The armor size is 17.5 tons, placed in two layers on a single layer of 1.75 ton quarrystone underlayer and 2 layers of 100 pound filter stone. The entire structure is built on filter cloth. The estimated first cost for the offshore breakwater with beach fill is $14,841,000, including a 20% contingency, engineering and design, and construction management, as shown in Table A-10.

A-88 Breakwaters will be difficult to construct due to difficult site access and in-water construction. Tidal currents are significant and breaking waves arrive from almost all onshore directions. The breakwater requires very large stone and a substantial width and elevation to be effective. The gaps between the breakwaters may induce significant currents that could increase scour to the bottom, potentially compromising the foundation of the breakwaters sometime in the future. The high currents may also cause a safety hazard to swimmers, surfers and fishermen who wade in the area. Higher surges with waves that submerge the +11 ft berm will not be prevented from damaging the revetment. Finally, the surfing activity in the area may be affected by changed reflected wave characteristics.

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MONTAUK POINT
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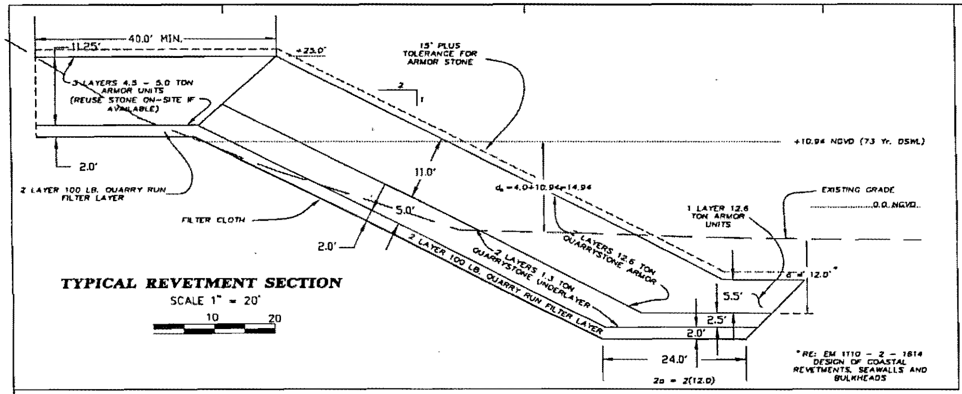
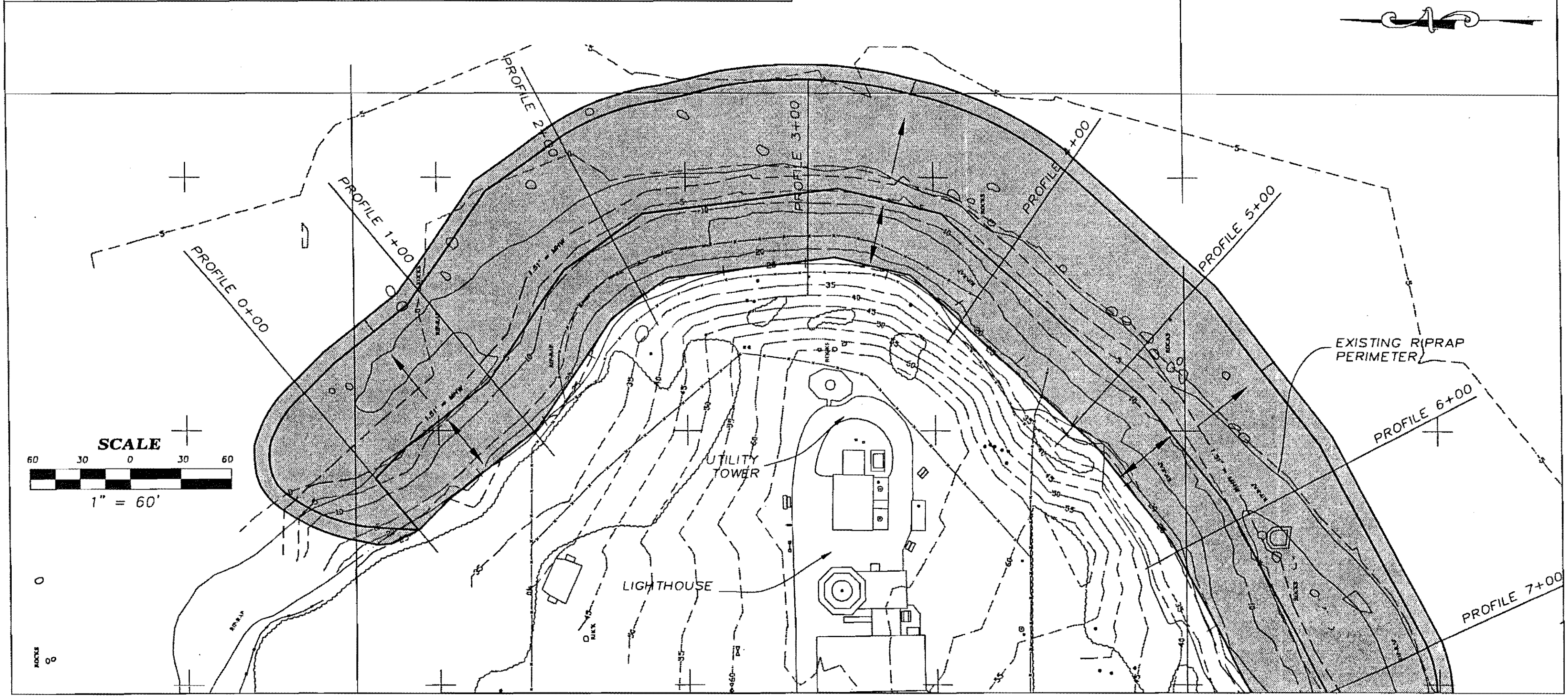
FEASIBILITY STUDY
STONE REVETMENT
ALTERNATIVE PLAN 2

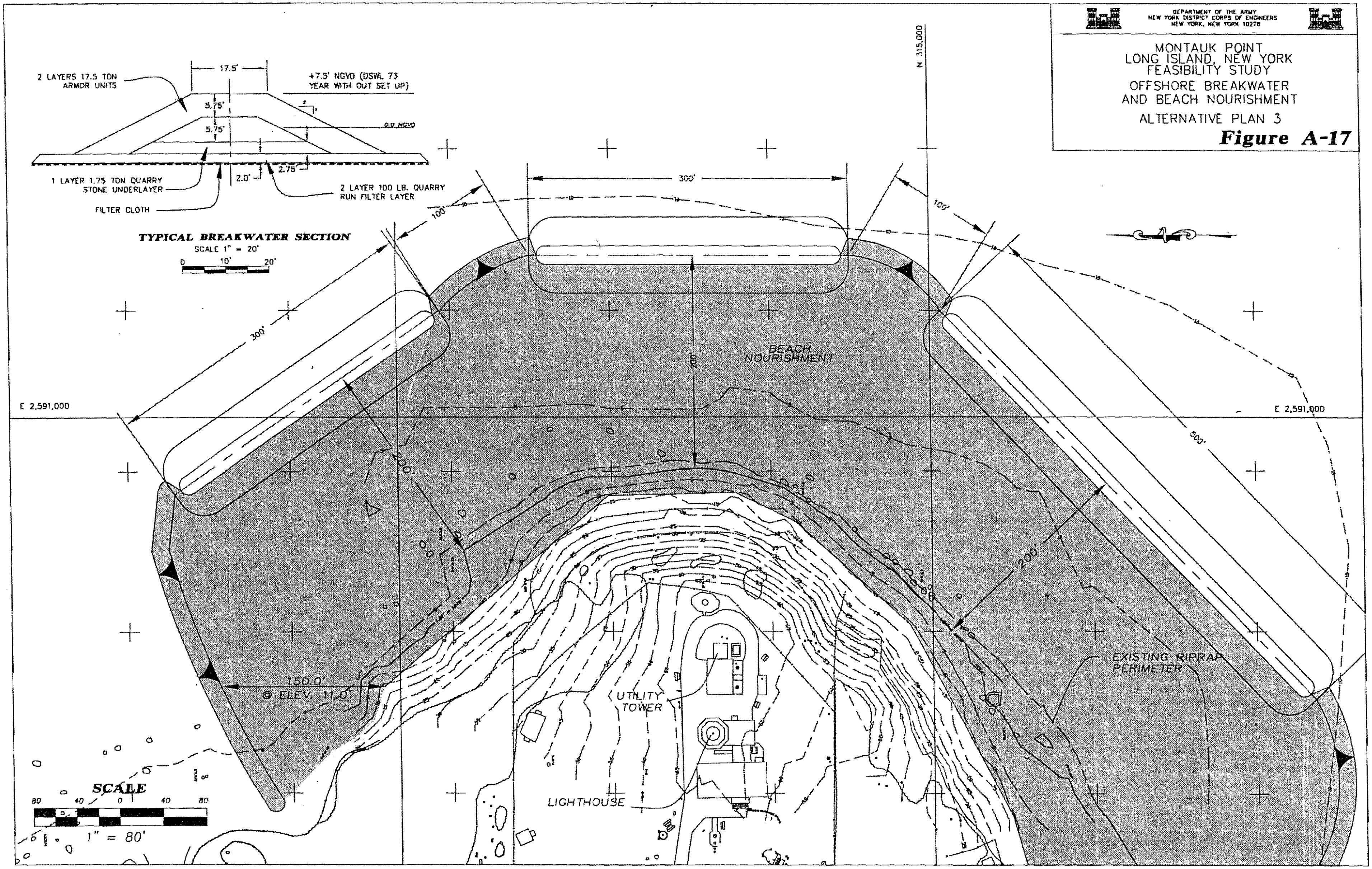
**Figure A-16**



**TYPICAL REVETMENT SECTION**

SCALE 1" = 20'





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MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
OFFSHORE BREAKWATER
AND BEACH NOURISHMENT
ALTERNATIVE PLAN 3

**Figure A-17**

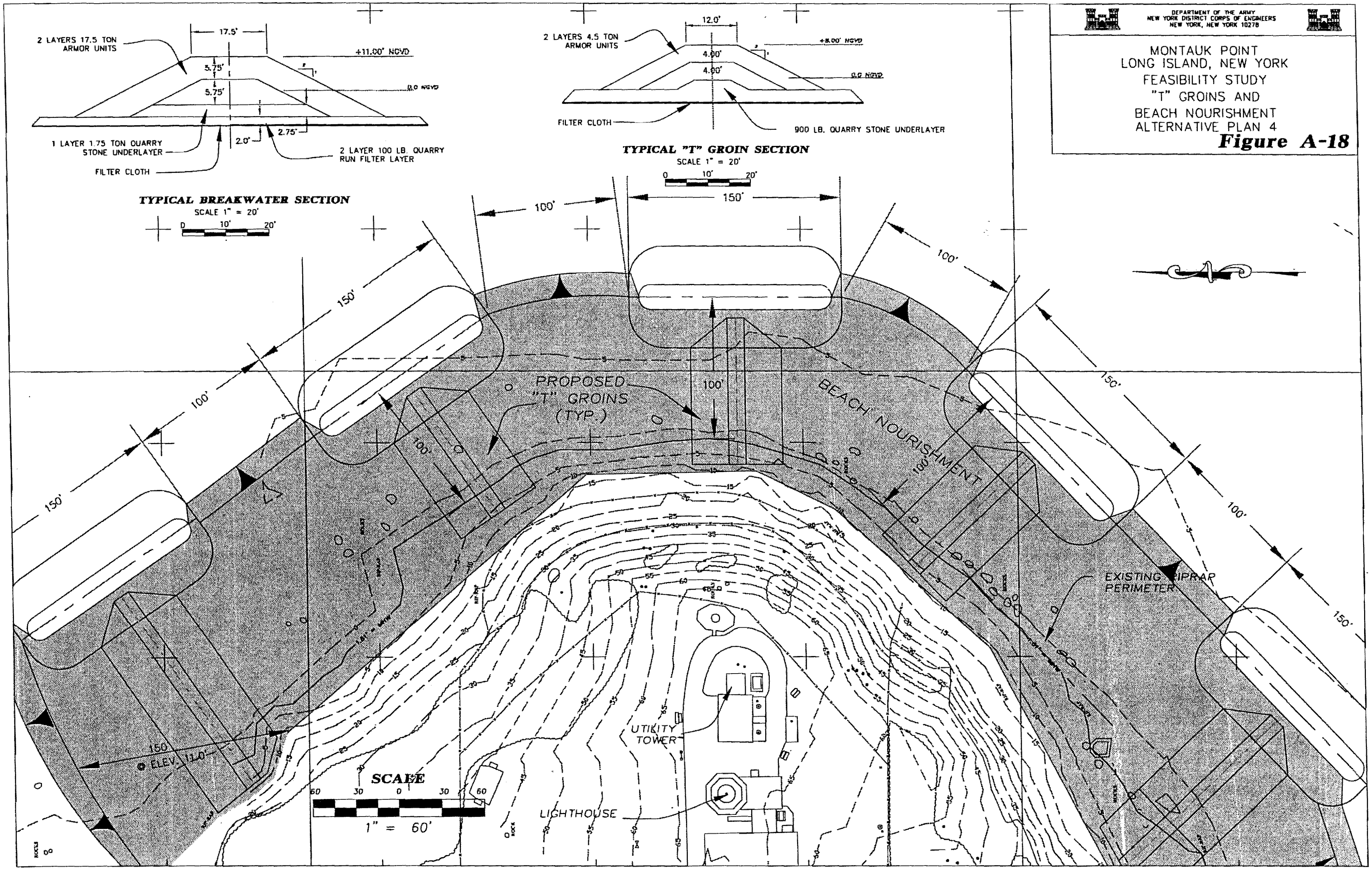
## PRELIMINARY ALTERNATIVE 4 – T-Groins with Beach Fill

A-89 T-groins, similar to a nearer-to-shore segmented breakwater system with shore-attached groins, are considered as a second breakwater alternative. Similar to the breakwater alternative presented, the purpose of T-groins is to reduce the storm wave height, thus reducing the wave impact force and runup elevation on the bluff. The consistent beach and shoreline recession would be reduced with the construction of T-groins and beach fill. The existing revetment and terracing of the upper bluff would provide a reasonable level of protection with the T-groins in place.

A-90 As shown in Figure A-18, the T-groin system would be a rubble mound structure located about 100 feet offshore at about the –5 ft NGVD contour. Five separate shore-parallel structures would be built, each being 150 feet in length. A groin will be extended from the center of the shore-parallel breakwater segment to shore, creating individual littoral cells. Beach fill is placed from shore out to the centerline of the shore-parallel breakwaters to provide erosion protection to the bluff toe to a berm elevation of +11 ft. NGVD. Approximately 125,000 cubic yards of beach fill will be placed. The required renourishment quantity is estimated at 100,000 cubic yards every 3 years. The sand is assumed to be trucked in from an upland borrow source. It is expected that embayments in the fill will quickly form as waves and tides re-mold the fill material. The openings between the structures would allow some tidal circulation but also may induce some dangerous currents concentrated in the gaps.

A-91 The T-groin design is based on present Corps guidelines. As shown in Figure A-18, the shore-parallel structure crest is placed at +11' NGVD and the groin section crest is placed at +8' NGVD. The armor size is 17.5 tons in the shore-parallel structures, placed in two layers on a single layer of 1.75 ton quarrystone underlayer and 2 layers of 100 pound filter stone. The armor size is 4.5 tons in the groins, placed in two layers on 900 lb. quarrystone underlayer. The entire structure is built on filter cloth. The estimated first cost for the T-groins with beach fill is $12,094,000, including a 20% contingency, engineering and design, and construction management, as shown in Table A-11.

A-92 T-groins will be difficult to construct due to difficult site access, however, land-based equipment can be utilized. Tidal currents are significant and breaking waves arrive from almost all onshore directions. The shore-parallel structures would require very large stone and a substantial width and elevation to be effective. The gaps between the shore-parallel structures may induce significant currents that could scour the bottom, potentially compromising the foundation of the T-groins sometime in the future. The high currents may also cause a safety hazard to swimmers, surfers and fishermen who wade in the area. In this option, the protective beach fill will require renourishment at a rate that is difficult to predict until it is constructed and monitored. Higher surges with waves that submerge the +11 ft. berm will not be prevented from damaging the revetment. Finally, the surfing activity in the area may be affected by changed reflected wave characteristics.



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MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
"T" GROINS AND
BEACH NOURISHMENT
ALTERNATIVE PLAN 4

**Figure A-18**

## PRELIMINARY ALTERNATIVE 5 – Beach Nourishment

A-93 Beach nourishment without containment structures is illustrated in Figure A-19. For this design, a construction berm with an elevation of +11' NGVD and 150 feet in width, is created. Approximately 200,000 cubic yards of beach fill will be placed. The sand is assumed to be acquired via a 4,000 cubic yard hopper dredge from Borrow Area IV, seaward of Shinnecock Inlet, as identified in the Fire Island to Montauk Point Reformulation Study.

A-94 This alternative is considered not feasible for many reasons. High longshore transport rates will remove the fill rapidly at an unpredictable rate and the area will require constant renourishment. A berm at +11' NGVD will provide some short term reduction in the recession of the toe of the bluff, but will not impede higher water levels and waves from impacting the bluff face and therefore will not provide adequate storm damage protection. Seasonal beach surveys (potentially monthly) will be required during the first two to three years after construction to refine the design of the beach fill cross section and to estimate the renourishment requirements. It expected that a beach nourishment project will change surfing conditions in the area by reducing wave reflection characteristics from the existing stone structures and by filling out the offshore beach profile to a more gradual slope. Because of the lack of adequate storm damage protection, this beach fill alternative will not be considered further.

## PRELIMINARY ALTERNATIVE 6 – Relocation of the Lighthouse

A-95 Moving the Montauk Point Light Station, a National Register listed property, would preserve the existing structures, but allow for the eventual destruction of the bluff. Prior to the relocation of the existing buildings, the arrangement and relationships of the structures on the landscape as well as the view to and from the lighthouse and bluff would be documented. In addition, subsurface archaeological investigations would be required at the current site as well as at the new lighthouse location.

A-96 The moving of the lighthouse itself is a precarious task at best. Unlike the Cape Hatteras Lighthouse (which rested on a relatively flat, level surface that permitted the National Park Service to move the structure for a cost of approximately $12 Million), the Montauk Point Lighthouse rests upon a hill on top of the bluff. Raised grades would have to be built to raise the level of the ground to the west of the bluff up to the lighthouse grade to ensure a stable move.

A-97 The preliminary estimated cost for moving the Montauk Point Lighthouse and undertaking the required archaeological investigations would be approximately $19,500,000. This figure does not take into account the creation of raised grades landward of the present location of the lighthouse for the move, which could add an additional cost of $8,600,000 and reduce parking facilities. The overall project would take approximately five years to complete, with a total cost of $26,800,000.

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MONTAUK POINT
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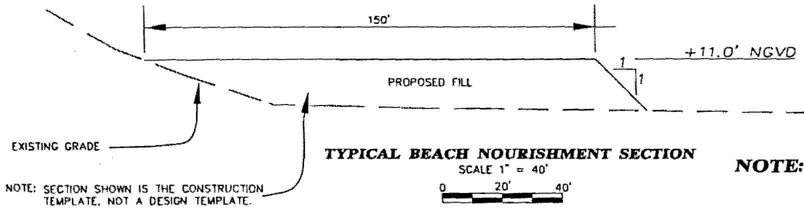
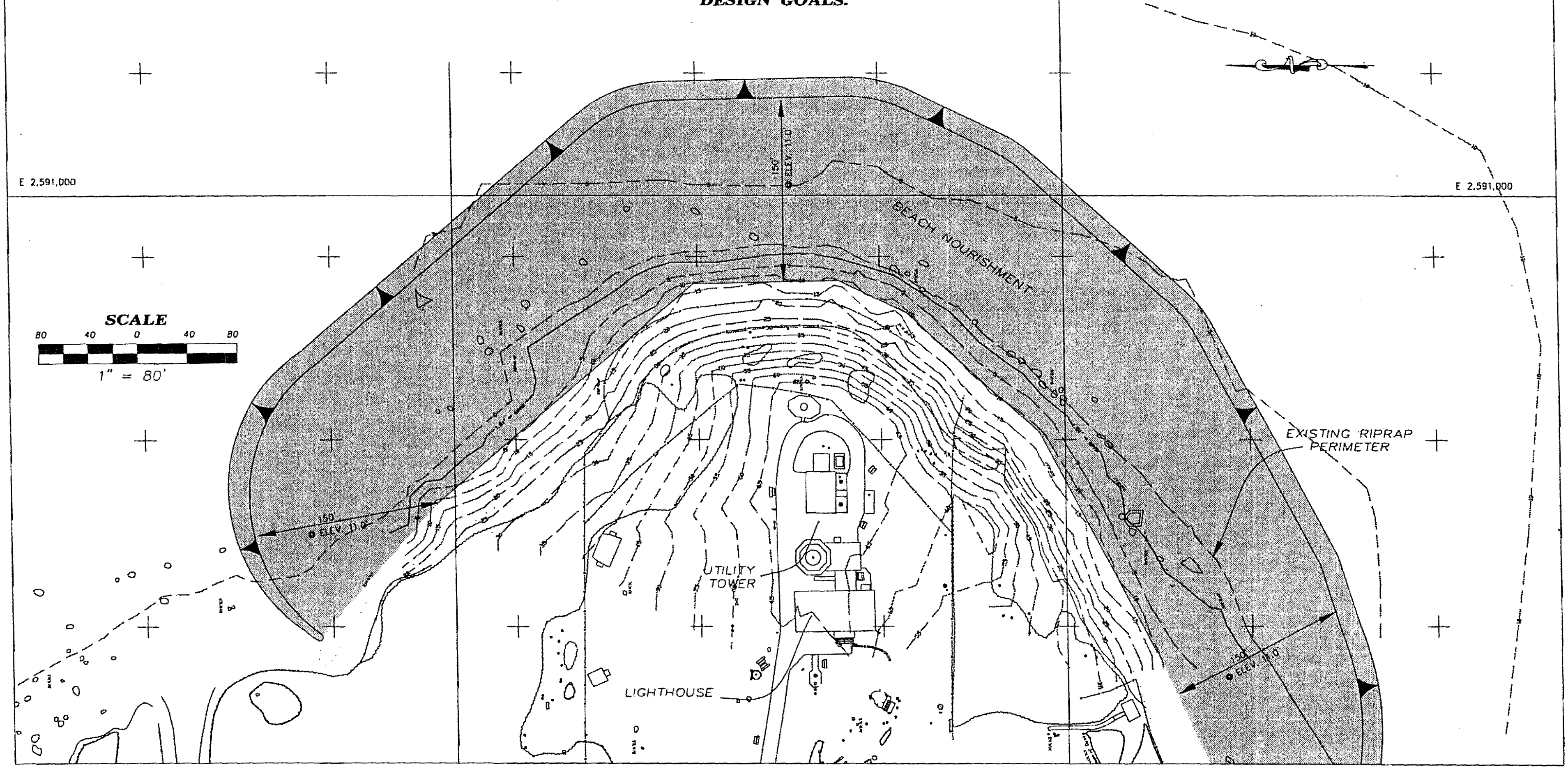
FEASIBILITY STUDY
BEACH NOURISHMENT
ALTERNATIVE PLAN 5

**Figure A-19**



**TYPICAL BEACH NOURISHMENT SECTION**
SCALE 1" = 40'
0 20' 40'

**NOTE:** **THE PLACEMENT OF THE BEACH NOURISHMENT AS SHOWN IS NOT EXPECTED TO BE STABLE AND/OR SATISFY THE SHORELINE PROTECTION DESIGN GOALS.**



### *10.3 Selected Preliminary Alternative – Stone Revetment*

A-98 A summary of the estimated first cost and annual cost of each of the structural alternatives is presented in Table A-12. Based on the advantages and disadvantages of each of the alternatives discussed above and the estimated costs of construction and periodic nourishment required with the offshore breakwater and T-groin alternatives, the selected plan for protection of Montauk Point and the lighthouse complex is the construction of a stone revetment as shown in Figure 16. As shown in Table A-12, the revetment alternative has the lowest annual cost of the alternatives considered. As discussed previously, revetments are a proven method of shore protection in this area and have a record of acceptance by state and local agencies. By re-using some of the stone already on site in the existing structure, cost savings will be realized.

A-99 Preliminary design variations in the revetment cross-section were considered to evaluate the impacts on construction costs. The cross-section of the preliminary revetment alternative, Alternative 2, shown in Figure A-16 is developed at a 73-year level of protection consistent with the level of protection afforded by all structural alternatives. It consists of the construction of a revetment section with a crest width of 40' at elevation +25' NGVD, 1V:2H side slopes, and 12.6-ton quarrystone armor units extending from the crest down to the embedded toe. The design wave for this structure is $H_{73\ Yr.}$ = 13.4' calculated using Figure 7-4 (SPM 1984) and $DSWL_{73\ Yr}$ = +10.94' NGVD. A heavily embedded toe is incorporated to protect against breaking waves and scour at the toe of the structure. The embedded toe was designed in accordance with EM 1110-2-1614 entitled "Design of Coastal Revetments, Seawalls and Bulkheads" (1995). Three layers of 4-5 ton armor units are used atop the splash apron. It is assumed that some of these stones can be re-used in the proposed revetment from the present structure. Sublayers are specified in accordance with standard design procedures. The estimated first cost for the selected preliminary alternative, the stone revetment, is $14,843,000 as shown in Table A-12.

A-100 For a breakdown of the stone revetment design, please refer to Sub-Appendix A-4, Design Calculations.

PRELIMINARY CONSTRUCTION COST ESTIMATE
October 2004 Price Level

ALTERNATIVE 2 - Stone Revetment

| DESCRIPTION | ESTIMATED QUANTITY | UNIT | UNIT PRICE | ESTIMATED AMOUNT | CONTING | TOTALS |
|---|---|---|---|---|---|---|
| Breakwaters & Seawalls (Revetment) | | | | | | |
| Mob.Demob | 1 | Job | L.S | $200,000 | $40,000 | |
| Armor Stone(12.6ton) - New | 51,000 | TON | $110.68 | $5,644,680 | $1,128,936 | |
| Armor Stone(4.5ton) - Rehandled | 18,500 | TON | $58.78 | $1,087,430 | $217,486 | |
| Underlayer(1.3ton)-New | 20,300 | TON | $111.42 | $2,261,826 | $452,365 | |
| Bedding Stone - New | 12,200 | TON | $94.76 | $1,156,072 | $231,214 | |
| Excavation | 34,300 | CY | $16.08 | $551,544 | $110,309 | |
| Filter Cloth | 12,700 | SY | $6.44 | $81,805 | $16,361 | |
| SUBTOTAL | | | | | | |
| | | | | $10,983,357 | | |
| CONTINGENCY @ 20% | | | | | $2,196,671 | |
| TOTAL BREAKWATERS & SEAWALLS | (Revetment) | | | | | $13,180,028 |
| ENGINEERING AND DESIGN | | | | $450,000 | $90,000 | $540,000 |
| CONSTRUCTION MANAGEMENT | | | | $935,000 | $187,000 | $1,122,000 |
| TOTAL FIRST COST | | | | | | $14,843,000 |
| INTEREST DURING CONSTRUCTION (30 Months @ 5.375%) | | | | | | $949,000 |
| TOTAL INVESTMENT COST | | | | | | $15,792,000 |
| ANNUALIZED INVESTMENT COST | | | | | | $915,630 |
| (Based on 50 Year Design Life and Annual Interest of 5.375%) | | | | | | |
| ANNUALIZED MAINTENANCE COST | | | | | | $54,917 |
| TOTAL ANNUAL COST | | | | | | $970,547 |
| | | | | | Rounded | $971,000 |

**Table A-9. Stone Revetment Preliminary Cost Estimate**

PRELIMINARY CONSTRUCTION COST ESTIMATE
October 2004 Price Level

ALTERNATIVE 3 - OFFSHORE BREAKWATER AND BEACHFILL

| DESCRIPTION | ESTIMATED QUANTITY | UNIT | UNIT PRICE | ESTIMATED AMOUNT | CONTING | TOTALS |
|---|---|---|---|---|---|---|
| Breakwaters & Seawalls | | | | | | |
| Mob.Demob | 1 | Job | L.S | $800,000 | $160,000 | |
| Armor Stone(17.5ton) - New | 41,200 | TON | $110.68 | $4,560,016 | $912,003 | |
| Underlayer(1.75ton)-New | 7,800 | TON | $111.42 | $869,076 | $173,815 | |
| Bedding Stone - New | 12,200 | TON | $94.76 | $1,156,072 | $231,214 | |
| Filter Cloth | 11,200 | SY | $6.44 | $72,143 | $14,429 | |
| Sand Fill | 200,000 | CY | $16.00 | $3,200,000 | $640,000 | |
| Repair Existing Revetment Above El +12.0 | 5000 | TON | $110.68 | $553,400 | $110,680 | |
| SUBTOTAL | | | | $10,657,307 | | |
| CONTINGENCY @ 20% | | | | | $2,131,461 | |
| TOTAL BREAKWATERS & SEAWALLS | | | | | | $12,788,768 |
| ENGINEERING AND DESIGN | | | | $500,000 | $100,000 | $600,000 |
| CONSTRUCTION MANAGEMENT | | | | $910,000 | $182,000 | $1,092,000 |
| TOTAL FIRST COST | | | | | | $14,481,000 |
| INTEREST DURING CONSTRUCTION<br>(24 Months @ 5.375%) | | | | | | $752,000 |
| TOTAL INVESTMENT COST | | | | | | $15,233,000 |
| ANNUALIZED INVESTMENT COST<br>(Based on 50 Year Design Life and Annual Interest of 5.375%) | | | | | | $884,000 |
| ANNUALIZED MAINTENANCE COST | | | | | | $56,054 |
| ANNUALIZED PERIODIC NOURISHMENT COST<br>(Based on 50 Year Design Life, Annual Interest of 5.375% and 100,000 cy. Nourishment Every 3 yrs) | | | | | | $502,000 |
| TOTAL ANNUAL COST | | | | | | $1,442,054 |
| | | | | | Rounded | $1,443,000 |

**Table A-10. Offshore Breakwater Preliminary Cost Estimate**

## PRELIMINARY CONSTRUCTION COST ESTIMATE
October 2004 Price Level

### ALTERNATIVE 4 - T GROINS AND BEACH NOURISHMENT

| DESCRIPTION | ESTIMATED QUANTITY | UNIT | UNIT PRICE | ESTIMATED AMOUNT | CONTING | TOTALS |
|---|---|---|---|---|---|---|
| Breakwaters & Seawalls (T Groins) | | | | | | |
| Mob.Demob | 1 | Job | L.S | $100,000 | $20,000 | |
| Armor Stone(17.5ton) - Breakwaters | 26,500 | TON | $110.68 | $2,933,020 | $586,604 | |
| Armor Stone(4.5ton) - Groin | 12,100 | TON | $110.68 | $1,339,228 | $267,846 | |
| Underlayer(1.75ton) - Breakwater | 5,300 | TON | $111.42 | $590,526 | $118,105 | |
| Underlayer (900 lb) - Groin | 8,500 | TON | $111.42 | $947,070 | $189,414 | |
| Bedding Stone - Breakwater | 8,400 | TON | $94.76 | $795,984 | $159,197 | |
| Filter Cloth | 16,100 | SY | $6.44 | $103,705 | $20,741 | |
| Sand Fill | 125000 | CY | $16.00 | $2,000,000 | $400,000 | |
| Repair Existing Revetment Above El +12.0 | 5000 | TON | $110.68 | $553,400 | $110,680 | |
| SUBTOTAL | | | | $8,809,533 | | |
| CONTINGENCY @ 20% | | | | | $1,761,907 | |
| TOTAL BREAKWATERS & SEAWALLS | (Breakwater) | | | | | $10,571,440 |
| ENGINEERING AND DESIGN | | | | $500,000 | $100,000 | $600,000 |
| CONSTRUCTION MANAGEMENT | | | | $768,000 | $153,600 | $921,600 |
| TOTAL FIRST COST | | | | | | $12,094,000 |
| INTEREST DURING CONSTRUCTION<br>(24 Months @ 5.375%) | | | | | | $629,000 |
| TOTAL INVESTMENT COST | | | | | | $12,723,000 |
| ANNUALIZED TOTAL INVESTMENT COST<br>(Based on 50 Year Design Life and Annual Interest of 5.375%) | | | | | | $738,000 |
| ANNUALIZED MAINTENANCE COST | | | | | | $46,815 |
| ANNUALIZED PERIODIC NOURISHMENT COST<br>(Based on 50 Year Design Life, Annual Interest of 5.375%<br>and 100,000 cy. Nourishment Every 3 yrs) | | | | | | $502,000 |
| TOTAL ANNUAL COST | | | | | | $1,286,815 |
| | | | | | Rounded | $1,287,000 |

**Table A-11. T-Groins and Beach Nourishment Preliminary Cost Estimate**

PRELIMINARY CONSTRUCTION COST ESTIMATE
October 2004 Price Level

FIRST COST AND ANNUAL COST SUMMARY

| | ALTERNATIVE 2 STONE REVETMENT | ALTERNATIVE 3 OFFSHORE BREAKWATER AND BEACH FILL | ALTERNATIVE 4 T GROINS AND BEACH FILL |
|---|---|---|---|
| TOTAL FIRST COST | $14,843,000 | $14,481,000 | $12,094,000 |
| INTEREST DURING CONSTRUCTION (@ 5.375%) | $949,000 | $752,000 | $629,000 |
| TOTAL INVESTMENT COST | $15,792,000 | $15,233,000 | $12,723,000 |
| ANNUALIZED TOTAL INVESTMENT COST (Based on 50 Year Design Life and Annual Interest of 5.375%) | $915,600 | $884,000 | $738,000 |
| ANNUALIZED MAINTENANCE COST | $55,000 | $57,000 | $47,000 |
| ANNUALIZED PERIODIC NOURISHMENT COST (Based on 50 Year Design Life, Annual Interest of 6.125% and 100,000 cy. Nourishment Every 3 yrs) | $0 | $502,000 | $502,000 |
| TOTAL ANNUAL COST | $971,000 | $1,443,000 | $1,287,000 |

**Table A-12. First Cost and Annual Cost Summary**

## *10.4 Final Improvement Designs*

A-101 For the three alternative revetment sizes developed as part of the optimization, the higher two levels of protection have a heavily embedded toe to protect against breaking waves and scour at the base of the structure. Embedded toe design will be in accordance with EM 1110-2-1614 entitled "Design of Coastal Revetments, Seawalls and Bulkheads" (1995). Sublayers are specified in accordance with standard design procedures. It is noted that because the revetment improvement is founded on dense till or stone, no filter cloth is required to underlie the improvement. This is a design refinement from the preliminary design, where filter cloth was included. In addition, the following three refinements to the preliminary revetment alternative were made: (1) the quantities changed slightly based on additional cross sections taken. (2) The mobilization and demobilization costs increased to include temporary construction berms at each end of the revetment to facilitate revetment construction. (3) Contingency reduced due to more detailed level of design. The following describes the three variations of the revetment alternative used in order to optimize the design.

**Alternative 2A: Stone Revetment with 150-year Level of Protection** - The design wave for the structure is $H_{150\ Yr.}$ = 14.6' based on the average toe el. near the improved revetment toe of el. –4' NGVD calculated using Figure 7-4 (SPM 1984) and $DSWL_{150\ Yr}$ = +12.31' NGVD. The cross-section of the revetment shown in Figure A-20 consists of the construction of a revetment section with a crest width of 40' at elevation +30' NGVD, 1V:2H side slopes, and 16.3-ton quarrystone armor units extending from the crest down to the embedded toe. According to Engineering Manual guidance described above, the bottom of the armor stone layer in the toe is located 12 ft. below existing grade at the toe (the stone crest at approximately –10' with the average toe el. at el. –4 NGVD). Three layers of 4-5 ton armor units are used atop the splash apron. It is assumed that some of these stones can be re-used in the proposed revetment from the present structure. Cross-sections of this revetment alternative along the existing profiles are shown in Figure A-21.

**Alternative 2B: Stone Revetment with 73-year Level of Protection** - The design wave for the structure is $H_{73\ Yr.}$ = 13.4' based on the average toe el. near the improved revetment toe of el. –4' NGVD calculated using Figure 7-4 (SPM 1984) and $DSWL_{73\ Yr}$ = +10.94' NGVD. The cross-section of the revetment shown in Figure A-22 consists of the construction of a revetment section with a crest width of 40' at elevation +25' NGVD, 1V:2H side slopes, and 12.6-ton quarrystone armor units extending from the crest down to the embedded toe. The bottom of the armor stone layer in the toe is located 12 ft. below existing grade at the toe (average toe el. at –4' NGVD). Three layers of 4-5 ton armor units are used atop the splash apron. It is assumed that some of these stones can be re-used in the proposed revetment from the present structure. Cross-sections of this revetment alternative along the existing profiles are shown in Figure A-23.

**Alternative 2C: Stone Revetment with 15-year Level of Protection** - The design wave for the structure is $H_{15\ Yr.}$ = 9.2' based pm the average toe el. near the improved toe of el. –1' NGVD calculated using Figure 7-4 (SPM 1984) and $DSWL_{15\ Yr}$ = +9.05' NGVD. The cross-section of the revetment shown in Figure A-24 consists of a revetment section with a crest width of 3' at elevation +25' NGVD, 1V:1.5H side slopes, and 7.5-ton quarrystone armor units extending from the crest down to the toe. The toe will be built up from the existing toe with large stone and will not require an excavated buried toe. It is assumed that some stones can be re-used in the proposed revetment from the present structure. Cross-sections of this revetment alternative along the existing profiles are shown in Figure A-25. Since the costly buried toe is not essential for the 15-year level of protection, a narrow berm was developed to provide better foundation on the existing toe stone. In order to construct the narrow berm, an offshore adjacent rubble mound stone temporary structure will be required from which land-based construction equipment will operate.

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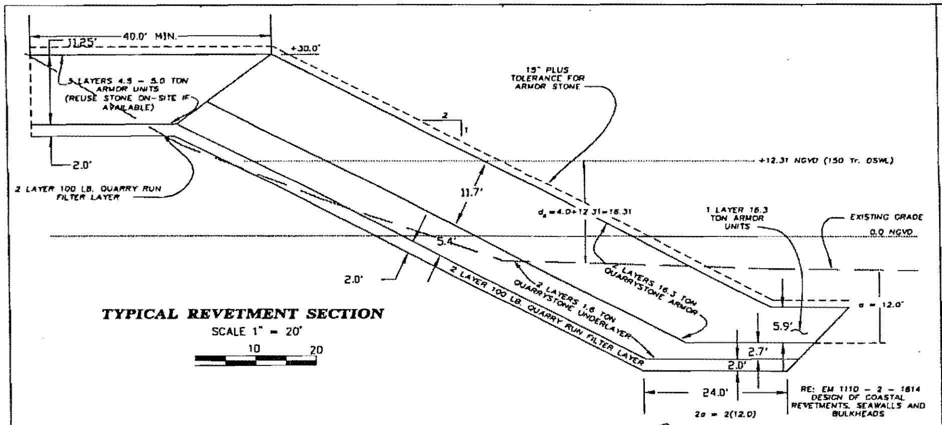
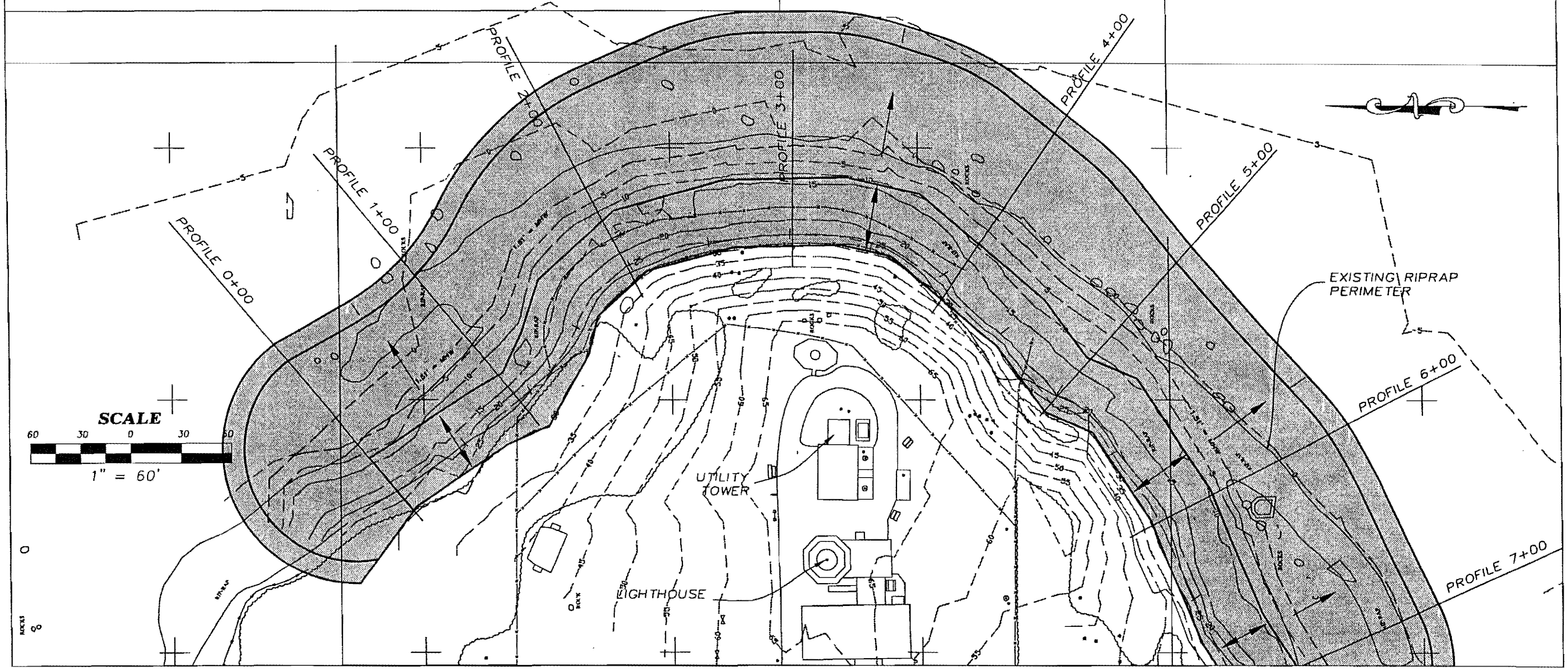
STONE REVETMENT
ALTERNATIVE PLAN 2A

**Figure A-20**



**TYPICAL REVETMENT SECTION**

SCALE 1" = 20'



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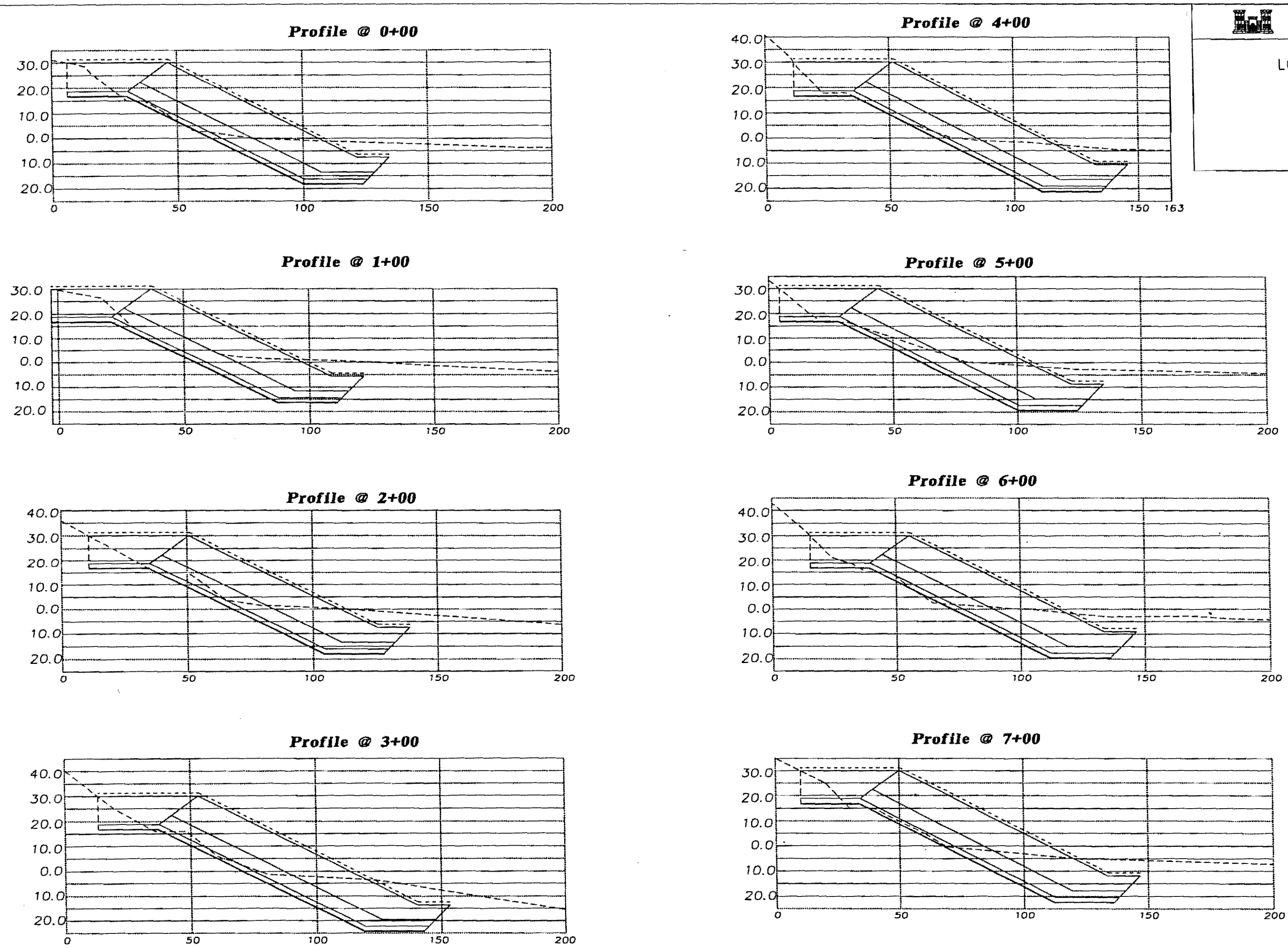
STONE REVETMENT
ALTERNATIVE 2A
PROFILES

**Figure A-21**



NOTE: SEE TYPICAL REVETMENT SECTION, FIGURE A-20.

SCALE : 1" = 40' (HORZ. & VERT)

0 20 40

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OFFSHORE AND COASTAL TECHNOLOGIES, INC.
AND
ANDREWS, MILLER & ASSOCIATES, INC.
(JOINT VENTURE)

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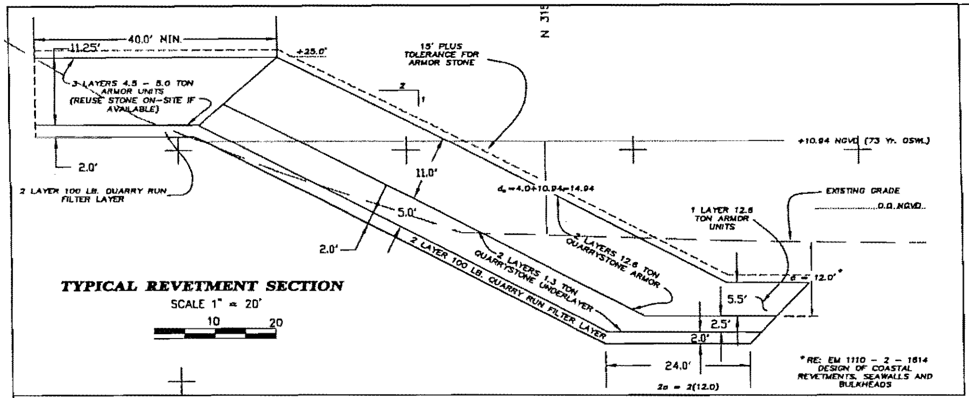
FEASIBILITY STUDY
STONE REVETMENT
ALTERNATIVE PLAN 2B

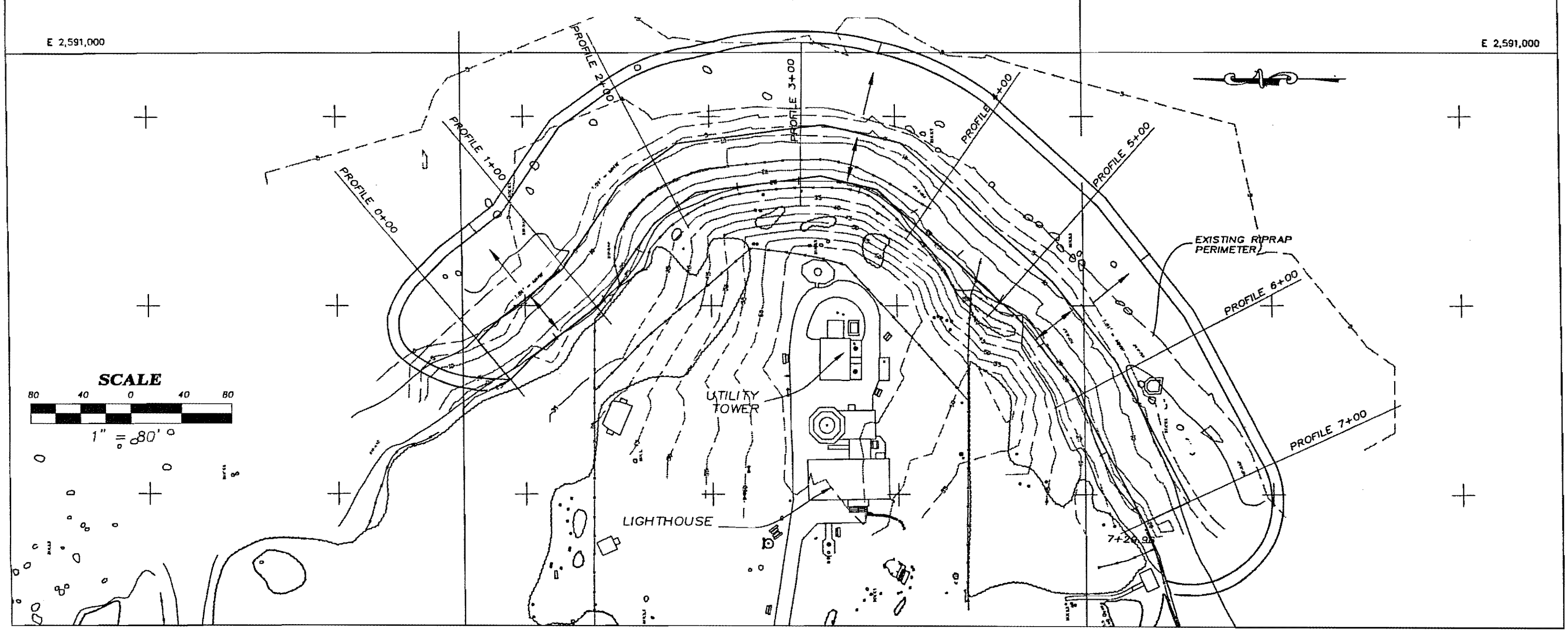
**Figure A-22**



TYPICAL REVETMENT SECTION

SCALE 1" = 20'

* RE: EM 1110 – 2 – 1614 DESIGN OF COASTAL REVETMENTS, SEAWALLS AND BULKHEADS



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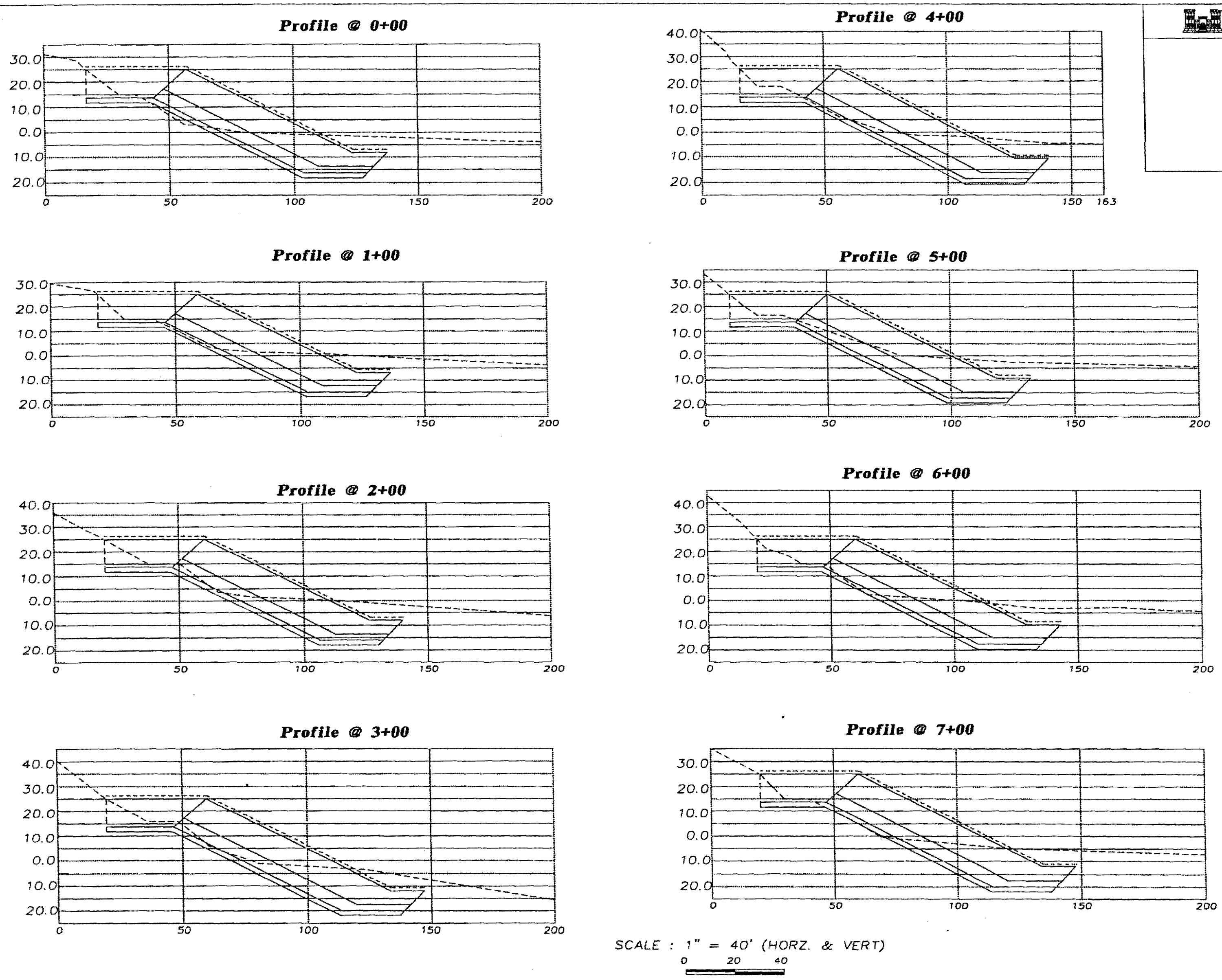
ALTERNATIVE 2B
PROFILES

**Figure A-23**



NOTE: SEE TYPICAL REVETMENT SECTION, FIGURE A-22.

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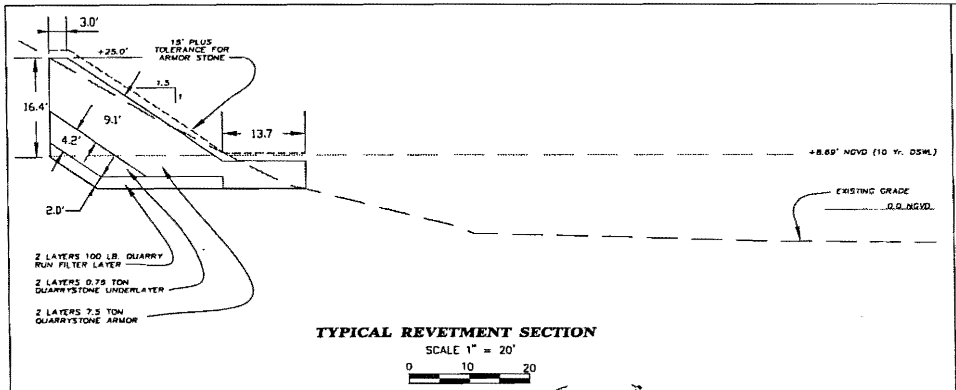
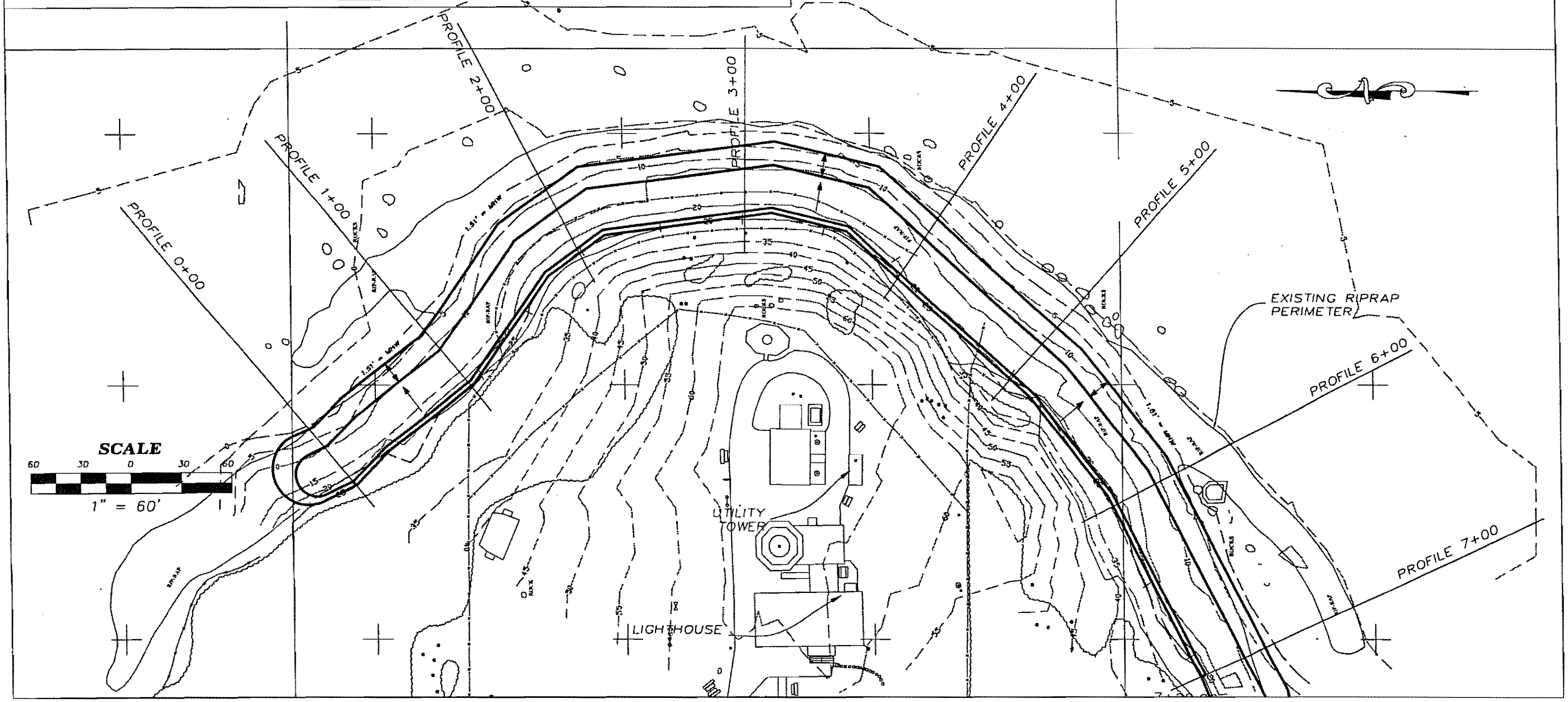
REVISED ALTERNATIVE PLAN 2C

**Figure A-24**



TYPICAL REVETMENT SECTION



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LONG ISLAND, NEW YORK
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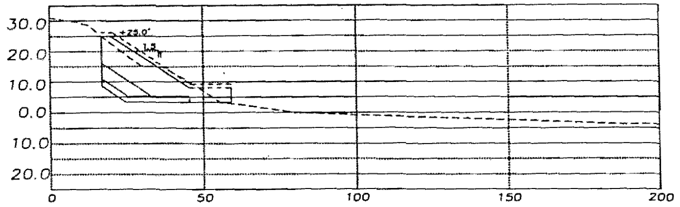
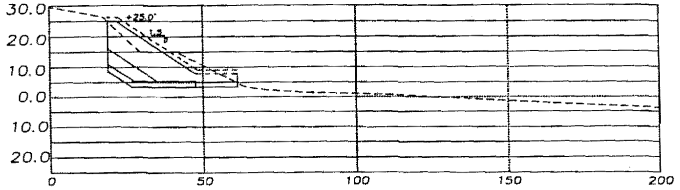
STONE REVETMENT
ALTERNATIVE 2C
PROFILES

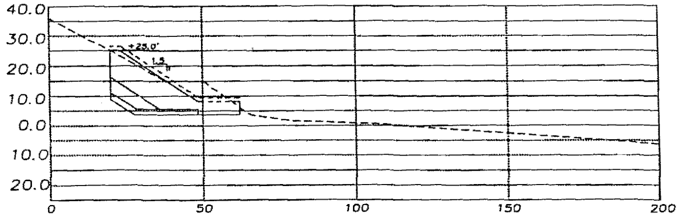
**Figure A-25**



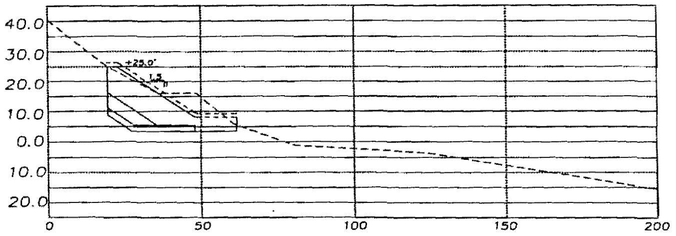
**Profile @ 0+00**



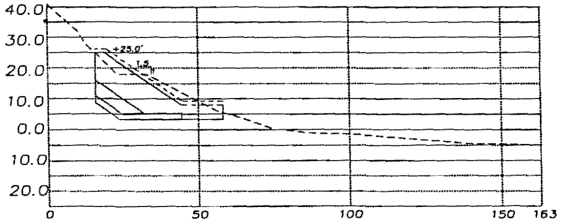
**Profile @ 1+00**



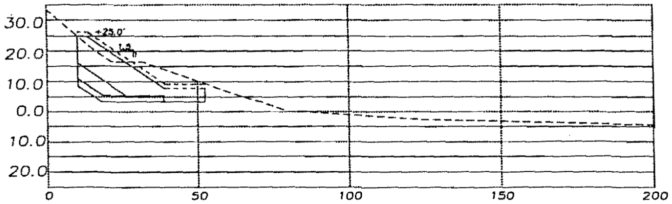
**Profile @ 2+00**



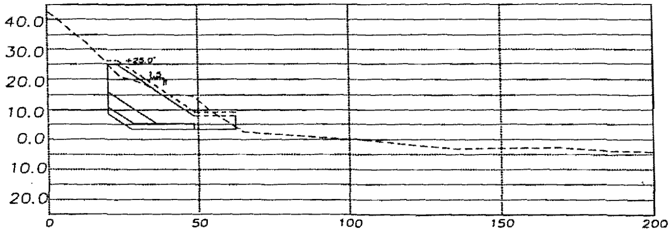
**Profile @ 3+00**



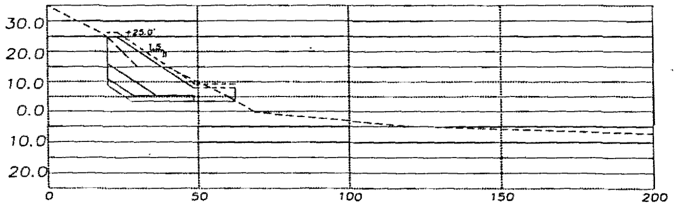
**Profile @ 4+00**



**Profile @ 5+00**



**Profile @ 6+00**



**Profile @ 7+00**

*NOTE: SEE TYPICAL REVETMENT SECTION, FIGURE A–24.*

SCALE : 1" = 40' (HORZ. & VERT)
0 20 40

## *10.5* Coastal Analysis of Improvement Plans

A-102 According to the Coastal Engineering Manual (EM 1110-2-1100, Part IV, Draft 30 Sep 01), design conditions for coastal structures require acceptable levels of hydraulic responses in terms of wave runup, overtopping, scour and reflection.

A-103 *Wave runup* level is one of the most important factors affecting the design of coastal structures because it determines the design crest level of the structure that limits wave overtopping.

A-104 Wave runup is calculated according to the methods outlined in the Coastal Engineering Manual (Draft 30 September 01). The method used here is described in Section VI-5-2 of that document. First, through the calculation of surf similarity parameter, assuming irregular waves, the 2% runup is calculated using the formula in the CEM on Figure VI-5-3. Surf similarity parameters at Montauk exceed a value of 4.0 for all storm events examined, so surface roughness effects on wave runup are negligible.

The surf-similarity parameter is a number that is related to the type of breaking wave. For irregular waves it is defined as:

$$\xi_{op} = \frac{\tan;}{\sqrt{S_{op}}}$$

Where: $$S_{om} = \frac{2\pi}{g}\frac{H_s}{T_p}$$

$H_s$ = significant wave height at the structure toe

$T_p$ = wave period at peak of wave spectrum

$g$ = acceleration due to gravity

$;$ = bottom slope

For: [illegible] breaking waves are spilling

$.5 < \xi_{op} < 3$ breaking waves are plunging

$3 < \xi_{op} < 3.5$ breaking waves are collapsing

$\xi_{op} > 3.5$ breaking waves are surging

A-105 To account for the composite slope conditions that are created by the presence of the berm at the top of the revetment (existing and proposed), the method of de Waal and van der Meer is used as given on Page VI-5-12 of the CEM. A factor, gamma, is determined from two other factors that account for the width of the berm and the elevation of the berm relative to the water level.

A-106 To examine the effect of permeability on wave runup, the CEM presents data from Delft Hydraulics in Table VI-5-12. The figure presents two best-fit lines through laboratory data for the ratio of the two-percent runup to the wave height as a function of surf similarity parameter. The percentage reduction between the two lines is used here to scale down the runup due to expected structural permeability. Because of the scatter in the underlying data, a reduction factor of 0.74 was used for all cases examined here.

A-107 Once the runup magnitudes are calculated they are added to the still water level corresponding to each recurrence level to determine absolute runup elevations relative to the project datum, NGVD29.

A-108 Table A-13 presents the runup elevations for the Final Improvement Plans and the existing structure. The presence of the berm at a lower elevation (as with the existing revetment) and steeper composite slope (from a relatively narrow berm and shallow toe depth) reduces the runup, but not the overtopping rate above the berm crest, due to the large berm crest width of the improvement. The effect of a steeper slope and shallower structure toe cause the runup elevations associated with Plan 2C to be lower than those for the other plans. The calculations indicate that runup elevations exceed the existing revetment crest (+18 feet NGVD) at all listed return periods using maximum design wave conditions. Field observations confirm that 'green water' frequently reaches the top of the revetment. Figure A-26 also confirms that wave runup (from the highest segment of the wave group for the more frequent storms, all the way to nearly all the waves on the 73 year return period storm) exceeds the crest elevation of the existing structure, from the 2 year thru the 500 year storm, even when permeability is accounted for.

A-109 *Wave overtopping* occurs when the structure crest height is lower than the runup level. Overtopping discharge is a very important design parameter because it determines the crest level and the design of the upper part of the structure. In the Montauk Point case, overtopping must be limited at design storm levels so as to avoid failure of the revetment from the top (as observed in the field and in the model test for the existing structure).

A-110 Critical levels of average overtopping discharges are provided in Table VI-5-6 of the CEM. The relevant critical levels (based on Coastal Engineering Manual criteria from physical modeling of damages sustained with paved and unpaved revetments) at Montauk are 100 liters/s/m (0.1 cu m/s/m). This is a critical threshold for damage of vegetative terracing immediately above the revetment stone; however, lower levels of damage can be initiated at the 50 liters/s/m threshold.

A-111 The overtopping rate can be calculated from the many approaches described in the CEM. The situation closest to the Montauk Point structure is presented in Table VI-5-12, which summarizes a formula developed semi-empirically by Pedersen (1996) for layered, permeable, rock-armored slopes with a berm in front of a crown wall (in this case analogous to the bluff atop the revetment). Table A-14 presents overtopping rates calculated using the Pedersen method outlined in the CEM on Table VI-5-12.

A-112 The results show that the critical level for significant damage initiation of the vegetative terracing is exceeded above a 200-year event for Plan 2A, a 100-year event for Plan 2B and greater than a 15-year event for Plan 2C. The existing structure exhibits damaging overtopping rates during events greater than a 10-year level.

A-113 *Wave reflection* affects the nearshore wave conditions immediately fronting the structure, and potentially along neighboring beaches. Incident energy is partly dissipated by wave breaking, surface roughness and porous flow through the stone structure.

A-114 The CEM equation VI-5-38 for wave reflection was originally formulated by Seelig (1983) and improved with coefficients for 1-layer and 2-layer rock structures with an underlayer by Allsop (1990).

The reflection coefficient is defined as:

$$C_r = \frac{a\xi_{op}^2}{b+\xi_{op}^2}$$

where:

$\xi_{op}$ = surf-similarity parameter

$a$ = 0.64 for 1- or 2- layer structures

$b$ = 7.22 for 1- layer of armor on stone underlayer

= 8.85 for 2- layers of armor on stone underlayer.

A-115 Allsop's coefficients are valid within the range of surf similarity parameters that occur during storms at Montauk Point. Table A-15 presents a comparison of reflection coefficients for the three Improvement Plans and the existing structure.

A-116 The wave reflection coefficients in Table A-15 indicate that the reflected wave will be reduced at all return periods for all three Final Improvement Alternative Plans versus the existing structure because of the flatter structure slopes and more porous rock layering. The reductions range from 13-19% for Plans 2A and 2B to 3-5% for Plan 2C.

A-117 *Wave scour* occurs at the toe of the structure due to the concentration of currents formed by the interaction of incident waves with the down rush from preceding waves. The extensive scour protection toe design included in the Final Improvement Alternative Plans 2A and 2B will prevent adverse scour (including both storm and long term).

A-118 *Adjacent Impacts*. Potential longshore effects include the impact of any new structures on neighboring beaches. Because a revetment similar to the recommended plan has been in place at Montauk Point for nearly 60 years, there is essentially no change from existing adjacent impacts due to implementation of the recommended plan. The sediment that would have become littoral supply to adjacent beaches from the area immediately behind the existing revetment has been stabilized at the Point during its functional life. The replacement of the existing structure with the recommended design would not alter this function. The recommended plan includes appropriate tie-backs on either side to minimize local erosion at the ends of the project due to longshore sediment demand. See Subappendix A-7 for further discussion.

A-119 *Level of Protection.* Based on the analysis of direct wave impact and runup/overtopping damages, Alternative 2A will provide protection from the 150-yr. storm event. During this event, damages to the revetment due to direct wave impact are estimated to be between 0- to 5- percent which is generally referred to as a no-damage condition. Wave overtopping during the 150-yr. storm event is limited to 47 liters/s/m which is significantly below 100 liters/s/m, which is the estimated threshold of significant damage to unpaved promenades. As a measure of uncertainty, if the 150-yr water level is increased to include 0.7 feet of sea level rise in 50 years and ¾ standard deviation of storm surge, the overtopping rate increases to be 118 liters/s/m for the *paved* promenade. This rate is just slightly above the threshold of significant damage to *unpaved* promenades, but much less than the threshold of significant damage to *paved* promenades (200 liters/m/s). Therefore, there is a large safety factor including uncertainty throughout the project life.

A-120 Alternative 2B will provide protection from the 73-yr. storm event. During this event, damages to the revetment due to direct wave impact are estimated to be between 0- to 5- percent (no-damage condition). Wave overtopping during the 73-yr. storm event is limited to 60 litres/s/m which is significantly below 100 litres/s/m, the estimated threshold of damage to *unpaved* promenades. As a measure of uncertainty, if the 73-yr water level is increased to include 0.7 feet of sea level rise in 50 years and ¾ standard deviation of storm surge, the overtopping rate is calculated to be 162 liters/s/m for the *paved* promenade. This rate is less than the threshold of significant damage to *paved* promenades, i.e. 200 liters/s/m. Therefore, including uncertainty throughout the project life, there is a reasonable safety factor (greater than 75% certainty).

A-121 Based on potential runup/overtopping damages, the level of protection provided by Alternative 2C with an *unpaved* promenade, is estimated to be on the order of a 15-yr. storm event. The wave overtopping during this event is estimated to be 70 litres/s/m, which is just below the threshold of damage to *unpaved* promenades. As a measure of uncertainty, if the 15-yr water level is increased to include 0.7 feet of sea level rise and one standard deviation of storm surge increase, the overtopping rate is calculated to be 251 litres/s/m. This yields a 60% probability of significant damage to the *unpaved* promenade (overtopping in excess of 100 litres/s/m) and a 10% probability of structure failure (overtopping in excess of 200 litres/s/m) with uncertainty included.

A-122 Damages to the existing revetment can be expected to continue and will require continued maintenance. The revetment damage maintenance costs are parameters that have been recurring since construction of the existing revetment. The quantitative assessment of wave-induced maintenance costs is based on the records of recent revetment maintenance operations increased to account for increasing damages due to a worsening without project condition and to account for increased damages due to sea level rise.

A-123 The assumptions used in the economic evaluation regarding revetment and bluff damage frequency were based on the results of engineering studies to assess the ability of the alternatives to withstand the design wave conditions in the area and reduce the runup and overtopping along the bluff face. The studies indicate that with Alternatives 2A and 2B, damages to the revetment and the bluff would be reduced significantly and that damages from storm excedence are greatly reduced from Alternative 2C where storm excedence damages are high.

A-124 The economic evaluation of Alternative 2A (150 year storm design level of protection) with a revetment height of +30 feet NGVD considered the impacts of storm events ranging from a 2-yr. event to a 200-yr. event. Wave impact damages are initiated slightly at the 15 year return period storm and overtopping damages are initiated at the 200 year return period storm. The total annual cost of Alternative 2A is estimated to be **$1,050,400**. Refer to the Quantities and Cost Appendix C.

A-125 The economic evaluation of Alternative 2B (73 year storm design level of protection) with a revetment height of +25 feet NGVD considered the impacts of storm events ranging from a 2-yr. event to a 200-yr. event. Wave impact damages are initiated, slightly, at the 5 year storm event and minor overtopping damages are initiated at the 73 year storm event. The total annual cost of Alternative 2B is estimated to be **$889,300**. Refer to the Quantities and Cost Appendix C for detail cost tables.

A-126 The economic evaluation of Alternative 2C (15 year storm design level of protection) with a revetment height of +25 feet NGVD considered the impacts of storm events ranging from a 2-yr. event to a 200-yr. event. Wave impact damage is initiated slightly at the 2 year return period storm and overtopping damage is initiated at the 15 year return period storm. The total annual cost of Alternative 2C is estimated to be **$524,700**. Refer to the Quantities and Cost Appendix C for detail cost tables.

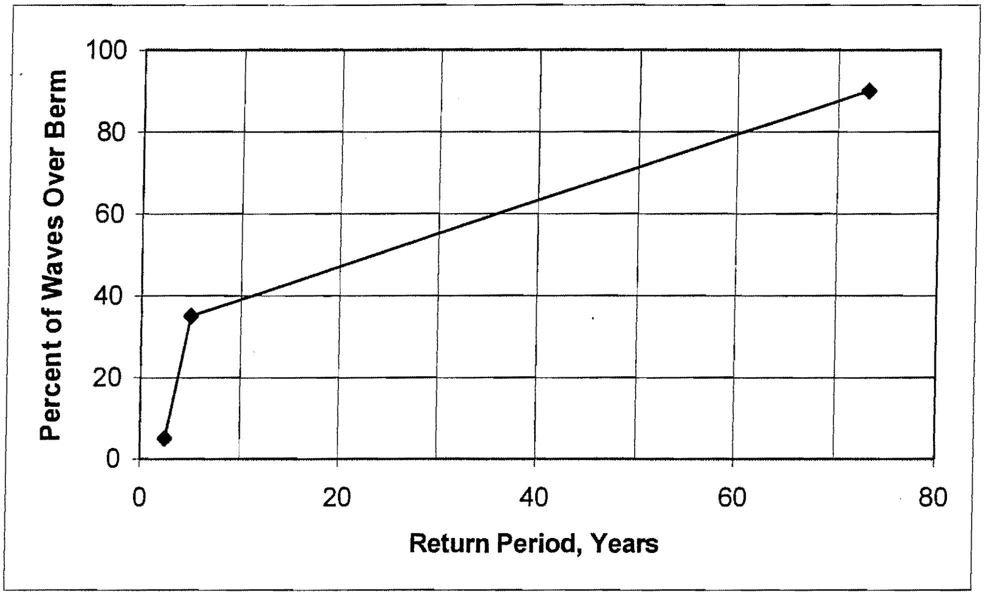


**Figure A-26. Percent of wave runup exceeding the existing berm elevation based upon physical model test studies performed for this feasibility study.**

**Table A-13. Runup Elevations for Existing Revetment and Improvement Plans**

| RETURN PERIOD | RUNUP ELEVATION (PERMEABLE) FT, NGVD | | | |
|---|---|---|---|---|
| (Years) | Existing | Plan 2A | Plan 2B | Plan 2C |
| 2 | 22.20 | 33.18 | 33.18 | 23.78 |
| 5 | 23.42 | 36.73 | 36.73 | 27.21 |
| 10 | 23.35 | 38.20 | 38.20 | 28.49 |
| 25 | 23.69 | 40.19 | 37.85 | 30.22 |
| 44 | 24.46 | 42.13 | 37.70 | 31.97 |
| 50 | 24.49 | 42.31 | 37.62 | 32.10 |
| 73 | 25.39 | 44.05 | 37.85 | 33.39 |
| 100 | 26.43 | 44.38 | 38.32 | 34.75 |
| 150 | 27.98 | 44.51 | 39.21 | 36.69 |
| 200 | 29.16 | 44.78 | 40.00 | 38.12 |
| 500 | 32.02 | 45.91 | 42.30 | 41.52 |

**Table A-14. Overtopping Rates for Existing Revetment and Improvement Plans**

| RETURN PERIOD | OVERTOPPING RATES (LITERS/S/M) | | | |
|---|---|---|---|---|
| (Years) | Existing | Plan 2A | Plan 2B | Plan 2C |
| 2 | 17 | 1 | 2 | 12 |
| 5 | 41 | 1 | 4 | 24 |
| 10 | 90 | 3 | 8 | 48 |
| 25 | 266 | 6 | 18 | 120 |
| 44 | 589 | 10 | 33 | 227 |
| 50 | 728 | 11 | 37 | 274 |
| 73 | 1430 | 18 | 60 | 460 |
| 100 | 2903 | 27 | 96 | 780 |
| 150 | 7479 | 47 | 175 | 1517 |
| 200 | 16221 | 70 | 280 | 2560 |
| 500 | 130783 | 223 | 1060 | 8073 |

**Table A-15. Reflection Coefficients for Existing Revetment and Improvement Plans**

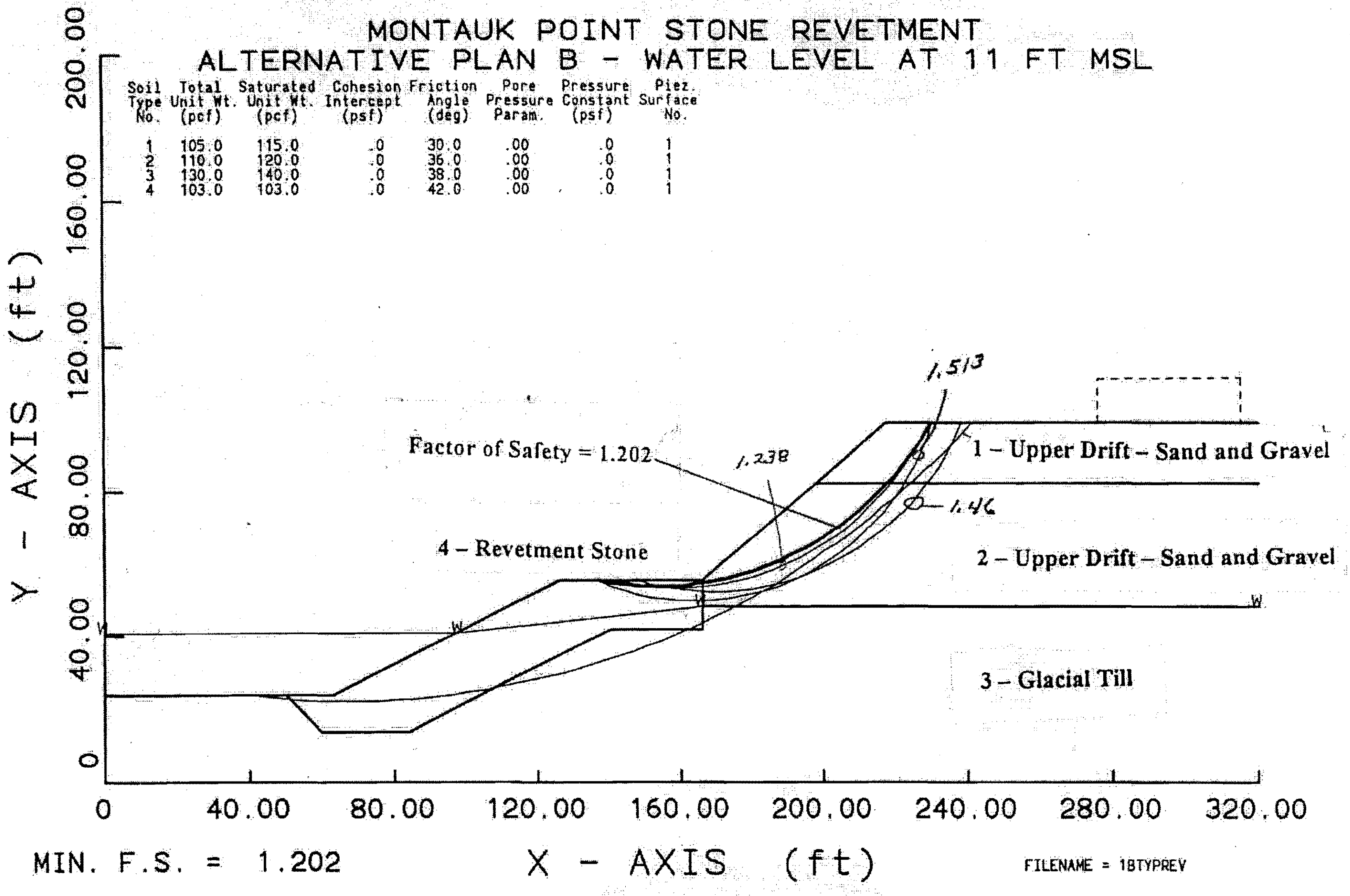
| RETURN PERIOD | REFLECTION COEFFICIENT | | |
|---|---|---|---|
| (Years) | Existing Structure | Plans 2A and 2B | Plan 2C |
| 2 | 0.57 | 0.46 | 0.54 |
| 5 | 0.57 | 0.45 | 0.54 |
| 10 | 0.57 | 0.47 | 0.55 |
| 25 | 0.58 | 0.48 | 0.56 |
| 44 | 0.59 | 0.49 | 0.56 |
| 50 | 0.59 | 0.50 | 0.56 |
| 73 | 0.59 | 0.50 | 0.57 |
| 100 | 0.59 | 0.50 | 0.57 |
| 150 | 0.59 | 0.51 | 0.57 |
| 200 | 0.59 | 0.51 | 0.57 |
| 500 | 0.60 | 0.52 | 0.58 |

### *10.6 Slope Stability Analysis of Improvement Plans*

A-128 Slope stability analysis was performed on Alternative 2B to evaluate "with project " conditions. Figure A-27 shows that the Factor of Safety for the critical failure surface is 1.46 through the revetment and 1.202 in the bluff above the revetment. This alternative was then examined for toe of slope saturation due to wave runup for a 100-year return period. The Factor of Safety for the critical failure surface through the revetment remained the same. The Factor of Safety for the critical failure surface through the bluff above the revetment decreased to 1.103 indicating that, for design storm exceedance, some repair above the revetment may be needed.

## 11. Monitoring

A-129 Monitoring of the revetment, as part of non-Federal maintenance of the structure, is required throughout the life of the project, i.e. 50 years, to assure that the revetment remains as built and is functioning properly with no flanking at each end and no stone displacement. This monitoring should be accomplished by on-site inspections regularly throughout the year. Such inspections are part of the existing operating practice for the site, and it is assumed that these will be continued throughout the project life at no additional cost to the project.



| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| 1 | 105.0 | 115.0 | .0 | 30.0 | .00 | .0 | 1 |
| 2 | 110.0 | 120.0 | .0 | 36.0 | .00 | .0 | 1 |
| 3 | 130.0 | 140.0 | .0 | 38.0 | .00 | .0 | 1 |
| 4 | 103.0 | 103.0 | .0 | 42.0 | .00 | .0 | 1 |

Figure A-27. Slope Stability Analysis for Stone Revetment Alternative “B”

# Computation Tables for Runup and Overtopping

### *Alt 2A and 2B - Runup*

| | | | | | | 1:2 slope | |
|---|---|---|---|---|---|---|---|
| Return Pe | DSWL (ft) | ds (ft) | Tp(s) | Hb | Sop | Eop | R2% (2) |
| 2 | 7.1 | 11.1 | 13.0 | 9.88 | 0.01141 | 4.682 | 35.21 |
| 5 | 8.1 | 12.1 | 13.2 | 10.77 | 0.01206 | 4.553 | 38.65 |
| 10 | 8.7 | 12.7 | 14.5 | 11.30 | 0.01049 | 4.882 | 39.83 |
| 25 | 9.5 | 13.5 | 16.1 | 12.02 | 0.00904 | 5.257 | 41.43 |
| 44 | 10.2 | 14.2 | 17.1 | 12.64 | 0.00843 | 5.445 | 43.11 |
| 50 | 10.3 | 14.3 | 17.4 | 12.73 | 0.00820 | 5.521 | 43.22 |
| 73 | 10.9 | 14.9 | 18.1 | 13.26 | 0.00790 | 5.626 | 44.75 |
| 100 | 11.5 | 15.5 | 18.7 | 13.80 | 0.00770 | 5.699 | 46.35 |
| 150 | 12.3 | 16.3 | 19.4 | 14.51 | 0.00752 | 5.765 | 48.55 |
| 200 | 12.9 | 16.9 | 20.0 | 15.04 | 0.00734 | 5.837 | 50.13 |
| 500 | 14.5 | 18.5 | 22.2 | 16.47 | 0.00652 | 6.193 | 53.70 |

(1) Use 0.89 to be consistent with Interim Report 2 Final Improvement
(2) Use Pilarczyk (1990) in CEM Fig VI-5-3 for
(3) rb is reduction due to berm width, rdh is reduction due to berm
(4) Gma is the total reduction due to berm width and height limited between 0.6
(5) Reduction in Runup due to Permeability taken from ratio of curves in Fig VI-5-12
Reductions due to roughness do not apply because surf similarity parameters

### *Alt 2C - Runup*

| | | | | | | 1:1.5 slope | |
|---|---|---|---|---|---|---|---|
| Return Pe | DSWL (ft) | ds (ft) | Tp(s) | Hb | Sop | Eop | R2% (2) |
| 2 | 7.1 | 8.1 | 13.0 | 7.37 | 0.00851 | 7.226 | 22.52 |
| 5 | 8.1 | 9.1 | 13.2 | 8.28 | 0.00927 | 6.922 | 25.80 |
| 10 | 8.7 | 9.7 | 14.5 | 8.83 | 0.00819 | 7.365 | 26.72 |
| 25 | 9.5 | 10.5 | 16.1 | 9.56 | 0.00719 | 7.860 | 27.98 |
| 44 | 10.2 | 11.2 | 17.1 | 10.19 | 0.00680 | 8.083 | 29.39 |
| 50 | 10.3 | 11.3 | 17.4 | 10.28 | 0.00663 | 8.188 | 29.43 |
| 73 | 10.9 | 11.9 | 18.1 | 10.83 | 0.00645 | 8.300 | 30.75 |
| 100 | 11.5 | 12.5 | 18.7 | 11.38 | 0.00635 | 8.367 | 32.15 |
| 150 | 12.3 | 13.3 | 19.4 | 12.10 | 0.00627 | 8.415 | 34.09 |
| 200 | 12.9 | 13.9 | 20.0 | 12.65 | 0.00617 | 8.486 | 35.45 |
| 500 | 14.5 | 15.5 | 22.2 | 14.11 | 0.00558 | 8.920 | 38.31 |

### *Existing Condition Structure - Runup*

| | | | | | | 1:1.25 slope | |
|---|---|---|---|---|---|---|---|
| Return Pe | DSWL (ft) | ds (ft) | Tp(s) | Hb | Sop | Eop | R2% (2) |
| 2 | 7.1 | 8.1 | 13.0 | 7.37 | 0.00851 | 8.672 | 20.39 |
| 5 | 8.1 | 9.1 | 13.2 | 8.28 | 0.00927 | 8.307 | 23.51 |
| 10 | 8.7 | 9.7 | 14.5 | 8.83 | 0.00819 | 8.839 | 24.12 |
| 25 | 9.5 | 10.5 | 16.1 | 9.56 | 0.00719 | 9.433 | 24.97 |
| 44 | 10.2 | 11.2 | 17.1 | 10.19 | 0.00680 | 9.701 | 26.09 |
| 50 | 10.3 | 11.3 | 17.4 | 10.28 | 0.00663 | 9.827 | 26.06 |
| 73 | 10.9 | 11.9 | 18.1 | 10.83 | 0.00645 | 9.961 | 27.16 |
| 100 | 11.5 | 12.5 | 18.7 | 11.38 | 0.00635 | 10.041 | 28.34 |
| 150 | 12.3 | 13.3 | 19.4 | 12.10 | 0.00627 | 10.099 | 30.02 |
| 200 | 12.9 | 13.9 | 20.0 | 12.65 | 0.00617 | 10.184 | 31.16 |
| 500 | 14.5 | 15.5 | 22.2 | 14.11 | 0.00558 | 10.705 | 33.27 |

### *Alt 2A - Runup On Composite*

| rb | rdh | Gma | Permea Factor | Runup (ft, |
|---|---|---|---|---|
| 0.5 | 1.00 | 1.00 | 0.7 | 33.1 |
| 0.4 | 1.00 | 1.00 | 0.7 | 36.7 |
| 0.4 | 1.00 | 1.00 | 0.7 | 38.2 |
| 0.4 | 1.00 | 1.00 | 0.7 | 40.1 |
| 0.4 | 1.00 | 1.00 | 0.7 | 42.1 |
| 0.4 | 1.00 | 1.00 | 0.7 | 42.3 |
| 0.4 | 1.00 | 1.00 | 0.7 | 44.0 |
| 0.4 | 0.89 | 0.95 | 0.7 | 44.3 |
| 0.4 | 0.74 | 0.89 | 0.7 | 44.5 |
| 0.4 | 0.64 | 0.85 | 0.7 | 44.7 |
| 0.3 | 0.44 | 0.79 | 0.7 | 45.9 |

### *Alt 2B - Runup On Composite*

| rdh | Gma | Permea Factor | Runup (ft, |
|---|---|---|---|
| 1.00 | 1.00 | 0.7 | 33.1 |
| 1.00 | 1.00 | 0.7 | 36.7 |
| 1.00 | 1.00 | 0.7 | 38.2 |
| 0.83 | 0.92 | 0.7 | 37.8 |
| 0.68 | 0.86 | 0.7 | 37.7 |
| 0.66 | 0.85 | 0.7 | 37.6 |
| 0.56 | 0.81 | 0.7 | 37.8 |
| 0.47 | 0.78 | 0.7 | 38.3 |
| 0.38 | 0.74 | 0.7 | 39.2 |
| 0.32 | 0.73 | 0.7 | 40.0 |
| 0.20 | 0.69 | 0.7 | 42.3 |

### *Alt 2C - Runup On Composite*

| rb | rdh | Gma | Permea Factor | Runup (ft, |
|---|---|---|---|---|
| 0.1 | 1.00 | 1.00 | 0.7 | 23.7 |
| 0.1 | 1.00 | 1.00 | 0.7 | 27.2 |
| 0.1 | 1.00 | 1.00 | 0.7 | 28.4 |
| 0.0 | 1.00 | 1.00 | 0.7 | 30.2 |
| 0.0 | 1.00 | 1.00 | 0.7 | 31.9 |
| 0.0 | 1.00 | 1.00 | 0.7 | 32.1 |
| 0.0 | 0.84 | 0.98 | 0.7 | 33.3 |
| 0.0 | 0.70 | 0.97 | 0.7 | 34.7 |
| 0.0 | 0.55 | 0.96 | 0.7 | 36.6 |
| 0.0 | 0.45 | 0.96 | 0.7 | 38.1 |
| 0.0 | 0.27 | 0.95 | 0.7 | 41.5 |

### *Existing Cond. - Runup On Composite*

| rb | rdh | Gma | Permea Factor | Runup (ft, |
|---|---|---|---|---|
| 0.4 | 1.00 | 1.00 | 0.7 | 22.2 |
| 0.4 | 0.71 | 0.88 | 0.7 | 23.4 |
| 0.4 | 0.55 | 0.82 | 0.7 | 23.3 |
| 0.3 | 0.39 | 0.76 | 0.7 | 23.6 |
| 0.3 | 0.29 | 0.73 | 0.7 | 24.4 |
| 0.3 | 0.28 | 0.73 | 0.7 | 24.4 |
| 0.3 | 0.21 | 0.72 | 0.7 | 25.3 |
| 0.3 | 0.16 | 0.71 | 0.7 | 26.4 |
| 0.3 | 0.11 | 0.70 | 0.7 | 27.9 |
| 0.3 | 0.08 | 0.70 | 0.7 | 29.1 |
| 0.3 | 0.03 | 0.71 | 0.7 | 32.0 |

***PEDERSON Overtopping - Plans 2B and 2A***

| | | | | | | | **Plan 2B** | | | **Plan 2A** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Crest +25 | cot a = 2 | | Crest +30 | cot a = 2 | |
| Return Per | DSWL (ft) | ds (ft) | Tp(s) | ds/gT2 | Hb/ds (1) | Hb | Ac (ft) | Rc (ft) | q(l/s/m) | Ac (ft) | Rc (ft) | q(l/s/m) |
| 2 | 7.1 | 11.1 | 13.0 | 0.00204 | 0.93 | 9.879 | 17.9 | 17.9 | 2 | 22.9 | 22.9 | 1 |
| 5 | 8.1 | 12.1 | 13.2 | 0.002157 | 0.93 | 10.769 | 16.9 | 16.9 | 4 | 21.9 | 21.9 | 1 |
| 10 | 8.7 | 12.7 | 14.5 | 0.001876 | 0.94 | 11.303 | 16.3 | 16.3 | 8 | 21.3 | 21.3 | 3 |
| 25 | 9.5 | 13.5 | 16.1 | 0.001617 | 0.94 | 12.015 | 15.5 | 15.5 | 18 | 20.5 | 20.5 | 6 |
| 44 | 10.2 | 14.2 | 17.1 | 0.001508 | 0.95 | 12.638 | 14.8 | 14.8 | 33 | 19.8 | 19.8 | 10 |
| 50 | 10.3 | 14.3 | 17.4 | 0.001467 | 0.95 | 12.727 | 14.7 | 14.7 | 37 | 19.7 | 19.7 | 11 |
| 73 | 10.9 | 14.9 | 18.1 | 0.001412 | 0.96 | 13.261 | 14.1 | 14.1 | 60 | 19.1 | 19.1 | 18 |
| 100 | 11.5 | 15.5 | 18.7 | 0.001377 | 0.96 | 13.795 | 13.5 | 13.5 | 96 | 18.5 | 18.5 | 27 |
| 150 | 12.3 | 16.3 | 19.4 | 0.001345 | 0.96 | 14.507 | 12.7 | 12.7 | 175 | 17.7 | 17.7 | 47 |
| 200 | 12.9 | 16.9 | 20.0 | 0.001312 | 0.97 | 15.041 | 12.1 | 12.1 | 280 | 17.1 | 17.1 | 70 |
| 500 | 14.5 | 18.5 | 22.2 | 0.001166 | 0.97 | 16.465 | 10.5 | 10.5 | 1060 | 15.5 | 15.5 | 223 |

Average overtopping rate calculated using Pederson (1996) for rock permeable slope fronting crown wall (bluff) and irregular waves

***Alternatives 2C and Existing Structure Using Toe at -1'NGVD***

| | | | | | | | **Plan 2C** | | | **Existing Structure** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Crest=+25 | cot a=1.5 | | Crest +18 | cot a=1.25 | |
| Return Per | DSWL (ft) | ds (ft) | Tp(s) | ds/gT2 | Hb/ds (1) | Hb | Ac (ft) | Rc (ft) | q(l/s/m) | Ac (ft) | Rc (ft) | q(l/s/m) |
| 2 | 7.1 | 8.1 | 13.0 | 0.001488 | 0.92 | 7.70 | 17.9 | 17.9 | 12 | 10.9 | 10.9 | 17 |
| 5 | 8.1 | 9.1 | 13.2 | 0.001622 | 0.92 | 8.37 | 16.9 | 16.9 | 24 | 9.9 | 9.9 | 41 |
| 10 | 8.7 | 9.7 | 14.5 | 0.001433 | 0.91 | 8.82 | 16.3 | 16.3 | 48 | 9.3 | 9.3 | 90 |
| 25 | 9.5 | 10.5 | 16.1 | 0.001258 | 0.91 | 9.57 | 15.5 | 15.5 | 120 | 8.5 | 8.5 | 266 |
| 44 | 10.2 | 11.2 | 17.1 | 0.00119 | 0.91 | 10.10 | 14.8 | 14.8 | 227 | 7.8 | 7.8 | 589 |
| 50 | 10.3 | 11.3 | 17.4 | 0.001159 | 0.91 | 10.32 | 14.7 | 14.7 | 274 | 7.7 | 7.7 | 728 |
| 73 | 10.9 | 11.9 | 18.1 | 0.001128 | 0.91 | 10.81 | 14.1 | 14.1 | 460 | 7.1 | 7.1 | 1430 |
| 100 | 11.5 | 12.5 | 18.7 | 0.00111 | 0.91 | 11.38 | 13.5 | 13.5 | 780 | 6.5 | 6.5 | 2903 |
| 150 | 12.3 | 13.3 | 19.4 | 0.001097 | 0.91 | 12.11 | 12.7 | 12.7 | 1517 | 5.7 | 5.7 | 7479 |
| 200 | 12.9 | 13.9 | 20.0 | 0.001079 | 0.91 | 12.70 | 12.1 | 12.1 | 2560 | 5.1 | 5.1 | 16221 |
| 500 | 14.5 | 15.5 | 22.2 | 0.000977 | 0.91 | 13.40 | 10.5 | 10.5 | 8073 | 3.5 | 3.5 | 130783 |

# Sub-Appendix A-1

# Historic Photographs

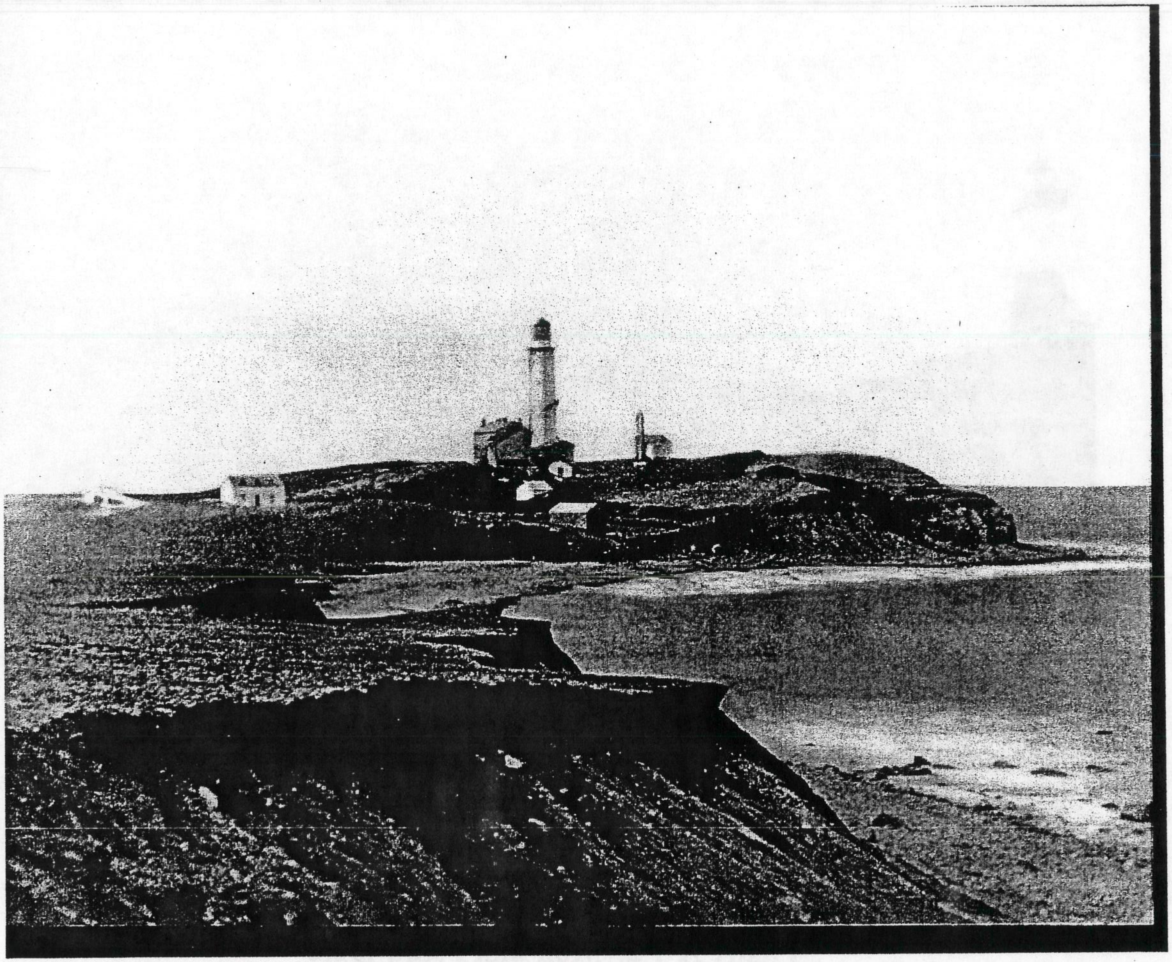


Figure A-1-1 Montauk Point, 1878.

Figure A-1-2. Montauk Point, 1928.

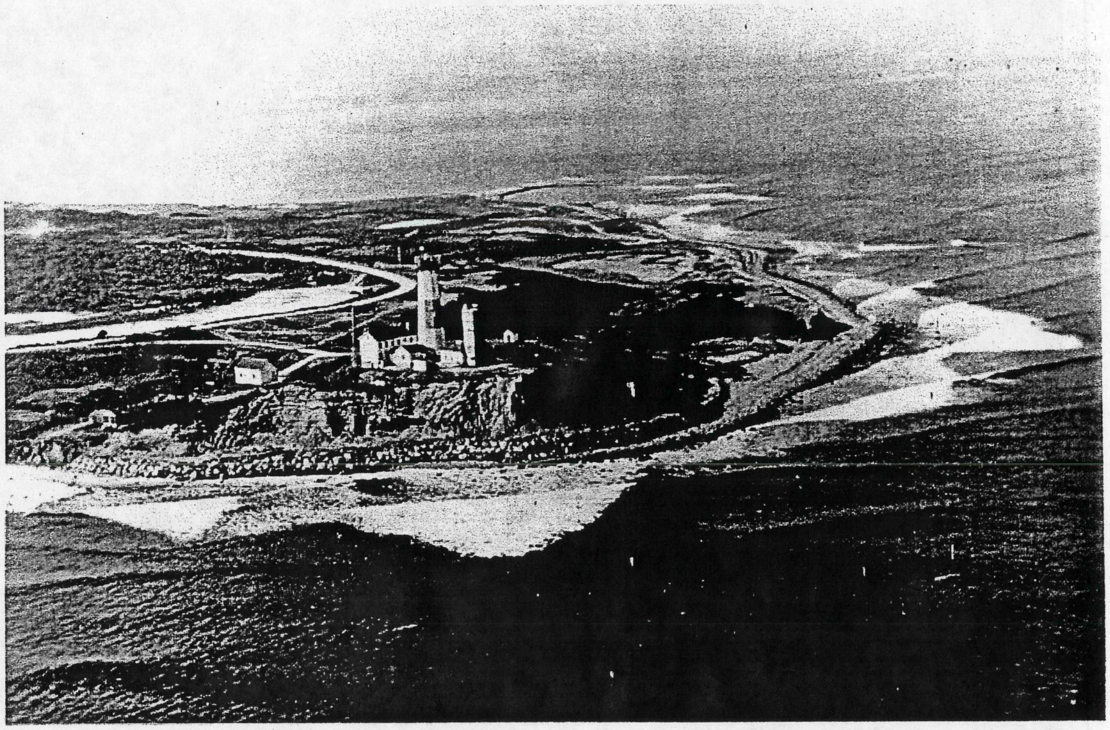


**Figure A-1-3. Montauk Point With Revetment, Circa 1946.**

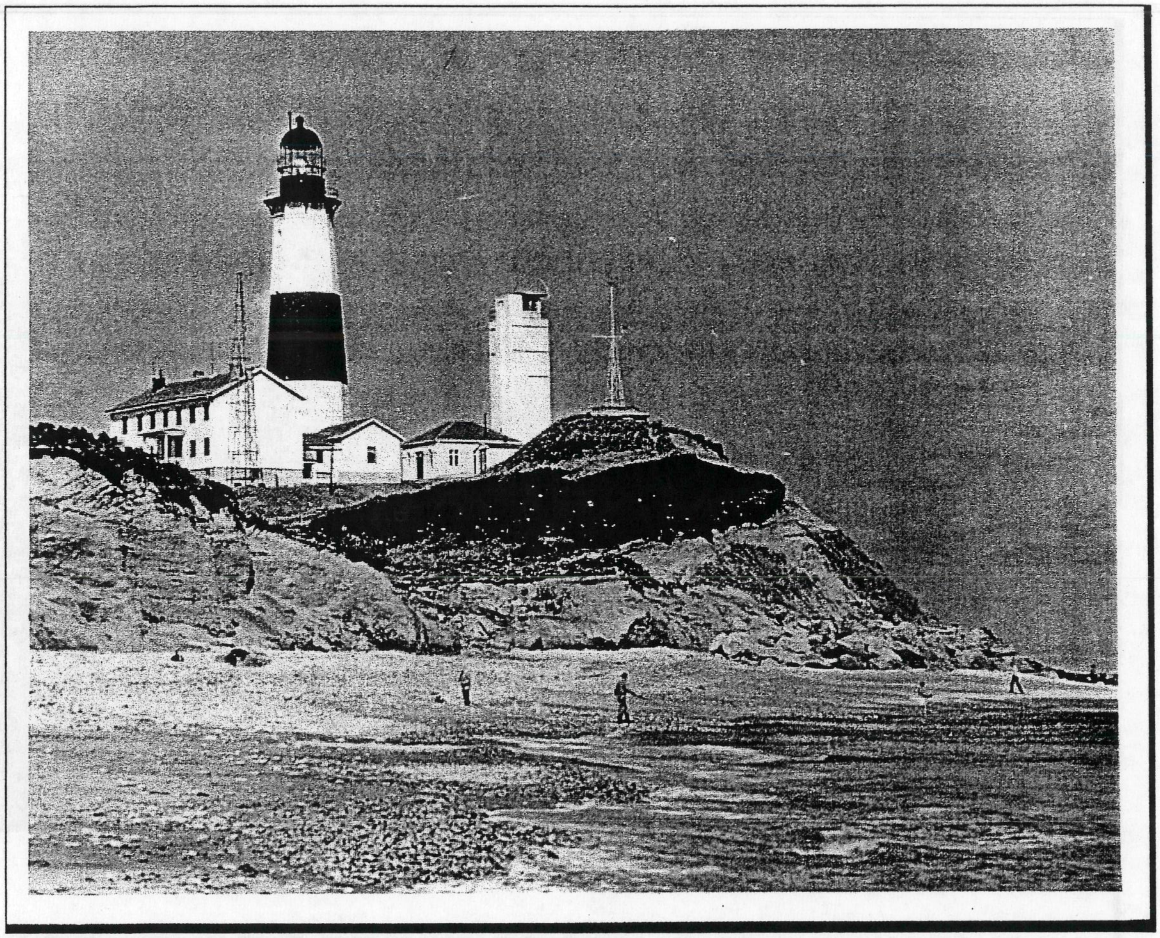
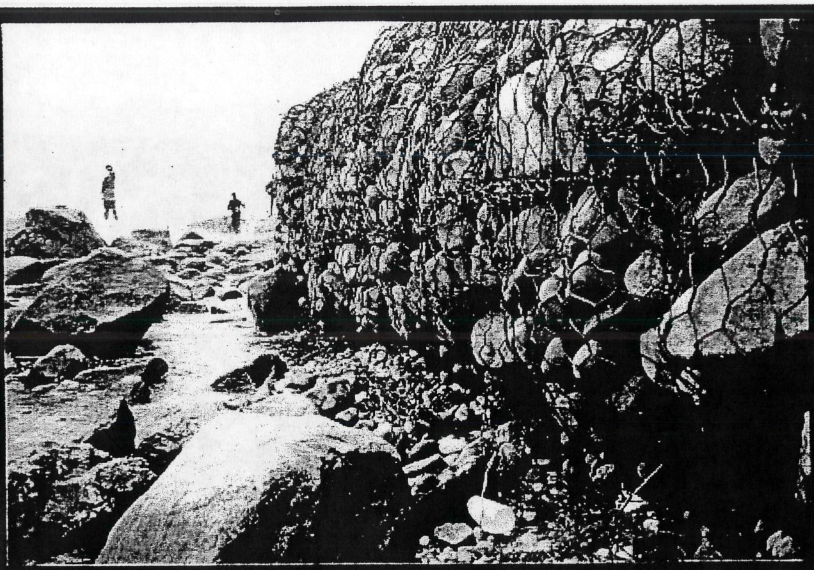


Figure A-1-4. Montauk Point, 1950s.

This 1960s aerial of Montauk Point shows the U.S.A.C.O.E. revetment and the untouched bluff face before Giorgina Reids pilot project on the eastern slope.

Figure A-1-5. Montauk Point, 1960s.



U.S. Coast Guard gabion structure before the 'Perfect Storm' of October 1991. The gabions provided ample toe protection for about 15 years. The three-day nor'easter destroyed the protection on the northern flank of the project.

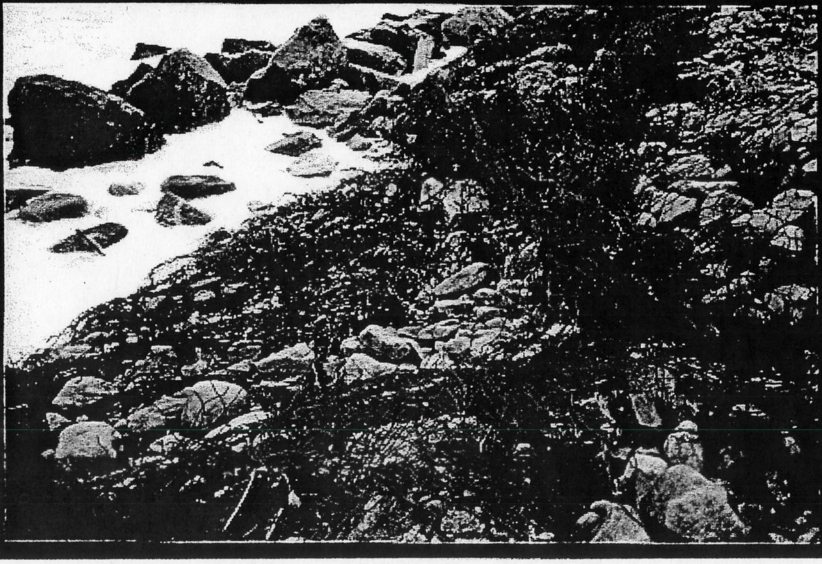
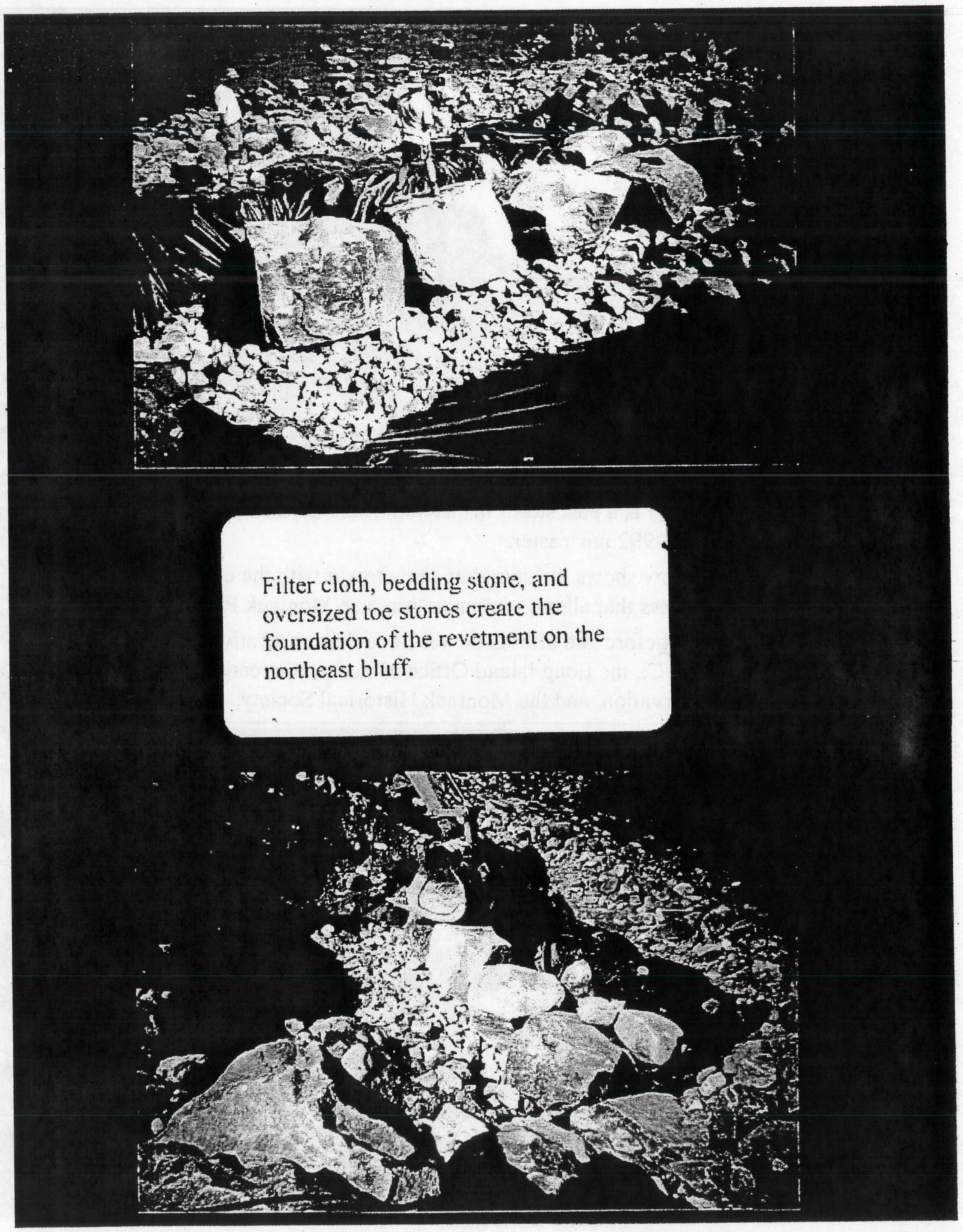
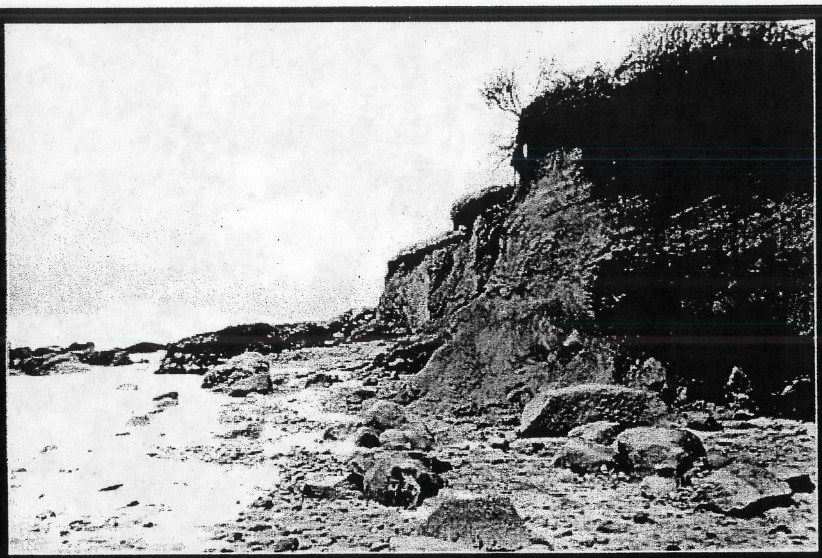


Figure A-1-6. Toe of Montauk Point before and after 1991 storm.



Filter cloth, bedding stone, and oversized toe stones create the foundation of the revetment on the northeast bluff.

Figure A-1-7. Construction of revetment, 1992.



The upper photo is a post storm inspection of the northeast bluff after the December 1992 nor'easter.

The photo below shows the completed revetment with the engineered pedestrian access that allows visitors to traverse Montauk Point.

This dramatic before and after is the result of the cooperative efforts of the N.Y.S.D.E.C., the Long Island Office of Parks, Recreation and Historic Preservation, and the Montauk Historical Society.

**Figure A-1-8. Montauk Point before and after December 1992 northeaster.**

The same camera angle thirty years later shows a stabilized toe and bluff face. The cooperative efforts of the U.S.A.C.O.E., the U.S.C.G. the N.Y.S.D.E.C., the Long Island Office of Parks, Recreation and Historic Preservation and the Montauk Historical Society have improved the erosion control protection at Montauk Point. (c 1995 Peter Paul Muller Jr.)

**Figure A-1-9. Montauk Point, 1995.**

Figure A-1-10. Montauk Point, 2001.

# Sub-Appendix A-2

# Surface Drainage Calculation Sheets

S.O. No. 23492 -001 - 0000 - 00006

Subject MONTAUK POINT LIGHTHOUSE

RUNOFF CALCULATION

Sheet No. 1 of 4

Drawing No.

Computed by EJG Checked By

Date 01/29/03

**Baker**

USING RATIONAL METHOD TO CALCULATE PEAK FLOW ANALYZE RUNOFF AND DRAIN CAPACITY FOR A 10 - YEAR RAINFALL EVENT.

$$Q = CIA$$

WHERE: Q = PEAK FLOW
C = RUNOFF CURVE NUMBER
I = RAINFALL INTENSITY
A = DRAINAGE AREA

C = 0.98 FOR CONCRETE PAVEMENT.

I = 6.7 in/hr FROM RAINFALL INTENSITY CURVE USING CONSERVATIVE TIME OF CONCENTRATION ($t_c$) OF 5 MINUTES.

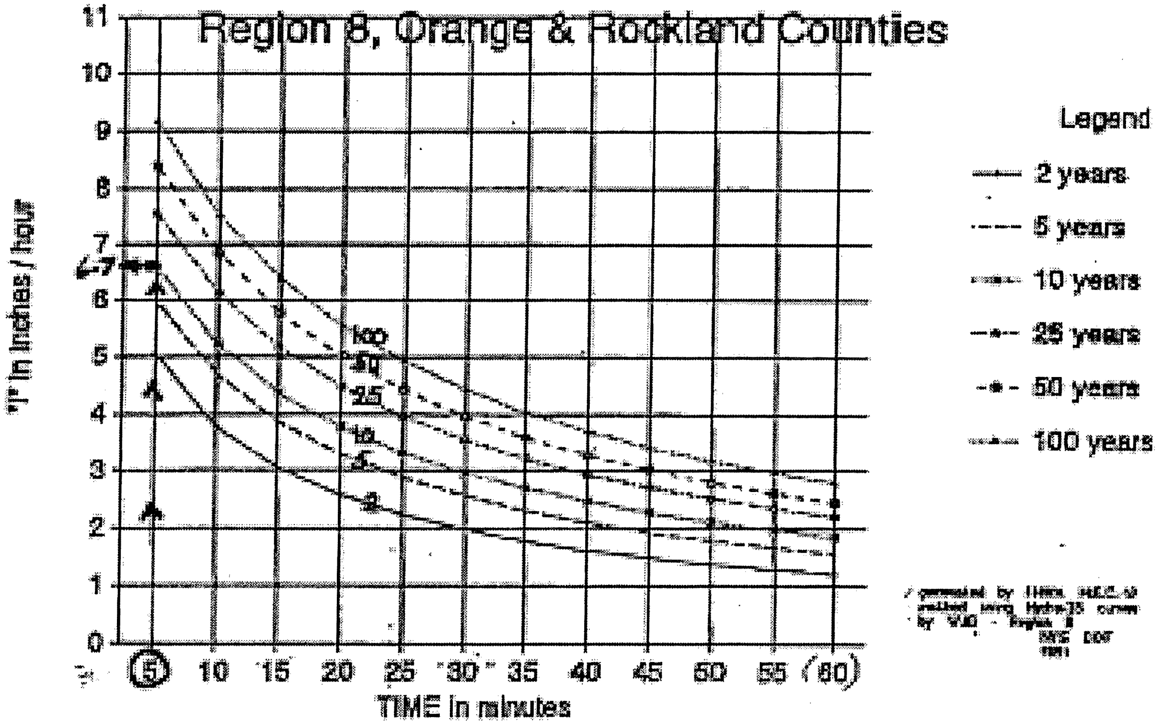
A = 0.11 ACRE AS MEASURED FROM AERIAL TOPO MAP.

$$\therefore Q = CIA = 0.98\,(6.7\ \text{in/hr})(0.11\ \text{ac})$$

$$Q = 0.72\ \text{CFS}$$

SINCE APPROXIMATE CAPACITY OF DRAIN IS 1.27 CFS (SEE SHEET 4 OF 4). THE EXISTING SLOTTED TRENCH DRAIN IS ADEQUATE WITH PROPER MAINTENANCE.

# RAINFALL INTENSITY



Region 8, Orange & Rockland Counties

generated by [illegible] method using Hydro-35 curves by [illegible] - Region 8 NYS DOT [illegible]

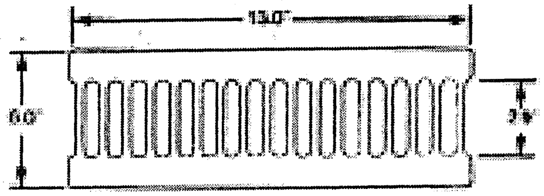
74

POLYDRAIN

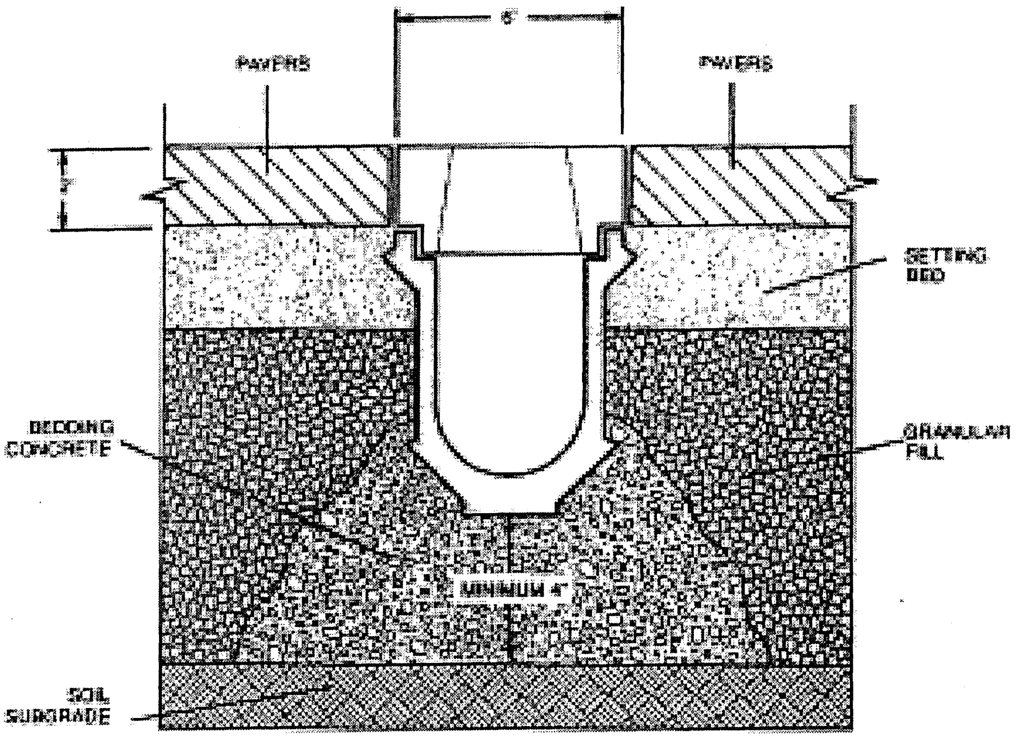
# No. 313 Polydyn Grate

* APPROX. CONFIGURATION OF EXISTING DRAIN.

PLAN VIEW



CROSS SECTIONAL VIEW



SCALE: ½"   1"

NOTE: No. 313 grate adds 2.0" to overall depth of channel.

**POLYDRAIN**

ABT, INC. P.O. Box 837/Murdock Road/Troutman, N.C. 28166
(704) 528-9806/FAX (704) 528-5178/Nationwide (800) 438-6057

TABLE 6-1
ABT, INC.
GRATING INFLOW DATA

| GRATING NUMBER | GRATE DESCRIPTION | AVG GRATE SLOT LENGTH (INCHES) | AVG. GRATE SLOT WIDTH (INCHES) | SLOT OPENINGS PER METER | PERCENT OPEN AREA | GRATE INFLOW (GPM) PER METER (GRATE INFLOW (GPM) PER FOOT) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | PERMISSIBLE HEAD | | | |
| | | | | | | 1/32" | 1/16" | 1/8" | 1/4" |
| 313 | POLYMER CONCRETE OVERLAY | 2.345 | 0.325 | 42 | 17.0 | 44 (13) | 62 (19) | 87 (27) | 123 (38) * |
| 410/412 | GALVANIZED PERFORATED | 0.250 | N/A | 765 | 19.8 | 41 (12) | 58 (18) | 81 (25) | 115 (35) |
| 420/422 | GALVANIZED SLOTTED | 3.100 | 0.351 | 37 | 21.5 | 44 (14) | 62 (19) | 88 (27) | 125 (38) |
| 430/432 | VINYL COATED | 3.070 | 0.295 | 37 | 17.5 | 36 (11) | 51 (16) | 73 (22) | 100 (32) |
| 440/442 | STAINLESS STEEL SLOTTED | 3.130 | 0.351 | 37 | 21.5 | 44 (14) | 62 (19) | 88 (27) | 125 (38) |
| 453/454 | STAINLESS STEEL (PERFORATED) | 0.250 | N/A | 765 | 19.8 | 41 (12) | 58 (18) | 81 (25) | 115 (35) |
| 502/512 | DUCTILE IRON INLAY/FRAME & GRATE | 4.031 | 0.700 | 36 | 52.4 | 110 (34) | 156 (48) | 221 (68) | 312 (96) |
| 503/513 | DUCTILE IRON INLAY/FRAME & GRATE | 3.458 | 0.702 | 36 | 44.0 | 95 (29) | 134 (41) | 190 (58) | 269 (82) |
| 504/514 | I.S. DUCTILE IRON INLAY/FRAME & GRATE | 3.433 | 0.656 | 36 | 42.2 | 91 (28) | 128 (39) | 181 (56) | 257 (79) |
| 532 | GRAY IRON GRATE & FRAME | 3.470 | 0.413 | 32 | 23.8 | 49 (15) | 70 (21) | 99 (30) | 140 (43) |
| 534 | I.S. DUCTILE IRON GRATE & GRAY IRON FRAME | 1.640 | 0.750 | 42 | 30.0 | 91 (28) | 128 (39) | 181 (56) | 257 (79) |
| 720 | FIBERGLASS (BARS 1 IN. ON CENTER) | 1.039 | 0.725 | 39 | 61.4 | 125 (38) | 179 (55) | 251 (77) | 356 (109) |
| 722 | FIBERGLASS (BARS 0.6 IN. ON CENTER) | 2.860 | 0.325 | 65 | 33.0 | 93 (28) | 131 (40) | 185 (57) | 262 (80) |
| 604/614 | 660 SERIES CATCH BASIN GRATE | 8.825 | 0.365 | 34 | 26.7 | 85 (26) | 121 (37) | 171 (52) | 242 (74) |
| 653/654 | GRAY/DUCTILE IRON GRATE FOR 8 IN. CHANNEL | 7.250 | 0.330 | 32 | 34.3 | 84 (26) | 119 (37) | 168 (52) | 238 (73) |
| 655 | FIBERGLASS (BARS 1 1/2 IN. ON CENTER) | 6.617" | 0.892 | 27 | 57.4 | 226 (69) | 320 (98) | 453 (138) | 640 (195) |
| 657 | FIBERGLASS (BARS 1.0 IN. ON CENTER) | 6.617" | 0.400 | 40 | 38.8 | 151 (46) | 214 (65) | 303 (92) | 428 (131) |
| 662 | GRAY IRON INLAY GRATE FOR 12 IN. CHANNEL | 5.910 | 1.150 | 34 | 41.8 | 245 (75) | 347 (106) | 491 (151) | 694 (211) |

* 38 gpm/lf 0.085 CFS/FT
LENGTH OF DRAIN = 15 FT.
∴ (0.085 cfs/ft) (15 ft) = 1.27 CFS

4/4

# Sub-Appendix A-3

# Boring Logs and Sieve Analyses

BKR_E (LD4)
(02/01 Baker)

# ENGINEERS FIELD BORING LOG

**BORING NO.** TB-1
**SHEET** 1 **OF** 2
**DATE: START** 08/22/01
**END** 08/22/01
**O.G. ELEV.** 68.2

**PROJECT NAME** Montauk Point Lighthouse
**LOCATION:** Montauk, NY
**STATION** ______ **OFFSET** ______ **BASELINE** ______
**COORDINATES: NORTH:** 315,217 **EAST:** 2,590,608
**INSPECTOR (SIGNED)** Eric Glisan **DRILLERS NAME/COMPANY** Carl Pedersen/Land, Air, Water Env.
**EQUIPMENT USED** Mobile B-61 HDX
**DRILLING METHODS** 4 1/4" I.D. Hollow Stem Augers w/ 1 3/8 " I.D. Split Spoon
**CASING: SIZE:** ______ **DEPTH:** ______ **WATER: DEPTH:** ______ **TIME:** ______ **DATE:** ______
**CHECKED BY:** ______ **DATE:** ______ **DEPTH:** ______ **TIME:** ______ **DATE:** ______
**S.O. NUMBER:** 23492-001-0000 **FILE:** Montauk **NOT ENCOUNTERED** ☒ **INCLINATION (DEGREES):** 0

| DEPTH (FT.) | SAMPLE NO. AND TYPE/CORE RUN | BLOWS/0.5 FT. ON SAMPLER | RECOVERY (FT.) / RQD (FT.) | RECOVERY (%) / RQD (%) | POCKET PENET or TORVANE (TSF) | USCS / AASHTO | H₂O CONTENT | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | S- 1 | 5<br>8<br>7<br>8 | 1.2 | 60 | | | | SANDY SILT (ml, a-4); tan to brown; moist; medium dense; non-plastic; homogeneous; sand is fine. | |
| 2.0 | S-2 | 7<br>5<br>5<br>4 | 1.6 | 80 | | | | 2.0<br>WELL GRADED SAND (sw, a-1-b); tan to yellow brown; moist; loose; non-plastic; homogeneous; sand is fine to medium; trace subangular gravel is coarse granite and quartz. | EL. 66.2 |
| 4.0 | S-3 | 3<br>3<br>3<br>3 | 1.0 | 50 | | | | | |
| 6.0 | S-4 | 3<br>3<br>3<br>10 | 1.3 | 65 | | | | | |
| 8.0 | S-5 | 12<br>15<br>13<br>14 | 0.7 | 35 | | | | 8.0<br>SANDY SILT (ml, a-4); light brown; moist; medium dense; non-plastic; homogeneous; sand is fine. | EL. 60.2 |
| 10.0 | A- N | | | | | | | 11.0<br>POORLY GRADED SAND WITH GRAVEL (sp, a-3); gray; dry; dense; non-plastic; homogeneous; sand is fine; subangular gravel is fine to coarse granite fragments. (glacial till) | EL. 57.2 |
| 14.0 | S- 6 | 10<br>17<br>17<br>16 | 0.4 | 20 | | | | | |
| 16.0 | A- N | | | | | | | | |
| 19.0 | | 13<br>11 | 0.3 | 15 | | | | 19.0<br>WELL GRADED SAND WITH GRAVEL (sw, a-1-b); brown; moist; medium dense; | EL. 49.2 |

Two attempts at different locations were made to advance TB-1 to the termination depth.

BKR_E (LD4)
(02/01 Baker)

# ENGINEERS FIELD BORING LOG

**BORING NO.** TB-1
**SHEET** 2 **OF** 2
**DATE: START** 08/22/01
**END** 08/22/01
**O.G. ELEV.** 68.2

**PROJECT NAME** Montauk Point Lighthouse
**LOCATION:** Montauk, NY
**STATION** ______ **OFFSET** ______ **BASELINE** ______
**COORDINATES: NORTH:** 315,217 **EAST:** 2,590,808
**INSPECTOR (SIGNED)** Eric Glisan **DRILLERS NAME/COMPANY** Carl Pedersen/Land, Air, Water Env.
**EQUIPMENT USED** Mobile B-61 HDX
**DRILLING METHODS** 4 1/4" I.D. Hollow Stem Augers w/ 1 3/8 " I.D. Split Spoon
**CASING: SIZE:** ______ **DEPTH:** ______ **WATER: DEPTH:** ______ **TIME:** ______ **DATE:** ______
**CHECKED BY:** ______ **DATE:** ______ **DEPTH:** ______ **TIME:** ______ **DATE:** ______
**S.O. NUMBER:** 23492-001-0000 **FILE:** Montauk **NOT ENCOUNTERED** ☒ **INCLINATION (DEGREES):** 0

| DEPTH (FT.) | SAMPLE NO. AND TYPE/CORE RUN | BLOWS/0.5 FT. ON SAMPLER | RECOVERY (FT.) / RQD (FT.) | RECOVERY (%) / RQD (%) | POCKET PENET or TORVANE (TSF) | USCS / AASHTO | $H_2O$ CONTENT | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 21.0 | S-7 | 13<br>10 | | | | | | non-plastic; homogeneous; sand is fine to medium; rounded gravel is fine to medium granite. (glacial till) | |
| 24.0 | A-N | | | | | | | | |
| 26.0 | S-8 | 6<br>6<br>12<br>27 | 1.1 | 55 | | | | 24.0<br>WELL GRADED SAND (sw, a-1-b); tan to yellow brown; moist; medium dense; non-plastic; homogeneous; sand is fine to medium; trace rounded gravel is medium granite. (glacial till) | EL. 44.2 |
| 29.0 | A-N | | | | | | | 27.0<br>POORLY GRADED SAND WITH GRAVEL (sp, a-1-b); yellow brown; moist; very dense; non-plastic; homogeneous; sand is fine to medium; rounded gravel is medium to coarse granite and quartz. (glacial till) | EL. 41.2 |
| 31.0 | S-9 | 24<br>27<br>50<br>42 | 1.0 | 50 | | | | | |
| | | | | | | | | 31.0<br>End of Boring at 31.0' | EL. 37.2<br>Auger Refusal |

Two attempts at different locations were made to advance TB-1 to the termination depth.

BKR_E (LD4)
(02/01 Baker)

# ENGINEERS FIELD BORING LOG

BORING NO. TB-2
SHEET 1 OF 3
DATE: START 08/22/01
END 08/23/01
O.G. ELEV. 66.5

PROJECT NAME Montauk Point Lighthouse
LOCATION: Montauk, NY
STATION ______ OFFSET ______ BASELINE ______
COORDINATES: NORTH: 315,167 EAST: 2,590,738
INSPECTOR (SIGNED) Eric Glisan DRILLERS NAME/COMPANY Carl Pedersen/Land, Air, Water Env.
EQUIPMENT USED Mobile B-61 HDX
DRILLING METHODS 4 1/4" I.D. Hollow Stem Augers w/ 1 3/8 " I.D. Split Spoon
CASING: SIZE: ______ DEPTH: ______ WATER: DEPTH: ______ TIME: ______ DATE: ______
CHECKED BY: ______ DATE: ______ DEPTH: ______ TIME: ______ DATE: ______
S.O. NUMBER: 23492-001-0000 FILE: Montauk NOT ENCOUNTERED ☒ INCLINATION (DEGREES): 0

| DEPTH (FT.) | SAMPLE NO. AND TYPE/CORE RUN | BLOWS/0.5 FT. ON SAMPLER | RECOVERY (FT.) / RQD (FT.) | RECOVERY (%) / RQD (%) | POCKET PENET or TORVANE (TSF) | USCS / AASHTO | $H_2O$ CONTENT | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 2.0 | S-1 | 5<br>8<br>9<br>7 | 1.3 | 65 | | | | SANDY SILT WITH GRAVEL (ml, a-4); brown, gray and black; moist; medium dense; non-plastic; homogeneous; sand is fine; subrounded gravel is fine to medium granite, coal, and quartz. (fill)<br>2.0 | EL. 64.5 |
| 4.0 | S-2 | 3<br>4<br>2<br>1 | 1.4 | 70 | | | | SANDY SILT (ml, a-4); tan to brown; loose to medium dense; non-plastic; homogeneous; sand is fine. | |
| 6.0 | S-3 | 3<br>3<br>4<br>6 | 1.7 | 85 | | | | | |
| 8.0 | S-4 | 4<br>6<br>8<br>9 | 1.6 | 80 | | | | | |
| 10.0 | S-5 | 4<br>5<br>5<br>9 | 1.4 | 70 | | | | | |
| 14.0 | A-N | | | | | | | 14.0 | EL. 52.5 |
| 16.0 | S-6 | 9<br>9<br>15<br>34 | 1.5 | 75 | | | | POORLY GRADED SAND WITH SILT (sp-sm, a-3); tan to yellow brown; moist; medium dense; non-plastic; homogeneous; sand is fine; trace subrounded gravel is fine to medium granite and quartz. | |
| 18.0 | S-7 | 43<br>15<br>15<br>30 | 1.2 | 60 | | | | 16.5<br>SANDY SILT (ml, a-4); light brown; moist; dense; non-plastic; homogeneous; sand is fine; trace rounded gravel is fine to coarse granite and quartz. | EL. 50.0 |
| 19.0 | A-N | | | | | | | 19.0 | EL. 47.5 |
| | | 11<br>13 | 1.2 | 60 | | | | POORLY GRADED SAND (sp, a-1-b); yellow brown; moist; medium dense to | |

Two attempts at different locations were made to advance TB-2 to the termination depth.

BKR_E (LD4)
(02/01 Baker)

# ENGINEERS FIELD BORING LOG

**BORING NO.** TB-2
**SHEET** 2 **OF** 3
**DATE: START** 08/22/01
**END** 08/23/01
**O.G. ELEV.** 66.5

**PROJECT NAME** Montauk Point Lighthouse
**LOCATION:** Montauk, NY
**STATION** ______ **OFFSET** ______ **BASELINE** ______
**COORDINATES: NORTH:** 315,167 **EAST:** 2,590,738
**INSPECTOR (SIGNED)** Eric Gilsan **DRILLERS NAME/COMPANY** Carl Pedersen/Land, Air, Water Env.
**EQUIPMENT USED** Mobile B-61 HDX
**DRILLING METHODS** 4 1/4" I.D. Hollow Stem Augers w/ 1 3/8 " I.D. Split Spoon
**CASING: SIZE:** ______ **DEPTH:** ______ **WATER: DEPTH:** ______ **TIME:** ______ **DATE:** ______
**CHECKED BY:** ______ **DATE:** ______ **DEPTH:** ______ **TIME:** ______ **DATE:** ______
**S.O. NUMBER:** 23492-001-0000 **FILE:** Montauk **NOT ENCOUNTERED** ☒ **INCLINATION (DEGREES):** 0

| DEPTH (FT.) | SAMPLE NO. AND TYPE/CORE RUN | BLOWS/0.5 FT. ON SAMPLER | RECOVERY (FT.) / RQD (FT.) | RECOVERY (%) / RQD (%) | POCKET PENET or TORVANE (TSF) | USCS / AASHTO | H₂O CONTENT | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | S-8 | 16<br>17 | | | | | | dense; non-plastic; sand is fine; trace rounded gravel is fine to medium granite. (glacial till) | |
| 21.0 | A-N | | | | | | | | |
| 24.0 | S-9 | 4<br>9<br>18<br>20 | 1.0 | 50 | | | | 25.5<br>SILTY SAND (sm, a-1-b); brown; moist; medium dense; non-plastic; homogeneous; sand is fine to medium. | EL. 41.0 |
| 26.0 | A-N | | | | | | | | |
| 29.0 | S-10 | 6<br>7<br>9<br>14 | 0.8 | 40 | | | | 29.0<br>WELL GRADED SAND (sw, a-1-b); tan to yellow brown; moist; medium dense; sand is fine to medium. | EL. 37.5 |
| 31.0 | A-N | | | | | | | | |
| 34.0 | S-11 | 15<br>16<br>22<br>25 | 1.0 | 50 | | | | 34.0<br>POORLY GRADED SAND (sp, a-3); tan; moist; dense; non-plastic; homogeneous; sand is fine. | EL. 32.5 |
| 36.0 | A-N | | | | | | | | |
| 39.0 | | 53<br>21 | 1.2 | 60 | | | | 39.0<br>ELASTIC SILT WITH SAND (ml, a-4); gray brown; moist; dense to very dense; -PL; | EL. 27.5 |

Two attempts at different locations were made to advance TB-2 to the termination depth.

BKR_E (LD4)
(02/01 Bakw)

# ENGINEERS FIELD BORING LOG

BORING NO. TB-2
SHEET 3 OF 3
DATE: START 08/22/01
END 08/23/01
O.G. ELEV. 66.5

PROJECT NAME Montauk Point Lighthouse
LOCATION: Montauk, NY
STATION ______ OFFSET ______ BASELINE ______
COORDINATES: NORTH: 315,167 EAST: 2,590,738
INSPECTOR (SIGNED) Eric Glisan DRILLERS NAME/COMPANY Carl Pedersen/Land, Air, Water Env.
EQUIPMENT USED Mobile B-61 HDX
DRILLING METHODS 4 1/4" I.D. Hollow Stem Augers w/ 1 3/8" I.D. Split Spoon
CASING: SIZE: ______ DEPTH: ______ WATER: DEPTH: ______ TIME: ______ DATE: ______
CHECKED BY: ______ DATE: ______ DEPTH: ______ TIME: ______ DATE: ______
S.O. NUMBER: 23492-001-0000 FILE: Montauk NOT ENCOUNTERED ☒ INCLINATION (DEGREES): 0

| | DEPTH (FT.) | SAMPLE NO. AND TYPE/CORE RUN | BLOWS/0.5 FT. ON SAMPLER | RECOVERY (FT.)<br>RQD (FT.) | RECOVERY (%)<br>RQD (%) | POCKET PENET or TORVANE (TSF) | USCS<br>AASHTO | $H_2O$ CONTENT | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 40 | | S-12 | 24<br>28 | | | | | | homogeneous; sand is fine. (glacial till) | |
| 41 | 41.0 | | | | | | | | | |
| 42 | | A-N | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | 44.0 | | | | | | | | | |
| | 44.6 | S-13 | 112<br>107/0.1 | 0.5 | 83 | | | | 44.3<br>POORLY GRADED GRAVEL AND SAND (gp-sp, a-1-a); gray; dry; very dense; non-plastic; homogeneous; sand is fine; angular gravel is medium to coarse granite fragments. (glacial till) | EL. 22.2 |
| 45 | | | | | | | | | | |
| 46 | | | | | | | | | | |
| 47 | | A-N | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | 49.0 | | | | | | | | | |
| | 49.5 | S-14 | 125<br>100/0.0 | 0.5 | 100 | | | | 49.5<br>End of Boring at 49.5' | EL. 17.0 |
| 50 | | | | | | | | | | |
| 51 | | | | | | | | | | |
| 52 | | | | | | | | | | |
| 53 | | | | | | | | | | |
| 54 | | | | | | | | | | |
| 55 | | | | | | | | | | |
| 56 | | | | | | | | | | |
| 57 | | | | | | | | | | |
| 58 | | | | | | | | | | |
| 59 | | | | | | | | | | |

Two attempts at different locations were made to advance TB-2 to the termination depth.

BKR_E (LD4)
(02/01 Baker)

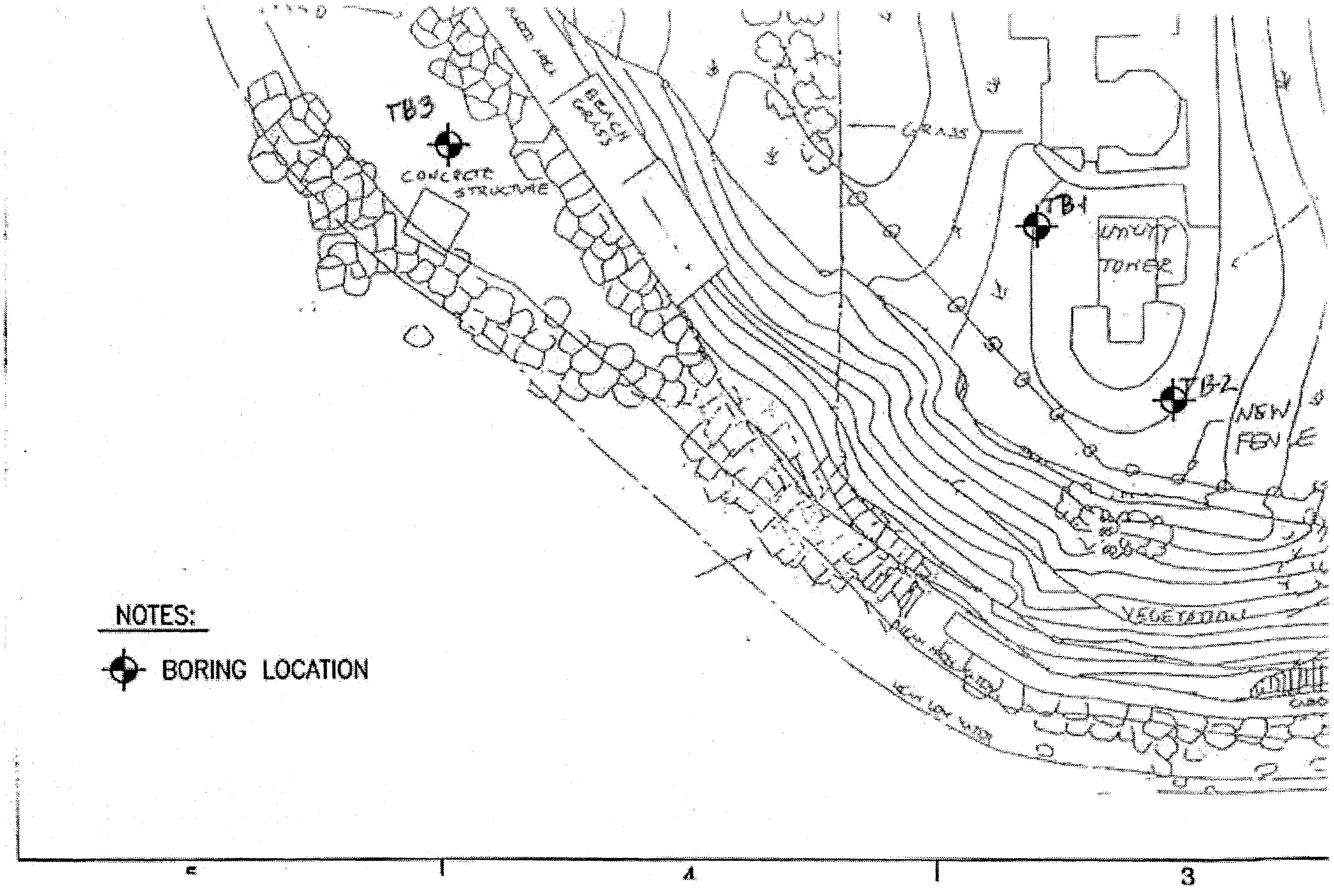
# ENGINEERS FIELD BORING LOG

**BORING NO.** TB-3
**SHEET** 1 **OF** 1
**DATE: START** 08/24/01
**END** 08/24/01
**O.G. ELEV.** 4.0

**PROJECT NAME** Montauk Point Lighthouse
**LOCATION:** Montauk, NY
**STATION** ____ **OFFSET** ____ **BASELINE** ____
**COORDINATES: NORTH:** 314,850 **EAST:** 2,590,600
**INSPECTOR (SIGNED)** Eric Glisan **DRILLERS NAME/COMPANY** Carl Pedersen/Land, Air, Water Env.
**EQUIPMENT USED** Mobile B-61 HDX
**DRILLING METHODS** 4 1/4" I.D. Hollow Stem Augers w/ 1 3/8 " I.D. Split Spoon
**CASING: SIZE:** ____ **DEPTH:** ____ **WATER: DEPTH:** 2.0 **TIME:** 0 hrs. **DATE:** 08/24/01
**CHECKED BY:** ____ **DATE:** ____ **DEPTH:** ____ **TIME:** ____ **DATE:** ____
**S.O. NUMBER:** 23492-001-0000 **FILE:** Montauk **NOT ENCOUNTERED** ☐ **INCLINATION (DEGREES):** 0

| DEPTH (FT.) | SAMPLE NO. AND TYPE/CORE RUN | BLOWS/0.5 FT. ON SAMPLER | RECOVERY (FT.) / RQD (FT.) | RECOVERY (%) / RQD (%) | POCKET PENET or TORVANE (TSF) | USCS / AASHTO | $H_2O$ CONTENT | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 2.0 | S-1 | 1<br>2<br>3<br>5 | 0.2 | 10 | | | | WELL GRADED SAND WITH GRAVEL (sw, a-1-b); black, tan, brown and gray; wet; loose; non-plastic; homogeneous; sand is fine to medium; rounded gravel is fine to coarse granite, quartz and chert. 2.0 | EL. 2.0 |
| 2.4 | S-2 | 75/0.4 | 0.2 | 50 | | | | Granite Boulder 2.4 | EL. 1.6 |
| | | | | | | | | End of Boring at 2.4' | |

Six attempts at different locations were made to advance TB-3 to the termination depth. Boulders were consistently encountered within two feet of the surface.


TB3
CONCRETE STRUCTURE
BEACH GRASS
GRASS
TB1
UTILITY TOWER
TB2
NEW FENCE
VEGETATION
NOTES:
BORING LOCATION
5
4
3

# Sub-Appendix A-4

# Design Calculations

# EROSION CONTROL FEASIBILITY STUDY
# MONTAUK POINT, NEW YORK

**PURPOSE:** To develop the Final Improvement Design

**REFERENCE:**

1. Shore Protection Manual, 1984 Edition
   Coastal Engineering Research Center
2. Coastal Engineering Manual, 2001
   Coastal and Hydraulics Laboratory
3. EM 1110-2-1614, Design of Coastal Revetments, Seawalls and Bulkheads.
4. Erosion Control Feasibility Study, Montauk Point, New York
   First Interim Submission, Final Report, 4 April 2002
5. Erosion Control Feasibility Study, Montauk Point, New York
   Coastal Analysis and Slope Stability Analysis for Improvement Plans, 28 June 2002.

**PROCEDURE:**

## Alternative Plans

The three (3) alternative plans under consideration are as follows:

| ALTERNATIVE 2A | ALTERNATIVE 2B | ALTERNATIVE 2C |
|---|---|---|
| STONE REVETMENT | STONE REVETMENT | STONE REVETMENT |
| 150-year Level of Protection | 73-year Level of Protection | 15-year Level of Protection |
| Crest Elev. +30' NGVD | Crest Elev. +25' NGVD | Crest Elev. +25' NGVD |

## Design Waves

An analysis of the design wave heights and design Stillwater levels occurring for the 5 yr., 10 yr., 25 yr., 50 yr., 73 yr., 100 yr. and 150 yr. storm events was conducted.

For this analysis, review of the wave data (Reference 4) indicated that the waves from the ESE-SSW directions with a wave period of 12 seconds have the most significant impact on the project area. Review of the existing profile data (Reference 4) indicates that the typical profiles have slopes ranging from 1V:50H to 1V:100H for an average 1V:75H.

Using these design parameters, the methodology, based on Figure 7-4 of Reference 1, was used to determine if the wave spectrum is subject to depth limitation, which would control the wave height for design purposes. For the three alternatives considered, the design wave is depth limited and is shown in Tables A-4-1 and A-4-2

For the purposes of the Feasibility Study, the annual cost of maintenance of the alternatives considered is estimated to be 0.5% of the total first cost of construction. This maintenance is associated with 0% - 5% damage levels up to the design storm. For storm exceedance damage levels to the specific design, damages increase and require major rehabilitation.

In order to determine the quantities and costs of major rehabilitation of each alternative after significant storm events, an analysis of the design wave heights and design still water levels occurring during the 2-yr., 5-yr., 10-yr., 15-yr., 25-yr., 50-yr., 73-yr., 100-yr. and 150-yr.storm events was conducted. The methodology used to determine the design wave heights was based on Figure 7-4 in the SPM (1984). The results of this analysis are presented in Table A-4- 1.

Major storm damage beginning with storm waves that are 80% of the design storm wave (to allow for a damage contingency at a lower initiation of damage) and extending to the 150-yr. storm are annualized to provide the major rehabilitation costs for each alternative.

During significant storm events, damage to the revetment alternatives is possible due to direct wave impact and due to wave runup and overtopping which erodes the bank above the revetment and undermines the revetment.

To evaluate the potential damage to the revetment alternatives from direct wave attack, the methodology presented in Table 7-9 in the SPM (1984) was used which gives $H/H_{D=0}$ as a function of cover-layer damage and type of armor unit; where H is the maximum wave height at the structure toe for a specific storm event and $H_{D=0}$ is the design wave height corresponding to 0- to 5-percent damage. To establish damages from wave impacts, the percentage of damage from Table 7-9 for a specific storm event is multiplied by the first cost of the alternative. It is noted, to capture the true cost of each operation under major rehabilitation, the mob & demob and E & D and construction management costs are initially separated out prior to prorating the percent damages and then added back in to reflect pertinent mob & demob, E and D and construction management which should not be prorated. These results are shown in Table C-8 of Appendix C.

To evaluate the potential damage to the revetment alternatives from wave runup and overtopping, the methodology presented in Table VI-5-6 in the Coastal Engineering Manual (CEM) Chapter VI-5 was used which gives critical values of average overtopping discharge (q, in litres/s per m) as a function of damage to structures. For this analysis, percent damage levels were assigned to the overtopping discharge (q, in litres/s per m) as shown in Table 3. The percentage of damage to the revetment from wave overtopping from Table 3 for a specific storm event is added to the percentage damage from wave impacts. The maximum damage for each damage mechanism is 50%. The results of this analysis are presented in Table C-8 of Appendix C.

The total revetment damage costs resulting from direct wave impact and runup/overtopping for significant storm events for each of the alternatives are presented in Table C-8 of Appendix C. The average annual major rehabilitation costs for each alternative are developed using a damage frequency analysis. Tables C-4 through C-7 present a summary in which the repair costs associated with each storm frequency are used to derive an average annual repair cost for major rehabilitation.

Future impacts on annual maintenance costs and major rehabilitation costs due to sea level rise are considered to be minor given the predicted rate of sea level rise of 0.014 feet per year. For example, at this rate at the mid-point of the project life, 25 years, the rise in water level would be 0.35 feet. Without sea level rise, the proposed design wave for Alternative 2B is H 73 Yr. = 13.4' calculated using Figure 7-4 (SPM 1984) and DSWL 73 Yr = +10.94' NGVD which results in a design armor stone weight of 12.6 tons.

Adding the sea level rise to the DSWL 73 Yr = +10.94' NGVD would result in DSWL 73 Yr + Sea Level Rise = 11.3' NGVD which would result in a design wave for this structure, H 73 Yr. +

Sea Level Rise = 13.8'. This design wave results in a design armor stone weight of 13.8 tons or a 9.5% increase in armor stone weight due to sea level rise through the mid-point of the project life.

Given the small predicted annual increase in sea level rise in the project area, and the standard construction specification for the armor stone to range from 0.75 W to 1.25 W (W = 12.6 tons) with about 50 percent of the individual stones weighing more than W, increasing the armor stone weight to account for future sea level rise is not considered to be warranted.

# DESIGN WAVE HEIGHTS PER STORM EVENT

## per SPM Figure 7-4

| | | 5-YR. | 10-YR. | 25-YR. | 50-YR. | **73-YR.** | 100-YR. | **150-YR.** |
|---|---|---|---|---|---|---|---|---|
| **ALT 2A** | | | | | | | | |
| DSWL | | 8.10 | 8.69 | 9.52 | 10.34 | 10.94 | 11.51 | 12.31 |
| d @ DSWL | | -4.00 | -4.00 | -4.00 | -4.00 | -4.00 | -4.00 | -4.00 |
| ds | | 12.10 | 12.69 | 13.52 | 14.34 | 14.94 | 15.51 | 16.31 |
| $ds/gT^2$ | | 0.00261 | 0.00274 | 0.00292 | 0.00309 | 0.00322 | 0.00334 | 0.00352 |
| Hb/ds | | 0.91 | 0.91 | 0.91 | 0.90 | 0.90 | 0.90 | 0.90 |
| $H_{Storm\ Event}$ (ft.) | | 10.95 | 11.48 | 12.24 | 12.91 | 13.37 | 13.88 | **14.60** |
| | | | | | | | | |
| **ALT 2B** | | | | | | | | |
| DSWL | | 8.10 | 8.69 | 9.52 | 10.34 | 10.94 | 11.51 | 12.31 |
| d @ DSWL | | -4.00 | -4.00 | -4.00 | -4.00 | -4.00 | -4.00 | -4.00 |
| ds | | 12.10 | 12.69 | 13.52 | 14.34 | 14.94 | 15.51 | 16.31 |
| $ds/gT^2$ | | 0.00261 | 0.00274 | 0.00292 | 0.00309 | 0.00322 | 0.00334 | 0.00352 |
| Hb/ds | | 0.91 | 0.91 | 0.91 | 0.90 | 0.90 | 0.90 | 0.90 |
| $H_{Storm\ Event}$ (ft.) | | 10.95 | 11.48 | 12.24 | 12.91 | **13.37** | 13.88 | 14.60 |
| | | | | | | | | |
| **ALT 2C** | | | | | | | | |
| DSWL | | 8.10 | 8.69 | 9.52 | 10.34 | 10.94 | 11.51 | 12.31 |
| d @ DSWL | | -1.00 | -1.00 | -1.00 | -1.00 | -1.00 | -1.00 | -1.00 |
| ds | | 9.10 | 9.69 | 10.52 | 11.34 | 11.94 | 12.51 | 13.31 |
| $ds/gT^2$ | | 0.00196 | 0.00209 | 0.00227 | 0.00245 | 0.00258 | 0.00270 | 0.00287 |
| Hb/ds | | 0.92 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| $H_{Storm\ Event}$ (ft.) | | 8.37 | 8.82 | 9.57 | 10.32 | 10.81 | 11.38 | 12.11 |
| | | | | | | | | |
| Breaker Travel Distance, $x_p$ | | | | | | | | |
| m = | 0.0667 | 37.0458153 | 38.8521815 | 41.3933407 | 43.6613207 | 45.2354422 | 46.9612924 | 49.3835383 |
| 0.052083333 | | | | | | | | |
| m = | 0.05 | 38.7373938 | 40.6262419 | 43.283435 | 45.654975 | 47.3009738 | 49.1056294 | 51.6384794 |
| 0.055555556 | | | | | | | | |

A summary of the design conditions for each of the final improvement plans is presented in Table A-4-2.

## TABLE A-4-2
## DESIGN CONDITIONS

| Final Improvement Plan | DSWL, Ft. NGVD | Design Wave, Ft. |
|---|---|---|
| Alternative 2A<br>Stone Revetment<br>150-year Level of Protection<br>Crest Elev. +30' NGVD | +12.31 | 14.6 |
| Alternative 2B<br>Stone Revetment<br>73-year Level of Protection<br>Crest Elev. +25' NGVD | +10.94 | 13.4 |
| Alternative 2C<br>Stone Revetment<br>15-year Level of Protection<br>Crest Elev. +25' NGVD | +9.05 | 9.2 |

### Armor Size Calculation

Hudson's stability formula was used to determine the required armor stone size using the ACES 1.07 breakwater design module with the following equation:

$$\mathbf{W} = \frac{\mathbf{W_r\, H^3}}{\mathbf{K_D\, (S_r - 1)^3\, COT@}}$$

where:

**W** = weight (lb.) of individual armor unit in the primary cover layer
**Wr** = unit weight of armor rock (165 lb/cubic ft)
**H** = design wave height
**$S_r$** = specific gravity of armor unit relative to water (2.58)
**COT@** = angle of structure side slope measured from the horizontal (degrees)
**$K_D$** = stability coefficient that varies primarily with the shape of the armor units, roughness of the armor unit surface, sharpness of edges, and degree of interlocking obtained in placement. $K_D$ values are selected for a breaking wave condition based on depths and slopes at the structure; $K_D = 2.0$

## Armor Thickness

The thickness of the armor layer was computed using ACES 107 – Breakwater Design Using Hudson and Related Equations. The equation used in ACES 1.07 is:

$$\mathbf{r = nK_d(W_a/W_r)^{1/3}}$$

where:

$\mathbf{r}$ = average thickness (ft)
$\mathbf{n}$ = number of layers (2)
$\mathbf{W_a}$ = weight of the individual armor unit
$\mathbf{W_r}$ = unit weight of the armor unit (165 lb./cubic foot)
$\mathbf{K_d}$ = layer thickness coefficient (1.0)

The recommended armor stone sizes and thickness determined using ACES 1.07 for each of the final alternative plans are presented in Table A-4-3.

## TABLE A-4-3

## ARMOR STONE SIZES AND THICKNESS
## (ACES 1.07 Output)

```
ALTERNATIVE 2A - 150-YR. DESIGN LEVEL

                      Armor Weight/Mass (Wr):       165.00 lb/ft^3
                            Wave Height (H)  :       14.60 ft
                  Stability Coefficient (Kd):         2.00
                      Layer Coefficient (K^):         1.02
                       Average Porosity (P)  :       38.00 %
           Cotangent of Structure Slope      :         2.00
 No. Units Comprising Layer Thickness (n)  :          2.00
                Single Armor Unit Weight (W)  :       16.31 tons
                     Minimum Crest Width (B)  :       17.83 ft
                 Average Layer Thickness (r)  :       11.89 ft
              No. of Single Armor Units (Nr):         37.26 Per 1000 ft^2


ALTERNATIVE 2B - 73-YR. DESIGN LEVEL

                      Armor Weight/Mass (Wr):       165.00 lb/ft^3
                            Wave Height (H)  :       13.40 ft
                  Stability Coefficient (Kd):         2.00
                      Layer Coefficient (K^):         1.02
                       Average Porosity (P)  :       38.00 %
           Cotangent of Structure Slope      :         2.00
 No. Units Comprising Layer Thickness (n)  :          2.00
                Single Armor Unit Weight (W)  :       12.61 tons
                     Minimum Crest Width (B)  :       16.36 ft
                 Average Layer Thickness (r)  :       10.91 ft
              No. of Single Armor Units (Nr):         44.24 Per 1000 ft^2


ALTERNATIVE 2C - 15-YR. DESIGN LEVEL

                      Armor Weight/Mass (Wr):       165.00 lb/ft^3
                            Wave Height (H)  :         9.20 ft
                  Stability Coefficient (Kd):         2.00
                      Layer Coefficient (K^):         1.02
                       Average Porosity (P)  :       38.00 %
           Cotangent of Structure Slope      :         1.50
 No. Units Comprising Layer Thickness (n)  :          2.00
                Single Armor Unit Weight (W)  :         5.4 tons
                     Minimum Crest Width (B)  :       13.71 ft (a)
                 Average Layer Thickness (r)  :        9.0  ft (a)
              No. of Single Armor Units (Nr):         63.02 Per 1000 ft^2  (a)
```

(a) Note - The minimum required armor stone size is 5.4 tons, however, since this alternative involves removal of armor stones in the 5 to 10 ton range which can be reused, the average layer thickness is increased to that associated with a 7.5 ton average armor stone.

### Underlayer and Bedding Layers

The recommended underlayer and bedding layer for each of the final improvement plans are presented in Table A-4-4.

**TABLE A-4-4**
**UNDERLAYER AND BEDDING LAYER**

| **Alternative Plan** | **Underlayer, W/10** | | **Bedding Layer** | |
|---|---|---|---|---|
| | Weight (Tons) | Thickness (Ft.) | Weight (Lbs) | Thickness (Ft.) |
| Alternative 2A | 1.6 | 5.4 | 100 | 2.0 |
| Alternative 2B | 1.3 | 5.0 | 100 | 2.0 |
| Alternative 2C | 0.75 | 4.2 | 100 | 2.0 |

### Toe Design

In Alternatives 2A and 2B, a heavily embedded toe is incorporated to protect against breaking waves and scour at the toe of the structure. The embedded toe is designed in accordance with EM 1110-2-1614 entitled "Design of Coastal Revetments, Seawalls and Bulkheads (Reference 3). Filter cloth and sublayers are specified in accordance with standard design procedures. For Alternative 2C, the toe will be built up from the existing toe with large stone and will not be an excavated buried toe.

# Sub-Appendix A-5

# Two-Dimensional Physical Model Study And Interview with Greg Donahue

## Introduction

Work done to date on the Montauk Point Feasibility Study has provided numerical estimates of the separate impacts to the existing stone revetment. Such impacts include storm waves, scour and overtopping. No satisfactory numerical modeling methodology exists for combining the effects of these damage mechanisms as they occur in nature. In order to more fully define the without-project condition, an estimate of conditions leading to failure of the existing structure is needed.

This report presents the results of a two-dimensional physical model test of the revetment presently in place at Montauk Point, Long Island, New York. The objective of this work is to better define the failure mechanisms and criteria for the existing revetment at Montauk Point. Failure criteria are expressed in terms of combinations of water level and wave conditions. Failure is assumed to occur when the structure is damaged to about the 25% level. Such a damage level would render the structure susceptible to catastrophic failure in future storm events. The tests were conducted at the University of Delaware Center for Applied Coastal Engineering wave test flume.

To prepare the model test conditions, such as the seafloor and revetment cross-section, the following activities were performed:

- Existing topographic and bathymetric data were reviewed to identify worst-case cross sections for testing.
- A field visit was performed to interview Mr. Greg Donohue, Erosion Control Director, Montauk Point Lighthouse Museum, and to inspect the existing stone revetment structure. The interview and inspection yielded information about the layering of the stone in the structure, the characteristics of the stone, the size distribution of the stone, and more accurate information about the elevations of the stone. A cross section was identified for testing, submitted to the New York District for approval, and then constructed in the wave test facility.

## Model Setup

The revetment model was constructed in the University of Delaware Center for Applied Coastal Engineering wave test flume. The wave tank is approximately 8 feet wide, 5 feet deep, and 120 feet long. It is equipped with a hydraulic wave generation system capable of creating realistic irregular wave trains of specified wave height and wave period. The wave tank is divided into two four-foot wide sections. The revetment model was built in one of the sections, while the other section was left open to provide energy dissipation on a rough stone beach.

The model scale of 1:30.48 was selected to insure that the offshore design wave could be developed by the wave generator. The scale factor of 30.48 was used because it is the ratio of one centimeter in the model to one foot in the prototype. This makes it convenient for constructing the model and for converting model measurements in centimeters into prototype conditions in feet.

A floor was constructed in the flume with a 1:50 slope to match the natural offshore bottom slope at Montauk Point. The slope was approximately 40 feet long (1200 cm in the model, or 1200 feet in prototype), running from –4.8 feet NGVD at the toe of the revetment to –28.8 feet NGVD at the seaward end of the slope. With elevated storm water levels, the seaward end of the slope was at a depth of about 10 meters, matching the water depth at which the design waves for the project have been specified.

The model revetment was constructed as shown in Figure A-5-1. This section was developed based on field measurements, discussions with Mr. Greg Donohue, and a design section provided by Mr. Donohue. The selected section has an over-steepened front slope. This section faces approximately due east, and was originally constructed at Montauk Point in the Federal Phase 2 project in the fall of 1992 and spring of 1993.

Special care was used to obtain an accurate simulation of armor stone size, shape, and constructed interlocking. Several sources of quarry stones were used in an attempt to obtain crushed stones with shapes similar to the quarry stones used in the construction of the revetment. The prototype stones are very blocky, with flat faces, and are fit closely in a single layer on the revetment. Crushed stones for the model were hand picked to obtain the most blocky and flat-faced stones for modeling purposes. After constructing a trial section in the wave flume, it was decided that the crushed stones did not adequately simulate the quarried stone used to construct the revetment. Therefore, more regular blocky, flat faced stones were obtained for the model by taking cut sheets of slate, breaking them into appropriate sized blocks, and tumbling them in a cement mixer to round the corners. This resulted in modeled armor stones closely matching the revetment armor stones in shape, weight, and interlocking characteristics.

The model revetment, illustrated in Figures A-5-2 and A-5-3, was carefully constructed so that the model represented realistic conditions, including imperfect stone placement, which could lead to local stone removal by wave attack or runup. A number of stones were carefully placed so that they were not jammed in by their neighbors, as observed in the prototype cross-section. Such weak spots could make it easier for the stones to be lifted from the slope. A few stones on the revetment berm were left unsupported on the seaward edge to examine the possibility of that failure due to non-interlocking. Several stones on the berm were also left unsupported at the rear of the berm (landward edge) to examine the stability of the berm if the support were removed from the bluff area by erosion.

Waves were measured in front of the revetment at 60, 160, and 240 prototype feet from the toe of the revetment. The offshore wave height was measured at the seaward end of the slope in about 33 feet of water. At this location, three gauges were used to provide data for the determination of the onshore component of the wave and the offshore component due to reflections from the revetment.

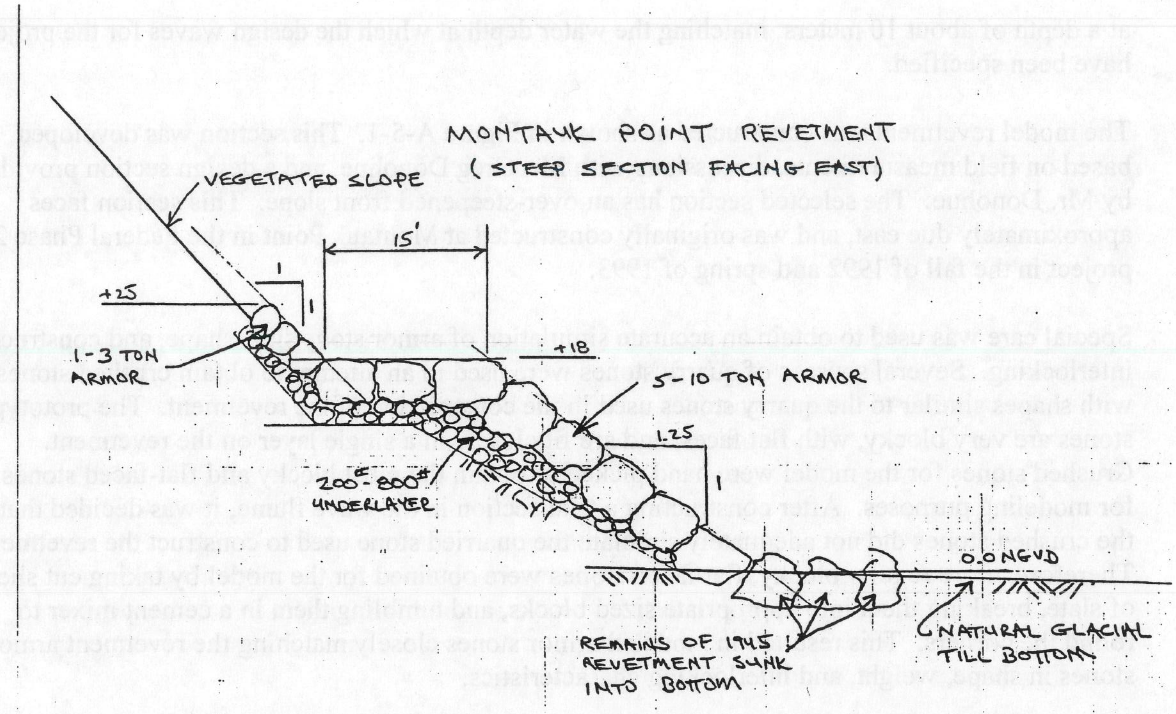


Figure A-5-1. Existing revetment cross-section used for physical modeling.

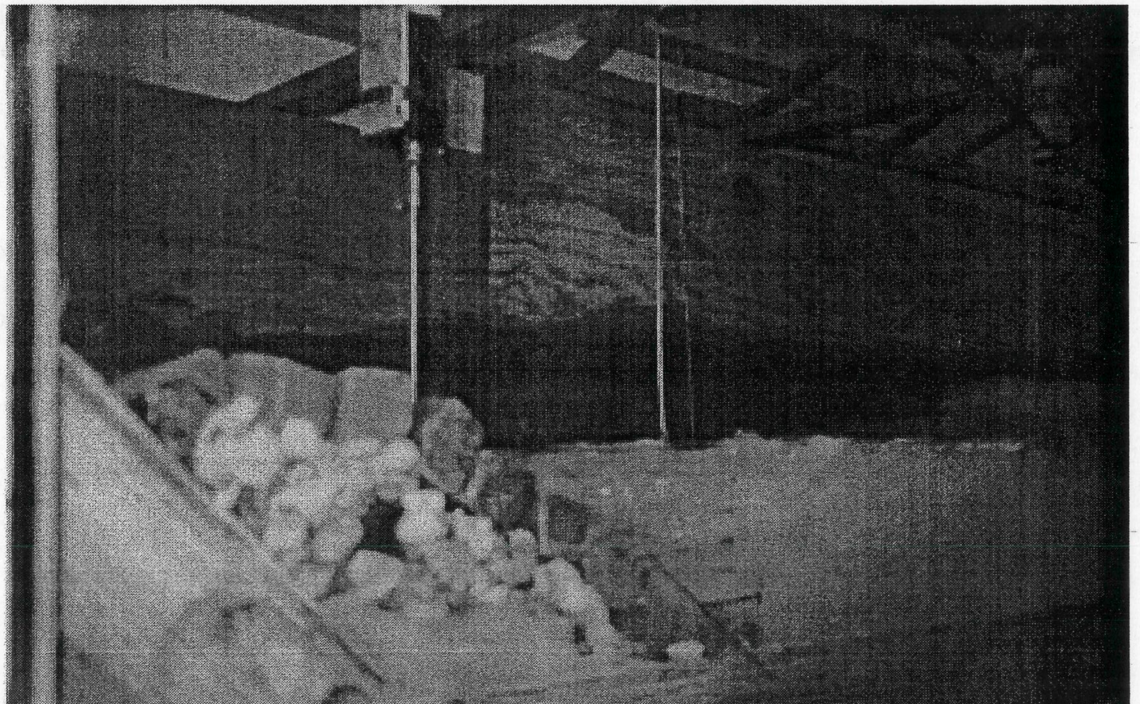


Figure A-5-2. Photograph of the cross-section of the two-dimensional model.

**Figure A-5-3. Plan view of revetment in two-dimensional model**

## Test Results

A total of 16 cases were tested in the revetment model tests, examining a range of events that encompassed the 2-year to the 100-year conditions (Table A-5-1). Water surface elevations were varied from +5.2 feet to +11.2 feet NGVD to represent the full range of possible storm water levels. Note that the water level locally was further elevated at the structure by additional wave setup; however the wave setup in the model is less than occurs in the prototype because the size of the test basin is much smaller. The total water level including wave setup in the model was targeted to be as close as possible to that estimated to occur in nature (Table A-5-1). Wave periods of 13, 15, and 18 seconds (prototype peak spectral period) were used to cover the range of expected storm wave periods. Wave heights at the offshore measurement position, in approximately 33 feet of water, ranged from about 14 to 17 feet (significant incident wave height). At the offshore measurement location, the larger waves in the wave train were observed to be breaking, indicating that they were being depth limited at that location.

**Table A-5-1. Extreme storm statistics produced by the Fire Island to Motnauk Point Reformulatin Study**

| Return Period (yrs) | Significant Wave Height (ft) | Storm Stage (ft, NGVD) | Storm Stage plus Wave Setup (ft, NGVD) | Max. Breaker Height (ft) (-32.8 ft NGVD contour) | Design Significant Wave Height (ft) -32.8 ft depth | Wave Period (s) |
|---|---|---|---|---|---|---|
| 2 | 17.13 | 4.53 | 7.07 | 29.12 | 16.18 | 13.00 |
| 5 | 20.57 | 5.38 | 8.10 | 29.79 | 16.55 | 13.15 |
| 10 | 21.03 | 5.81 | 8.69 | 30.12 | 16.73 | 14.48 |
| 25 | 21.56 | 6.33 | 9.52 | 30.53 | 16.96 | 16.13 |
| 44 | 21.99 | 6.77 | 10.16 | 30.87 | 17.15 | 17.10 |
| 50 | 22.11 | 6.92 | 10.34 | 30.99 | 17.22 | 17.37 |
| 73 | 22.49 | 7.42 | 10.94 | 31.38 | 17.43 | 18.11 |
| 100 | 22.83 | 7.94 | 11.51 | 31.78 | 17.66 | 18.66 |

The first 11 tests examined the existing revetment for the full range of water levels and wave periods. Test 12 examined the fate of a layer of sand placed in front of the structure toe under storm conditions. The final tests examined a larger revetment, similar to that proposed for construction. In these final tests, the stone sizes were not carefully simulated for stability testing. These tests examined the effect of the larger revetment on runup and wave reflection. The test conditions are shown in the Table A-5-2.

**Existing Revetment Tests**

For the 5.2 ft NGVD water level, corresponding to a storm with a return period of <2 years (when wave setup is added by the waves), the maximum runup was about +35 feet on the bluff behind the revetment. About 5% of waves overtopped the revetment berm. No movement of armor stones or stones on the bluff above the berm occurred.

**Table A-5-2. Tests cases examined in the physical model.**

| TEST NO. | WATER LEVEL | WAVE SETUP (measured) | WATER LEVEL (w/setup) | Approx. RETURN PERIOD | WAVE PERIOD | OFFSHORE WAVE HT. (model) | MAX. WAVE@TOE. (measured) | TEST CONDITION |
|---|---|---|---|---|---|---|---|---|
| | (ft, NGVD) | (ft) | (ft, NGVD) | (yr) | (sec) | (Hs, ft) | (ft) | |
| 1 | 5.2 | 0.1 | 5.2 | <2 | 13.0 | 14.2 | 13.6 | Existing Revetment |
| 2 | 5.2 | 0.1 | 5.2 | <2 | 15.0 | 14.9 | 14.0 | Existing Revetment |
| 3 | 5.2 | 0.1 | 5.2 | <2 | 18.1 | 17.1 | 15.6 | Existing Revetment |
| 4 | 7.2 | 0.3 | 7.5 | 3 | 13.0 | 14.3 | 15.4 | Existing Revetment |
| 5 | 7.2 | 0.3 | 7.5 | 3 | 15.0 | 14.9 | 16.0 | Existing Revetment |
| 6 | 7.2 | 0.3 | 7.5 | 3 | 18.1 | 17.1 | 16.9 | Existing Revetment |
| 7 | 9.7 | 1.2 | 10.9 | 73 | 13.0 | 14.4 | 15.6 | Existing Revetment |
| 8 | 9.7 | 1.2 | 10.2 | 73 | 15.0 | 14.6 | 16.9 | Existing Revetment |
| 9 | 9.7 | 1.2 | 10.2 | 73 | 18.1 | 16.8 | 19.0 | Existing Revetment |
| 10 | 11.2 | 1.2 | 12.4 | >100 | 18.1 | 16.7 | 21.6 | Existing Revetment |
| 11 | 8.2 | 0.5 | 8.7 | 10 | 18.1 | 16.9 | 16.4 | Existing Revetment |
| 12 | 8.2 | 0.5 | 8.7 | 10 | 18.1 | 17.0 | 18.5 | Sand Layer at Toe |
| 13 | 5.2 | 0.1 | 5.2 | <2 | 18.1 | 16.3 | 15.4 | Larger Revetment |
| 14 | 7.2 | 0.3 | 7.5 | 3 | 18.1 | 16.4 | 15.3 | Larger Revetment |
| 15 | 8.2 | 0.5 | 8.7 | 10 | 18.1 | 17.0 | 16.9 | Larger Revetment |
| 16 | 9.7 | 1.2 | 10.9 | 73 | 18.1 | 16.3 | 18.6 | Larger Revetment |

For the +7.2 foot water level, corresponding to a storm with a return period in the 3-year range (when wave setup is added by the waves), the maximum runup was to approximately +45 feet on the bluff. About 35% of waves overtopped the revetment berm. The stones armoring the bluff above the berm (the splash protection) were displaced and carried down onto the berm.

For the +9.7 foot water level, which corresponds to a storm return period of approximately 73 years (when wave setup is added by the waves), the maximum runup elevation exceeded +50 feet on the bluff. Over 90% of all waves overtopped the revetment berm. One or two of the smaller unsupported armor stones on the seaward edge of the berm were removed by waves. This was not considered a failure of the structure but just a local repositioning of unsupported smaller stones. Unsupported stones on the back edge of the berm were move landward by waves. The movement of these stones did not lead to unraveling of the armor layer.

For the +11.2 foot MLLW water level, which corresponds to a storm return period exceeding 100 years, the runup again exceeded +50 feet on the bluff. All of the waves overtopped the berm. The armor layer began failing about one-half way through the test, and quickly unraveled, leading to complete failure of the revetment section within about 30 minutes prototype time.

Figure A-5-4 compares the percent of waves which overtopped the berm and impacted the unprotected back berm as a function of storm return period. The figure indicates that at about a 10-year return period, 40% of the runups exceed the berm and would erode the bluff. At that frequency, the bluff would be eroded by consecutive waves during the highest parts of the wave groups, leading to flow rates that would likely undermine the berm, leading to revetment failure from the top down.

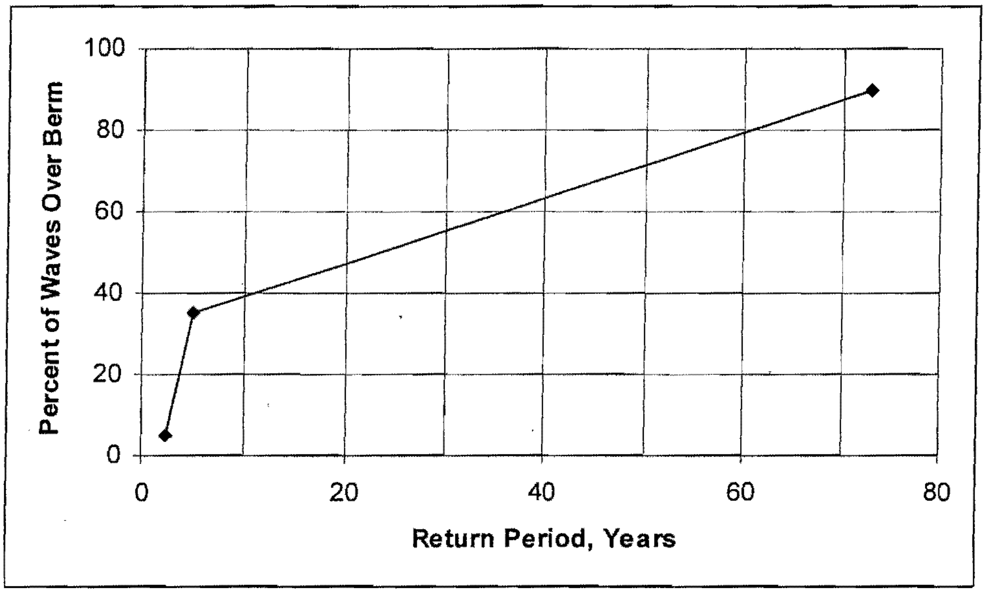


**Figure A-5-4. Runup on bluff versus storm return period**

### Sand Layer Test

The sand layer test consisted of spreading a four-foot thick layer of sand in front of the revetment toe, extending out 120 feet. The storm waves were then run, and the sand layer was observed during and after the test. It was observed that the sand was displaced seaward, leading to a scour hole in front of the toe. In the one and one-half hour (prototype) test, the sand scoured to the wave tank bottom (through all four feet of sand), and extended approximately 40 feet seaward of the toe.

While the scour depth was limited by the fixed wave tank floor, and sediment movement rates are not linearly scaled in the wave tests, the sand layer test indicates that sand will be scoured from in front of the revetment under storm conditions in a relatively short period. It should be emphasized that observations at the site and discussions with Mr. Greg Donohue indicate that the bottom in front of the revetment consists of very firm glacial till, covered with a thin veneer of sand in the summer. The glacial till will be much more resistant to erosion than the sand layer and therefore the test results show only that toe scour might have been a problem had the bottom in front of the revetment been a removable beach sand.

## Large Revetment Tests

In order to assess the performance of a larger revetment cross-section, similar to that proposed for a new Federal project, on wave runup and reflection, the revetment section was rebuilt to the following specifications, which are based on preliminary design plans for a new revetment section:

Berm Height: 25' NGVD
Berm Width: 40'
Slope: 1:2
Armor Layer Thickness: 11'
Underlayer Thickness: 5'
Filter Layer Thickness: 2'

The gradation and stone sizes of the armor layer and under layers were not as carefully modeled, as they would have been for armor stability tests. The general geometry, porosity, and stone sizes were maintained, so that the model properly simulated runup and reflection characteristics.

The large revetment had significantly less runup than did the existing revetment. At a water level of +5.2, no waves ran up on the bluff. With a water level of +7.2, a few waves reached the bluff, but did not run up on the bluff. With a water level of +9.7, the maximum runup reached approximately +40, with about 10 percent of the waves reaching the bluff.

It was noted that even when the waves did not reach the top of the berm at +25, water did flow through the armor stones and surge up the bluff behind the armor stones. Therefore, the bluff material should be covered with appropriate filter stones before application of the armor layers.

The reflectivity of the larger revetment was approximately 25 percent under the storm conditions tested. This compares to a measured reflectivity of approximately 30 percent for the existing revetment under similar conditions.

## Conclusions

The model tests of the existing revetment demonstrate that the existing revetment armor layer is stable in storm waves with return period up to approximately 73 years. In storm waves with periods exceeding 100 years, the revetment rapidly fails. This assessment assumes that the armor layer remains in a condition similar to that observed in the field and model tested. The model tests do not account for changes in the geometry due to effects such as loss of toe stones, collapse due to loss of bluff support behind the structure, or loss of filter material from beneath the structure.

The pre-model interview with Mr. Greg Donohue of the Montauk Historical Society and field inspection indicated that the existing revetment was constructed very well (i.e. better than average interlocking, careful toe stone placement). These characteristics were replicated to the best degree possible in the tested model, and that this good construction has resulted in better than expected performance by the existing section, both in the model test and in the field.

Runup on the bluff above the top of the revetment was observed in storm waves with return periods in the 2 to 5 year range. This is consistent with observations by Mr. Greg Donohue, who has reported that green water over the top of the berm at +18 feet has damage the chain link fence between the berm and the bluff on several occasions over the past 10 years. During the past ten years, there have been no extreme storm events (since the 1992 storm).

For more extreme storms, such as the 10 to 20 year storm, the runup on the bluff is extreme, and would likely result in failure of the revetment (with lighter stones) by displacement with subsequent lower collapse back into the eroded zone. The armoring of the upper bluff varies so the exact location of the first failure will depend upon the direction of wave attack and the size of the armor protecting the upper bluff. In areas where the bluff is armored heavily, the top of the revetment may fail first.

The sand layer test indicated that sand in front of the toe of the revetment is eroded seaward in storm wave conditions, leaving a scour hole at the toe of the slope. It should be noted that observations at the site and discussions with Mr. Greg Donohue indicate that the bottom in front of the revetment consists of very firm glacial till, covered with a thin veneer of sand in the summer. The glacial till will be much more resistant to erosion than is the sand layer. The existence of armor stones from the 1945 revetment at the toe of the existing revetment indicates that the erosion of material in front of the revetment is relatively slow. The erosion in the cohesive material will tend to be more long term erosion, rather than storm erosion as would occur with a sand bottom.

Model tests of a larger revetment section, based on preliminary plans for a reconstructed section, indicate stability for storms with return periods greater than 100 years (the maximum tested here). For this section, runup is less severe for the larger section. However, the bluff will still need protection against runup erosion damage for design level storms up to an elevation of approximately +40. At the highest tested water level, only one or two waves reached +40' ft NGVD, with most reaching +25 to +30'. This test corresponded to a 100-year level (or slightly greater), and the maximum runup (Rmax) could be interpreted to be about +40 ft NGVD with a smooth plywood bluff slope. An estimate for a rough slope at this return period puts the average of the highest 2% of runups (R2%) at about +25 ft to +30 ft NGVD, which generally agrees with computations done by CEM procedures. The reflection of the larger proposed section is reduced to 25 percent, as compared to 30 percent for the existing structure. This reduction is due to a flatter armor slope, and more porous armor. This difference, although notable from an engineering perspective, should not result in noticeable difference to surfing conditions in the area.

Notes of meeting with Greg Donahue concerning the Montauk Lighthouse revetment history and construction.

Date: 1/29/2002

Attending:
Dan Behnke, OCTI
Ed Fulford, Andrews Miller
Gary Williams, Andrews Miller
Greg Donahue

The purpose of the meeting was to obtain information from Greg Donahue concerning the history and construction of the Montauk Lighthouse revetment. The meeting took place at the lighthouse, and included a walking tour of the revetment with Mr. Donahue.

The general history of recent efforts to stabilize the bluffs around the lighthouse was presented by Mr. Donahue as follows:

1970's – Coast Guard construction of gabions

1989 – Historical Society began bluff stabilization, including bluff terracing, engineering and stone placement.

1989-1997 – State, Federal and local efforts constructed revetment in 5 phases, beginning with Phase 1 in 1992, the Phase 2 Federal segment in fall 1992 and spring 1993, Phase 3 in 1993, Phase 4 by the State in 1995, and Phase 5 by the State in 1996 and 1997.

Concerning construction of the existing revetment, Mr. Donahue reported that the sand and cobbles visible at the toe of the revetment is just a thin veneer on top of very firm glacial till. The remains of the old corps revetment, which can be seen seaward of the toe of the existing revetment, has settled into the glacial till bottom. A few of these old stones were attempted to be removed during construction of the existing revetment, and it was extremely difficult to remove them from the bottom, even with heavy construction equipment, because of the adhesion and suction of the clay-rich glacial till.

Based on Mr. Donahue's description of the natural existing bottom material, and observations of the old revetment stones sitting on the bottom at an elevation of approximately 0.0' NGVD, it appears that the existing bottom in front of the revetments is quite resistant to erosion. If erosion had taken place during large storms in the years since the construction of the old corps revetment, the armor stones would have sunk deeper into the bottom, and would not be sitting well above the bottom as they currently do. Long-term erosion may slowly erode away the bottom material, but it appears unlikely that it will significantly erode during a single storm event.

For the Phase 1 construction, filter cloth was laid on the existing slope, a modest layer of filter stone was laid on the filter cloth, and a single layer of armor stone was placed on the filter stone. The toe of the revetment was laid against the existing stones from the old corps revetment that were sunk in the clay bottom. The berm of the revetment is approximately +15-16 feet.

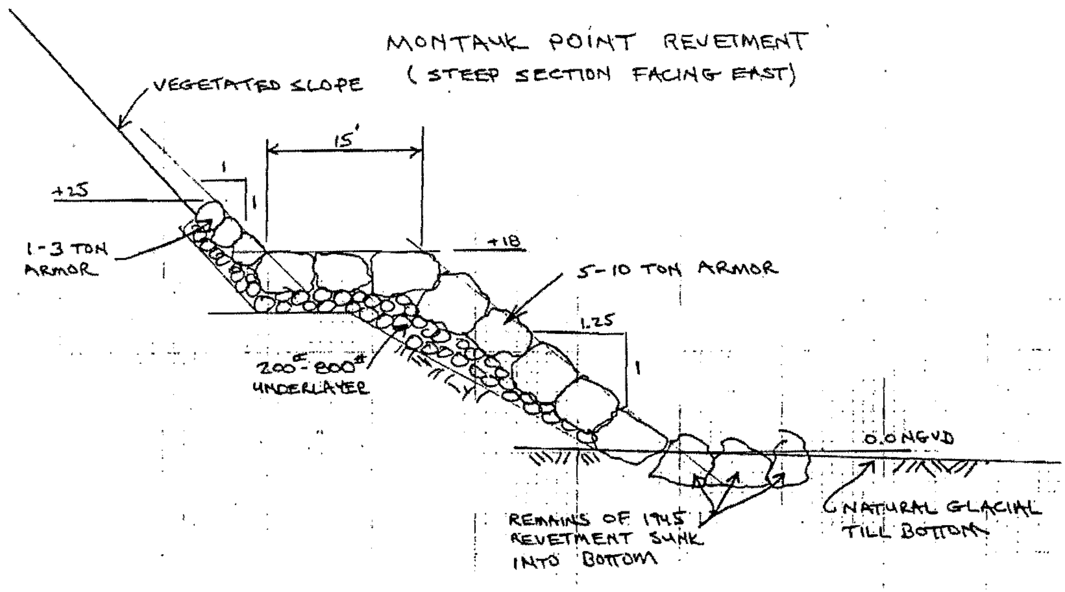
For Phase 2 construction, a construction roadway was built along the toe of the bluff. Filter cloth was laid on the bluff above the construction road. No filter cloth was used behind the construction road or beneath the toe. A layer of filter stone was laid over the construction road.

A single layer of armor stone was laid on the filter stone at approximately 1:1.5 slope. The toe of the filter stone was kept behind the existing stones from the old corps revetment. In some areas, the available distance between the existing stones from the old corps revetment and the construction road was not sufficient for the 1:1.5 slope, so the slope was steepened to fit the revetment in the available space. One such area, which faces due east, was estimated to be the worst case in terms of wave attack and stone stability, because of the steep slope. The slope in this area was estimated to be approximately 1:1.25. The crest elevation is +17', and the crest width is about 15 feet. Above the crest the bluff is protected by a layer of 200 to 500 pound rip rap over a layer of filter cloth. The primary armor stones are specified as 7 to 10 tons. A total of 20 stones were measured to obtain an estimate of the in-place stone size distribution.

For the Phase 3 construction, a toe trench was excavated in the glacial till bottom to –4', filter cloth was laid in the trench, filter stone of 200 –800 pounds was placed over the cloth, and armor stones were placed over the filter stones. The toe of the revetment for Phases 3-5 is behind the old stones from the corps revetment. The stone weights are 7-10 for the lower slopes, and 5-8 tons for the upper slopes/crest. The bluff slopes above the crest are armored with 1000-pound stone over filter cloth. Mr. Donahue showed a large number of photographs of construction of phases 3-5, showing the toe trench, filter cloth, filter stone, single layer of armor stone, etc. The stone fitting is quite tight and uniform, probably leading to greater stability than predicted by Hudson's equation with typical SPM stability coefficients, as long as the section stays intact.

Mr. Donahue reported that the chain link fence on top of the crest of the Phase 2 revetment, at an elevation of +17' to +18' has been damaged several times since construction, and that he has seen solid green water several feet deep over the top of the crest.

The following sketch was made of the section of the Phase 2 section judged to be the most vulnerable to damage due to wave exposure and steep slopes:



Based on my discussions with Mr. Donahue, examinations of photographs taken by Mr. Donahue during construction of the existing revetments, and examinations of the existing revetments, I believe that Mr. Donahue is knowledgeable concerning the construction of the existing revetments, and the conditions at the site. I place high confidence on the information provided by Mr. Donahue concerning the Montauk Lighthouse revetments.

Daniel L. Behnke, P.E.
Senior Coastal Engineer

# Sub-Appendix A-6

# NDT Engineering Seismic Report

# GEOPHYSICAL SURVEY

# MONTAUK POINT LIGHTHOUSE

MONTAUK, NEW YORK

PREPARED FOR

MICHAEL BAKER JR., INC

DECEMBER, 2001

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NDT ENGINEERING, INC.

NDT ENGINEERING, INC.

December 12, 2001

Mr. John Callahan, PG
Michael Baker Jr. Inc.
4301 Dutch Ridge Road
Beaver, Pennsylvania 15009-0280

Dear Mr. Glisan:

In accordance with your letter of authorization to proceed dated November 7, 2001 NDT Engineering conducted a seismic refraction and electrical resistivity geophysical study on November 28, 2001 at the Montauk Point Lighthouse in Montauk, New York. The objectives of this investigation were to evaluate soil layering and depth of ground water table.

This report presents the results and findings of this investigation.

Sincerely,
NDT ENGINEERING, Inc.
Paul Fisk

Paul S. Fisk
President

P.O. Box 303 SHREWSBURY, MA 01545 Tel (508) 845-1950 Fax (508) 845-1952

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## .0 RESULTS

The results of the seismic refraction and electrical resistivity measurements are shown on profiles for lines SL 1 and SL 2, Figures 2 and 3 respectively. While the two profiles differ slightly the comments given below apply to both.

The results of the seismic survey show a 1,600ft/sec layer approximately 50ft thick underlain by a layer of 5,600 to 6,000ft/sec. The first layer has a velocity typical of sands and gravels. The second layer velocity (5,600 to 6,000ft/sec) is representative of a relatively compact glacial till. Boring blow counts should be used for soil strength evaluations.

Superimposed on the seismic profile are the results of the electrical resistivity survey. The best fit for the electrical survey is a four-layer case. The topmost layer is about 4feet thick with an electrical resistivity of 3,000ohm-meters underlain by a layer about 8 feet thick with a resistivity of 6,000 ohmmeters. These two layers are relatively dry sands and gravels. The third layer from about 8ft to about 45ft has an electrical resistivity of 106 ohmmeters. This layer is also indicative of sands and gravels with some silts and clays with sufficient moisture content to lower its resistivity. The lowest layer, below a depth of 45ft. is influenced by higher moisture content, this boundary is coincident with the top of the till layer however the resistivity value is due to the water content. In this case a true or perched water table on the top of the till.

## 2.0 INTRODUCTION AND PURPOSE

A seismic refraction and electrical resistivity investigation was conducted at the Montauk Point lighthouse on November 28, 2001 to evaluate soil layering and depth of ground water table.

## 3.0 METHODS OF INVESTIGATION

### Survey Control

The locations of seismic refraction lines and resistivity sounding are shown on Figures 1 which is a portion of a Corps of Engineers plan provided to NDT Engineering by Michael Baker Jr., Inc. The location of the seismic refraction lines was determined by measurements referenced to roads, fences, buildings and other onsite landmarks. Ground surface elevations were determined from a ground surface contour map provided.

### Seismic Refraction

A 24-channel seismic refraction system with geophone sensors spaced at 10 and 20-foot intervals and a "carbon electric industrial blank" energy source was used. to generate seismic energy at the ends, quarter point and center of each survey line in 2 to 3 foot deep holes. Measured travel times (in milliseconds) of compressional "P" wave energy were used to develop travel time plots used as a basis for data interpretation. A discussion of the seismic refraction survey method is included in Appendix A.

## Electrical Resistivity Measurements

Electrical resistivity (inverse conductivity) measurements made at ground surface can be used to evaluate subsurface materials. The resistivity of earth materials is related to temperature, water content, salinity or ion content of water and matrix materials. For almost all earth materials the conductivity/resistivity is controlled by the presence of water. Dry sands, gravels and massive unweathered rock are typical relatively high resistivity whereas clays, water-saturated sediments or weathered bedrock have low resistivities.

The "apparent" resistivity value of a particular material, measured in the field, is a function of the material's true resistivity, the thickness of the unit, thickness and resistivity of adjacent layers, and the electrode spacing. Apparent resistivity values are calculated based on the configuration of current and potential electrodes. Interpretation of electrical resistivity data performed by computer inverse modeling.

The field technique used for this investigation was vertical sounding or point test. A resistivity point test is analogous to drilling; the results of a point test consists of vertical profile of units defined by resistivity characteristics, similar to a lithologic sequence developed from drilling data. A point test is conducted by incrementally increasing the spacing between electrodes, maintaining the electrode configuration about a single point. Resistivity measurements obtained at greater electrode separations are sampling deeper in the earth. For this investigation the Lee Partition of the Wenner electrode configuration was used. An electrical current is applied across the outer electrodes and the change in voltage is measured between the inner pair of potential electrodes. The electrode spacings used for this investigation were 3, 5, 7, 10, 20, 30, 40, 50, 70, 100, 120 and160-feet.

# TABLES

## RESISTIVITY TABLE FOR LEE PARTITION

LOCATION: LONG ISLAND NY   DATE: 112801   CLIENT: BAKER ENG   JOB: N4159

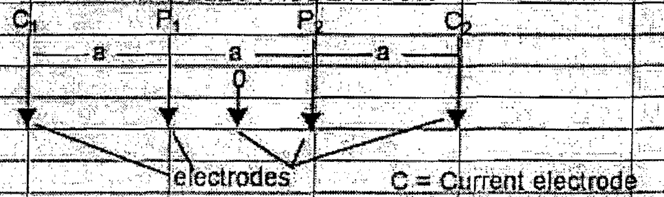
SL1

| spacing ft | resistance | resistance | resistance | resistivity | resistivity | resistivity | resistivity |
|---|---|---|---|---|---|---|---|
| | p1-p2(ohmft | 0-p1(ohmft) | 0-p2(ohmft) | 0-p1(ohmft) | 0-p2(ohmft) | p1-p2(ohmft) | p1-p2(ohmm) |
| 3 | 405.8 | 204.6 | 201.3 | 3858 | 3796 | 7649 | 2332 |
| 5 | 257 | 125.8 | 131.7 | 3954 | 4139 | 8074 | 2461 |
| 7 | 183.7 | 95.2 | 88.4 | 4189 | 3890 | 8079 | 2463 |
| 10 | 130.3 | 69.1 | 61.1 | 4344 | 3841 | 8187 | 2496 |
| 20 | 47.1 | 24.7 | 22.4 | 3105 | 2816 | 5919 | 1804 |
| 30 | 19.8 | 10.1 | 9.6 | 1905 | 1810 | 3732 | 1138 |
| 40 | 12.6 | 5.6 | 7.1 | 1408 | 1785 | 3167 | 965 |
| 50 | 9.4 | 4 | 5.5 | 1257 | 1729 | 2953 | 900 |
| 70 | 5 | 2.1 | 2.9 | 924 | 1276 | 2199 | 670 |
| 100 | 2.1 | 0.8 | 1.3 | 503 | 817 | 1319 | 402 |
| 120 | 1.4 | 0.5 | 0.9 | 377 | 679 | 1056 | 322 |
| 160 | 0.6 | 0.2 | 0.6 | 201 | 603 | 603 | 184 |

SL2

| spacing ft | resistance | resistance | resistance | resistivity | resistivity | resistivity | resistivity |
|---|---|---|---|---|---|---|---|
| | p1-p2(ohmft | 0-p1(ohmft) | 0-p2(ohmft) | 0-p1(ohmft) | 0-p2(ohmft) | p1-p2(ohmft) | p1-p2(ohmm) |
| 3 | 522.9 | 275.6 | 254 | 5197 | 4790 | 9856 | 3005 |
| 5 | 355.7 | 186.8 | 170.1 | 5871 | 5346 | 11174 | 3407 |
| 7 | 255 | 137.2 | 118 | 6037 | 5192 | 11215 | 3419 |
| 10 | 168.4 | 94.4 | 75 | 5934 | 4715 | 10581 | 3226 |
| 20 | 42 | 21.5 | 20.6 | 2703 | 2590 | 5278 | 1609 |
| 30 | 14.7 | 6.6 | 8.2 | 1245 | 1546 | 2771 | 845 |
| 40 | 4.6 | 2.03 | 2.52 | 510 | 634 | 1156 | 352 |
| 50 | 2.14 | 9.6 | 1.18 | 3017 | 371 | 672 | 205 |
| 70 | 1.58 | 0.73 | 0.85 | 321 | 374 | 695 | 212 |
| 100 | 0.73 | 0.4 | 0.33 | 251 | 207 | 459 | 140 |
| 120 | 0.38 | 0.21 | 0.17 | 158 | 128 | 287 | 87 |

WENNER ELECTRODE ARRAY



C = Current electrode
P = Potential electrode

# FIGURES

MONTAUK POINT LIGHTHOUSE AREA OF INVESTIGATION

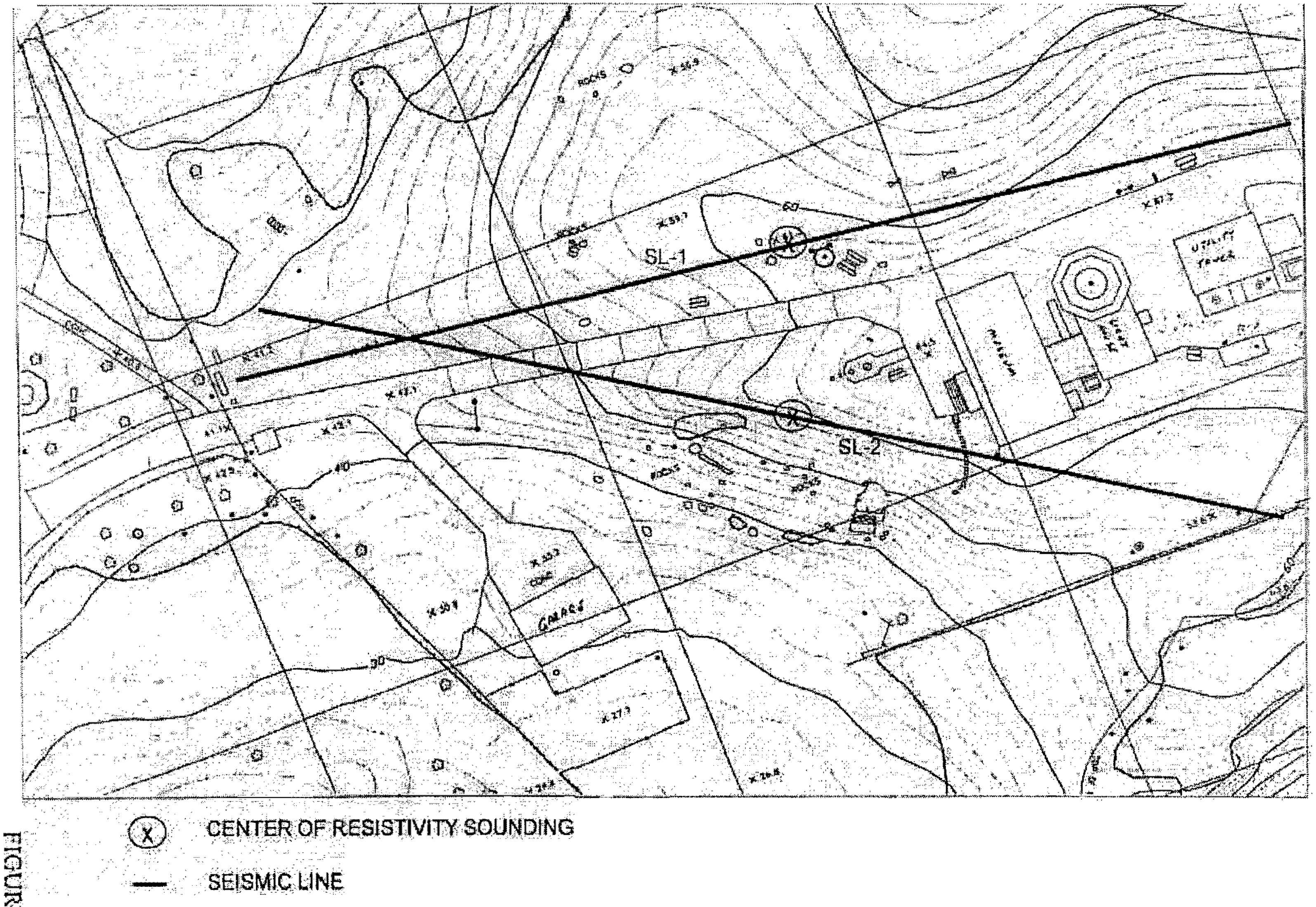
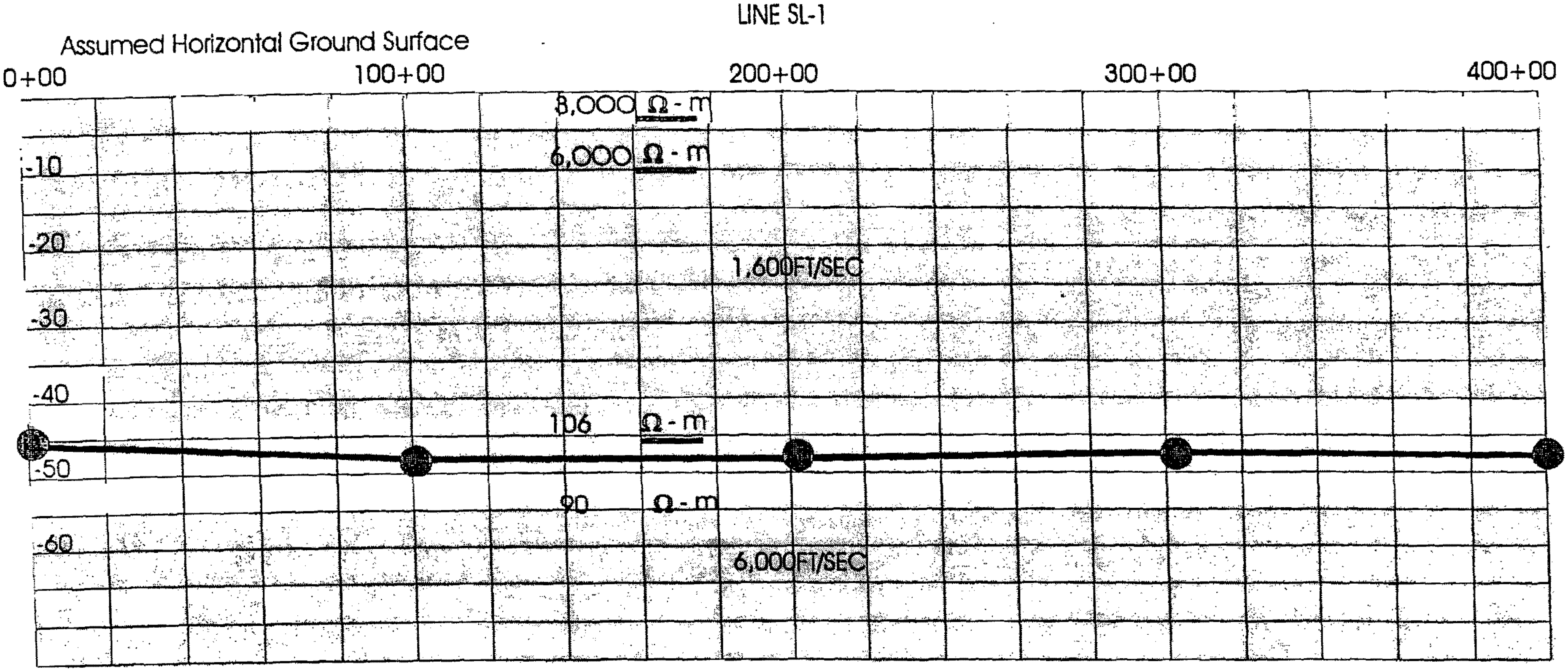


FIGURE 1

[redacted]

## Seismic and Electrical Sounding Results
## Montauk Point Long Island New York

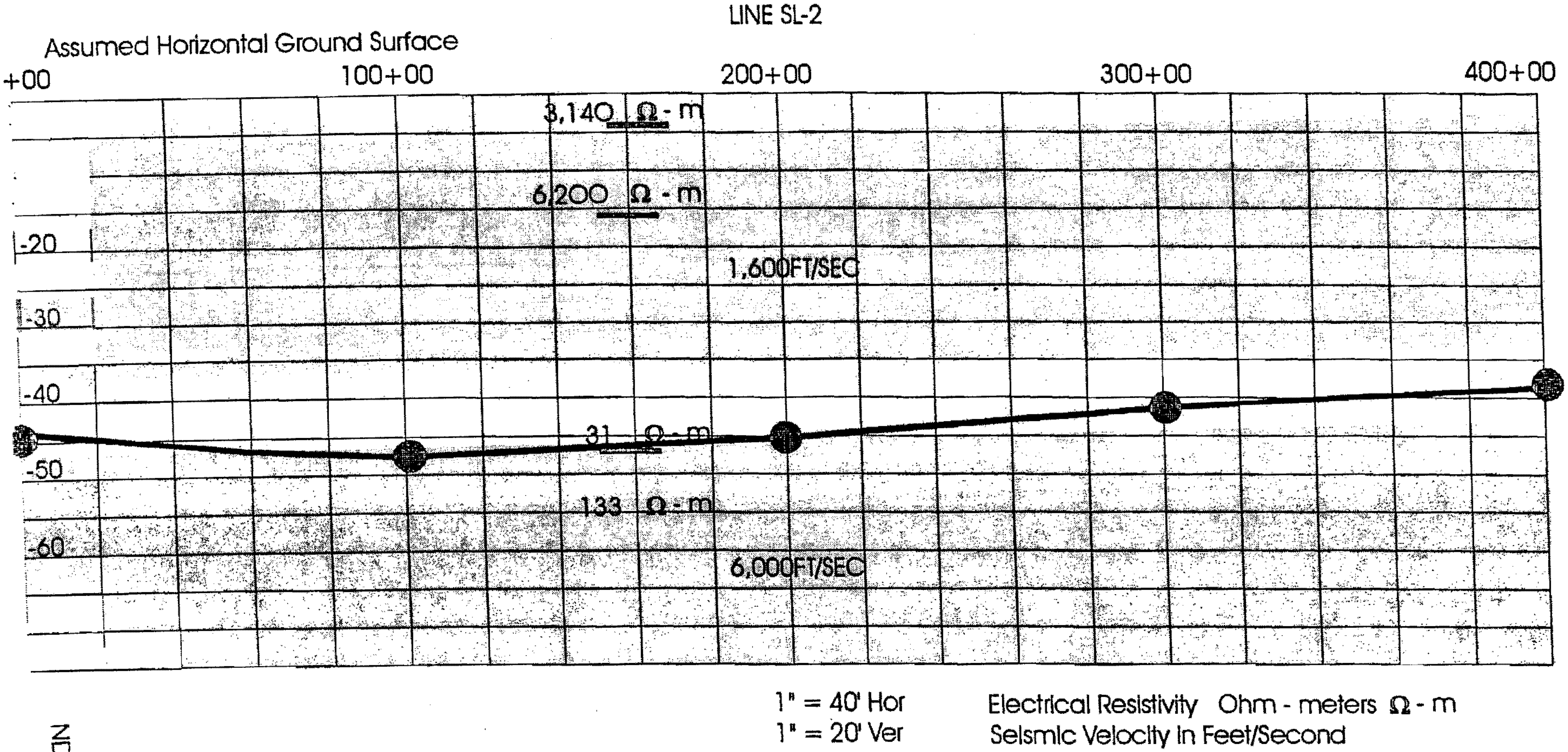


1" = 40' Hor
1" = 20' Ver

Electrical Resistivity Ohm - meters Ω - m
Seismic Velocity in Feet/Second

NDT ENGINEERING INC.

## Seismic and Electrical Sounding Results
## Montauk Point Long Island New York



NDT ENGINEERING INC.
FIGURE 3

# APPENDIX 1

# APPENDIX: SEISMIC REFRACTION

## OVERVIEW

Seismic exploration methods utilize the natural energy transmitting properties of the soils and rocks and are based on the principle that the velocity at which seismic waves travel through the earth is a function of the physical properties (elastic moduli and Poisson's ratio) of the materials. Energy is generated at the ends and at the center of the seismic spread. The geophone/hydrophone is in direct contact with the earth/water and converts the earth's motion resulting from the energy generation into electric signals with a voltage proportional to the particle velocity of the ground motion. The field operator can amplify and filter the seismic signals to minimize background noise. Data are recorded on magnetic disk and can be printed in the field. Interpretations are based on the time required for a seismic wave to travel form a source to a series of geophones/hydrophones located at specific intervals along the ground surface. The resultant seismic velocities are used for:

Material identification.
* Stratigraphic correlation.
* Depth determinations.
* Calculation of elastic moduli values and Poison's ratio.

A variety of seismic wave types, differing in resultant particle motion, are generated by a near surface seismic energy source. The two types of seismic waves for seismic exploration are the compressional (P) wave and the shear (S) wave. Particle motion resulting from a (P-wave) is an oscillation, consisting of alternating compression and dilatation, orientated parallel to the direction of propagation. An S-wave causes particle motion transverse to the direction of propagation. The P-wave travels with a higher velocity of the two waves and is of greater importance for seismic surveying. The following discussions are concerned principally with P-waves.

Possible seismic wave paths include a direct wave path, a reflected wave path or a refracted wave path. These wave paths are illustrated in FIGURE A1. The different paths result in different travel times, so that the recorded seismic waveform will theoretically show three distinct wave arrivals. The direct and refracted wave paths are important to seismic refraction exploration while the reflected wave path is important for seismic reflection studies.

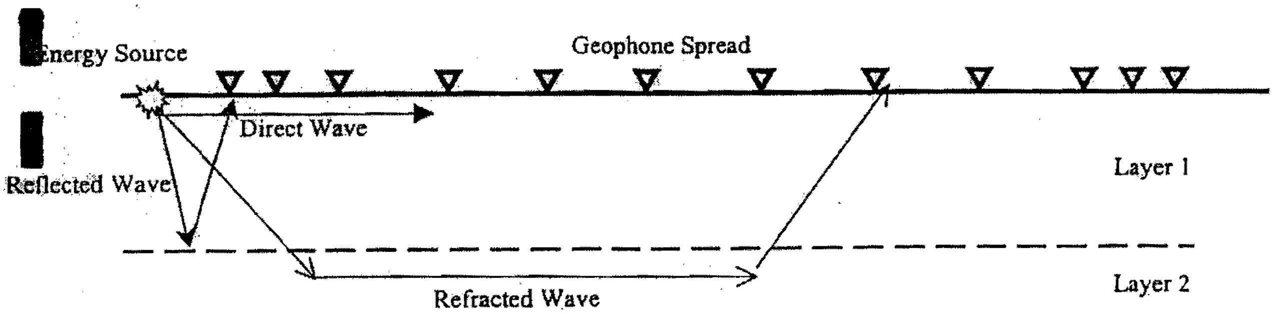


FIGURE A1:
SEISMIC WAVE PATHS FOR DIRECT WAVE, REFLECTED WAVE AND REFRACTED WAVE ILLUSTRATING EFFECTS OF A BOUNDARY BETWEEN MATERIALS WITH DIFFERENT ELASTIC PROPERTIES

At small distances between the energy source and detector the first arriving seismic signals will be direct waves that travel near the ground surface through lower velocity materials. At greater distances, the first arrival will be refracted waves that have taken an incident path through the two layers. The refracted wave arrives before the direct velocity materials compensate for the longer path. Depth calculations are based on the ratio of the layer velocities and the horizontal distance from the energy source to the point that the refracted wave overtakes the direct wave.

Seismic waves incident on the interface between materials of different elastic properties at what is termed the critical angle are refracted and travel along the top of the lower layer. The critical angle is a function of the seismic velocities of the two materials. These same waves are then refracted back to the surface at the same angle. The recorded arrival times of these refracted waves, because they depend on the properties and geometry of the subsurface, can be analyzed to produce a vertical profile of the subsurface. Information such as the number, thickness and depths of stratigraphic layers, as well as clues to the composition of these units can be ascertained.

The first arrivals at the geophones/hydrophones located near the energy source are direct waves that travel through the near surface. At greater distances, the first arrival is a refracted wave. Lower layers typically are higher velocity materials, therefore the refracted wave will overtake both the direct wave and the reflected wave, because of the time gained travelling through the higher velocity material compensates for the longer wave path. Depth computations are based on the ratio of the layer velocities and the distance from the energy source to the point where refracted wave arrivals over take direct arrivals.

Although not the usual case, a constraint on refraction theory is that material velocities ideally should increase with depth. If a velocity inversion exists, i.e. where a higher velocity layer overlies a low velocity layer, depths and seismic velocities can be calculated but the uncertainty in calculations is increased unless borehole data are available.

## APPLICATIONS

Seismic refraction technique is an accurate and effective method for determining the thickness of subsurface geologic layers. Applications for engineering design, assessment, and remediation as well as ground water and hydrogeologic studies include:

Continuous profiling of subsurface layers including the bedrock surface
- Water-table depth determinations
- Mapping and general identification of significant stratigraphic layers
- Detection of sinkholes and cavities
- Detection of bedrock fracture zones
- Detection of filled-in areas
- Elastic moduli and Poisson's ratio values for subsurface layers

Seismic refraction investigations are particularly useful because seismic velocities can be used for material identification. FIGURE A2 presents a guide to material identification based on P-wave seismic velocities. In rocks and compacted overburden material, the seismic waves travel from grain to grain so that the measured seismic velocity value is a direct function of the solid material. In porous or fractured rock and most overburden materials the seismic waves travel partly or wholly though the fluid between the grains.

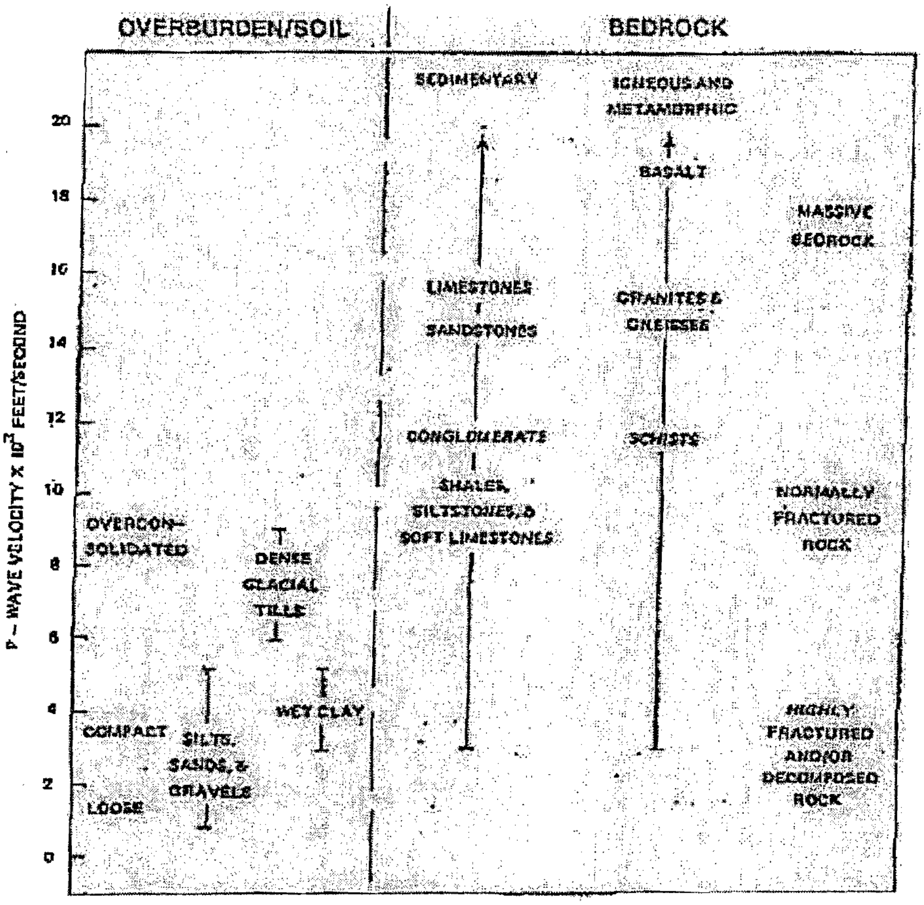


**FIGURE A2:**
GUIDE TO MATERIAL IDENTIFICATION BY P-WAVE VELOCITY

Seismic compressional wave velocities in unconsolidated deposits are significantly affected by water saturation. The seismic velocity values of unsaturated overburden materials such gravels, sands and silts generally fall in the range of 1,000 to 2,000 ft/sec. When these materials are water saturated, that is when the space between individual grains are 100% filled with water, the seismic velocities range from 4,800 to 5,100 ft/sec, equivalent to the compressional P-wave velocity of sound in water. This is because the seismic wave assumes the velocity of the faster medium, that of water. Even a small decrease in the saturation level will substantially lower the measured P-wave velocity of the material. Because of this velocity contrast between saturated and unsaturated materials, the water table acts as a strong refractor.

Seismic investigations over unconsolidated deposits are used to map stratigraphic discontinuities and to unravel the gross stratigraphy of the subsurface. These can be vertically as in the case of a dense till layer beneath a layer of saturated material or horizontally as in the case of the boundaries of a fill material. Often these boundaries represent significant hydrologic boundaries, such as those between aquifers and aquicludes.

A common use of seismic refraction is the determination of the thickness of a saturated layer in unconsolidated sediments and the depth to relatively impermeable bedrock or dense glacial till. Continuous subsurface profiles and even contour maps of the top of a particular horizon or layer of interest can be developed from a suite of seismic refraction data.

Bedrock velocities FIGURE A2 vary over a broad range depending on variables, which include:

* Rock type
* Density
* Degree of jointing/fracturing
* Degree of weathering

Fracturing and weathering generally reduce seismic velocity values in bedrock. Low velocity zones in seismic data must be evaluated carefully to determine if they are due to overburden conditions or fractured/weathered or perhaps even faulted bedrock.

EQUIPMENT:

The basic equipment necessary to conduct a seismic refraction investigation consists of:

* Energy source
* Seismometers (Geophones/Hydrophones)
* Seismic cables
* Seismograph

Energy sources used for seismic surveys are categorized as either non-explosive or explosive. The energy for a non-explosive seismic signal can be provided by one of the following:

* Sledge Hammer (very shallow penetration)
* Weight Drop
* Seisgun

- Airgun
- Sparker
- Vibrators (for reflection surveys)

Explosive sources can be categorized as:

- Dynamite
- Primers
- Blasting Agents

Choice of energy source is dependent on site conditions, depth of investigation, and seismic technique chosen as well as local restrictions. Explosive sources may be prohibited in urban areas where non-explosive sources can be routinely used. Deeper investigations usually require a larger energy source: therefore, explosives may be required for sufficient penetration.

Geophones/Hydrophones are sensitive vibration detectors, which convert ground motion to an electric voltage for recording the seismic wave arrivals. Seismic cables, which link the geophones/hydrophones and seismograph are generally fabricated with pre-measured locations for the geophones/hydrophones and shot point definitions.

The seismograph can be single channel or multi-channel, although, multi-channel seismographs (12 to 24 channels) are preferred and necessary for all but the simplest of very shallow surveys. The seismograph, amplifies (increases the voltage output of the geophones), conditions/filters the data, and produces analog and digital archives of the data. The analog archive is in the form of a thermal print of the data, which can be printed directly after acquisition in the field. The digital archive is stored on magnetic disk and can be used for subsequent computer processing and enable more extensive and detailed interpretation of seismic data.

## ACQUISITION CONSIDERATIONS:

Several concerns arise before data collection, which must be addressed before of any seismic survey:

- Geophone spacing and Spread length
- Energy Source (discussed above)
- On-site utilities and cultural features (buildings, high tension lines, buried utilities, etc.)
- Vibration generating activities
- Geology
- Topography

To acquire seismic refraction data, a specific number of geophones are spaced at regular intervals along a straight line on the ground surface; this line is commonly referred to as a seismic spread. The length of spread determines the depth of penetration; a longer spread is required for a greater depth of penetration. Spread length should be approximately three to five times the required depth of penetration. Required resolution will control the number of geophones in each spread and the distance between each geophone. Closer spacings and more geophones usually result in more detail and greater resolution.

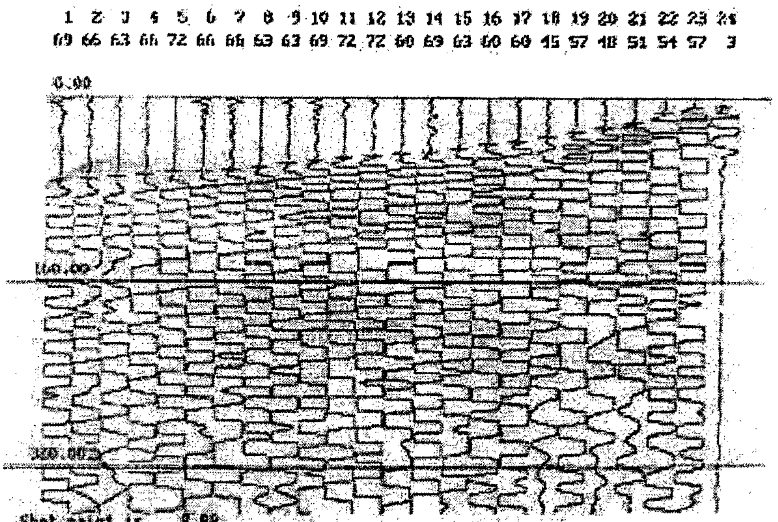
Cultural effects such as vibration generating activities, on-site utilities, and building affect where data can be acquired, and where lines/spreads are located. High volume traffic areas may require nighttime acquisition. If the survey is to be conducted near a building where vibration-sensitive manufacturing is conducted, data acquisition may be constrained to particular time intervals and appropriate energy sources must be used. Over head and buried utilities must be located an avoided, for both safety and induced electrical noise concerns. Since the seismic method measures ground vibration, it is inherently sensitive to noise from a variety of sources such as traffic, wind, rain etc. Signal Enhancement, such as record stacking, accomplished by adding a number of seismic signals from a repeated source, causes the seismic signal to "grow" out of the noise level, permitting operation in noisier environments and at greater source to phone spacings.

Knowledge of site geology can be used to determine the energy source. Some geologic materials, such as loose, unsaturated alluvium, do not transmit seismic energy as well and a powerful energy source may be required. Geologic conditions also dictate whether or not drilled shotholes are required. Site geology can also dictate the positioning of seismic lines/spreads. Where a bedrock depression of a feature is suspected, seismic lines should be orientated perpendicular to the suspected trend of the feature. Seismic cross profiles may be necessary to confirm depths to a particular refracting horizon.

The topography of a site dictates whether or not surveyed elevations are required. If possible, refraction profile lines should be positioned along level topography. For highly variable topography, a continuous elevation profile may be required to ensure sufficiently accurate cross-sections and to permit the use of time corrections in the interpretation of the refraction data.

## DATA PRESENTATION AND INTERPETATION:

Interpretation of seismic refraction data involves solving a number of mathematical equations with the refraction data as it is presented on a travel-time versus distance chart. Seismic refraction data FIGURE A3 can be processed by plotting the "First Arrival" travel times at each geophone location. The preferred format of data presentation is a graph (Travel Time Plot) illustrated in FIGURE A4, in which travel time in milliseconds is plotted against source-receiver distance. From such a chart, the velocities of each layer can be obtained directly from the increase slope of each straight-line segment. Using the velocities the critical angle of refraction for each boundary can be calculated using Snell's Law. Then, utilizing these velocities, and angles and the recorded distances to crossover points (where line segments cross); the depths and thickness of each layer can be calculated using simple geometric relationships.



```
 Shot point is    0.00
Channel   1   Phone location  195.00  Arrival time  71.3 msec
Channel   2   Phone location  190.00  Arrival time  70.3 msec
Channel   3   Phone location  185.00  Arrival time  66.5 msec
Channel   4   Phone location  175.00  Arrival time  66.3 msec
Channel   5   Phone location  165.00  Arrival time  63.8 msec
Channel   6   Phone location  155.00  Arrival time  63.0 msec
Channel   7   Phone location  145.00  Arrival time  62.8 msec
Channel   8   Phone location  135.00  Arrival time  59.8 msec
Channel   9   Phone location  125.00  Arrival time  56.8 msec
Channel  10   Phone location  115.00  Arrival time  54.0 msec
Channel  11   Phone location  110.00  Arrival time  51.5 msec
Channel  12   Phone location  105.00  Arrival time  49.3 msec
Channel  13   Phone location   95.00  Arrival time  47.3 msec
Channel  14   Phone location   90.00  Arrival time  45.0 msec
Channel  15   Phone location   85.00  Arrival time  43.0 msec
Channel  16   Phone location   75.00  Arrival time  35.0 msec
Channel  17   Phone location   65.00  Arrival time  37.0 msec
Channel  18   Phone location   55.00  Arrival time  33.0 msec
Channel  19   Phone location   45.00  Arrival time  28.0 msec
Channel  20   Phone location   35.00  Arrival time  25.0 msec
Channel  21   Phone location   25.00  Arrival time  20.0 msec
Channel  22   Phone location   15.00  Arrival time  12.0 msec
Channel  23   Phone location   10.00  Arrival time   8.0 msec
Channel  24   Phone location    5.00  Arrival time   7.0 msec
```

**FIGURE A3:**
TYPICAL 24 CHANNEL ANALOG SEISMIC REFRACTION RECORD, WITH FIRST ARRIVAL TIMES

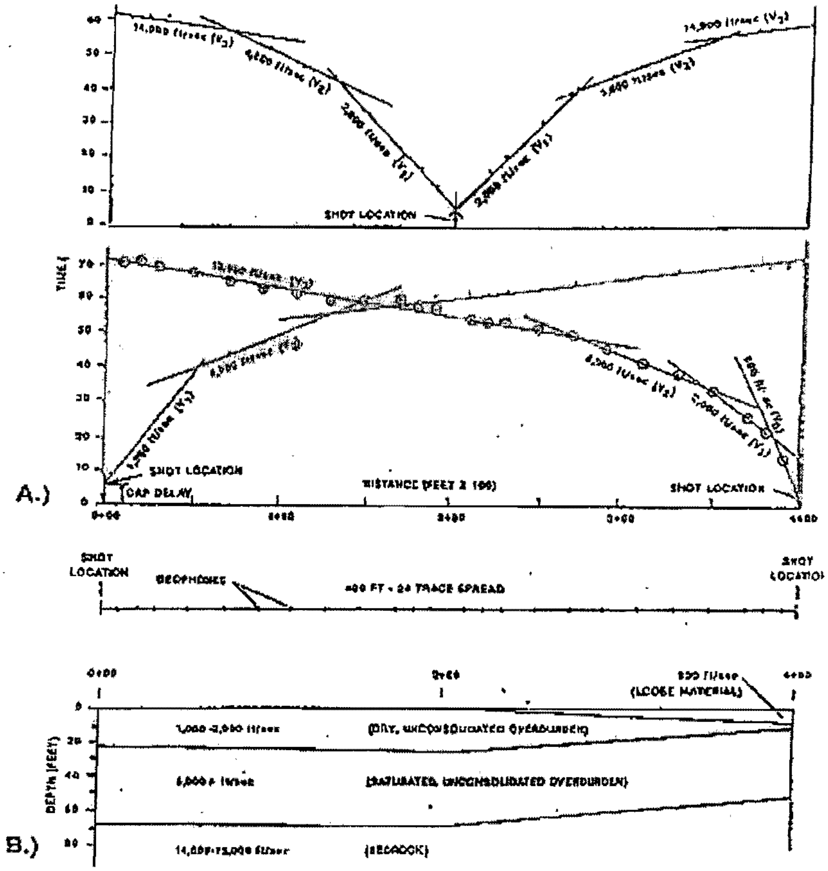


**FIGURE A4:**
A: TRAVEL-TIME PLOTS; UPPER PLOT IS A CENTER SHOT, LOWER PLOT IS TWO END SHOTS
B: RESULTING PROFILE OF SUBSURFACE MATERIALS SHOWING INTERFACE BETWEEN DIFFERENT SEISMIC VELOCITY LAYERS

The results of any seismic survey, refraction or reflection are usually presented in profile form showing elevations of seismic horizons/layers. Data acquired on a grid basis can be contoured and used to construct isopach maps. Seismic velocities and therefore, generalized material identifications should be presented on refraction profiles along with any test borings used for correlation to establish confidence in the overall subsurface data, both seismic and borings.

Where profiles indicate dipping boundaries, calculation of dips, true depths and true velocities involve more complicated equations. Further more, corrections for differing elevations and varying thicknesses of weathered zones must often be made. Fracturing and weathering generally reduce seismic velocity values in bedrock. Consequently, travel-time plots with late arrivals must be evaluated carefully to determine if the late arrival times (slower velocities) are due to overburden conditions or fractured/weathered bedrock.

Very thin layers or low velocity zones often complicate the travel-time chart as well. Although not the usual case, one constraint on refraction theory is that material velocities ideally should increase with depth. If a velocity inversion exists, i.e. where a higher velocity layer overlies a low velocity layer, depths and seismic velocities can be calculated but the uncertainty in calculations is increased unless borehole velocity data are available.

## ADVANTAGES AND LIMITATIONS:

The seismic refraction technique, when properly employed, is the most accurate of the geophysical methods for determining subsurface layering and materials. It is extremely effective in that as much as 2,000 linear feet or more of profiling can be acquired in a field day. The resulting profiles can be used to minimize drilling and place drilling at locations where borehole information will be maximized resulting in cost-effective exploration. A standard drilling program runs the risk of missing key locations due to drillhole spacing. This risk is substantially reduced when refraction is used.

In summary, the advantages and limitations of the seismic techniques are:

Advantages:

- Material identification
- Subsurface data over broader areas at less cost than drilling
- Relatively accurate depth determination
- Correlation between drillholes
- Preliminary results available almost immediately
- Rapid data processing

Limitations:

- As depth of interest and geophone spacing increases, resolution decreases
- Thin layers may be undetected
- Velocity inversions may add uncertainty to calculations
- Susceptible to noise interference in urban areas, which require use of grounded cables and equipment, signal enhancement and alternative energy sources.

# Sub-Appendix A-7

# Further Discussion Including Downdrift Impacts, Contribution to Littoral Drift, Surfing Impacts, and Moving the Lighthouse as an Alternative

## As Resulted from Public Information Sessions Held in September 2005

## Introduction

At a public information session held 19 September 2005, Corps representatives agreed to develop additional explanation for the Feasibility Report regarding the potential project effects on coastal and littoral processes. The following explanation, though lengthy, provides a fairly simple, yet thorough, discussion regarding the coastal and littoral process considerations involved in the plan formulation evaluation.

Coastal Processes. The proposed project alternative to protect Montauk Point will essentially continue the coastal process impacts of the 1992-1993 revetment over the 50-year planning horizon. The effects on coastal processes at the Point from man made interventions date back nearly 60 years. Shoreline erosion rates are a function of many factors including the type of material at each shoreline location, total mass of material at each location, and the wave energy impinging upon it. The Long Island shoreline both north and south of Montauk Point consists of a series of concave and convex shoreline reaches, indicating a variation in erodability alongshore. Historic shoreline mapping shows that the 1870, 1933 and 1938 shorelines, preceding construction of revetments at Montauk Point in the 1940's, all have an indentation at Turtle Cove, similar to the shoreline shape that exists now. This indicates that the Turtle Cove reach erodes at a faster rate than the point, and that this indented curvature was not caused by construction of the revetment. Shorelines also show that the Atlantic shore west of the point has been generally erosive over the 1870-1995 period. The existing and the proposed revetment alternative will act to hold or anchor the eastern most end of the Turtle Cove area. While the proposed revetment alternative will continue to limit the coastal erosion at the Point protecting the Lighthouse complex, forces such as tidal currents and waves will continue to erode the north and south downdrift shores continuing the curvature process, especially immediately adjacent to the revetment.

Downdrift Effects. The erosion of the areas just west of the Point tends to make up for the material covered by the existing revetment that is prevented from entering the littoral system. Since the proposed revetment alternative will extend over virtually the same lineal extent of the shoreline as the existing revetment, the proposed revetment will continue this trend. The effect of both the existing revetment and the proposed revetment on the downdrift, unprotected shoreline is to reduce the amount of sand moving alongshore by a small amount estimated to be approximately 3,000 cy/yr for the south shore. The sediment deficit would tend to increase the erosion rate of shoreline immediately adjacent to the revetment by a similar increment, over a short distance downdrift. Shoreline change mapping for the Turtle Cove area shows approximately a 2-ft/yr increase in retreat rate in the post-revetment period (1938-to 1995) as compared to the pre-revetment period (1870-1938), which may be due in part to the construction of the existing revetment, as well as to all other factors contributing to shoreline erosion. Indications from the shoreline change mapping are that any sediment deficits caused by the revetment are made up within approximately 2,500 feet of the end of the structure, at which point the shorelines changes to a pattern of fluctuation of erosion and accretion. Shorelines north of the existing revetment have a similar response, which would continue with the proposed structure in place. At the same time, for shoreline further westward, the relative impact of the small amount of reduced littoral material due to the revetment also diminishes because the net amount of littoral material moving westerly along the shores gradually increases as the waves and currents act upon the more westerly shores.

The curvature of the immediately downdrift or westerly shore areas will continue but will not pinch off or cause flanking of the protected area during the 50 year project evaluation period. It is also likely that as the curved recession due to waves and currents continues, there may be a tendency toward stabilization as the landform adjusts to the prevailing coastal forces. Subject to the occurrence of future storm events, the rate of erosion observed in relatively recent years could be somewhat reduced.

The following paragraphs give an indication of the volumes of littoral material involved in determining downdrift impacts of the project:

Contribution to Littoral Drift. Erosion of bluffs and beach fronting the Montauk Lighthouse does contribute a small amount of material to the littoral drift that moves along the Atlantic shore southwest of the lighthouse as well as along the Block Island Sound shore northwest of the lighthouse. Based on measurement over the period of record (1868-1993) the average annual erosion rate of bluff and beach as stated in the Feasibility Report, is estimated at 6 cubic yards per year per foot of shoreline. This average includes periods of time when the bluff was covered by a revetment, as well as prior to the construction of protective works. As such, this long-term average is a reasonable estimate for shoreline loss for periods of time covering conditions when the protective works are intact and limit loss, and periods of time when the protective works have lost integrity, resulting in greater amounts of erosion.

The proposed revetment covers approximately 840 linear feet of shoreline, which is virtually identical to the length of the existing revetment. Using the long-term erosion rate of 6 cubic yards (cy) per linear foot per year, approximately 5,000 cy of material can be assumed lost from the beach and bluff per year. Note that the material comprising the bluff is a mix of sand, gravel, and silt, based on boring logs. Some percentage of the eroded material is lost to the net longshore sand transport as it is either too fine, or too coarse. This percentage could be in the 10-30% range, but for this discussion no reduction has been taken for loss of fines or coarse material to the quantity of sediment transport.

The estimated volume of material per year will move either northwest or southwest of the point, except for some finer sediment moved permanently offshore or larger material that settles out. Based on the shape of the point and the length of the revetment, approximately 60% of the eroded material can be expected to move southwest, and approximately 40% can be expected to move northwest, i.e. approximately 3,000 cy/year will be contributed to the littoral drift along the Atlantic shore and approximately 2,000 cy/year along the Block Island Sound shore from the revetted shoreline. The shores to the northwest and southwest tend to make up for the effects of the revetment by contributing substitute littoral material over a relatively short distance downdrift.

For comparative purposes along the Atlantic shore, sediment budget estimates of the net longshore sand transport rate moving westward at Ditch Plains is approximately 70,000 cy per year. At the Montauk beaches, the net longshore transport rate increases to approximately 100,000 cy/yr. There is considerable uncertainty in sediment budget calculations, such that the given amount may differ by +/-40,000 cy/yr. Effects of both the existing structure at Montauk and the proposed structure on the littoral sand transport are small and are expected to be local, i.e. are not likely to extend as far alongshore to developed areas such as Ditch Plains or more developed points further west, especially in view of the variable shoreline shape and materials in between.

The amount of material that would be contributed downdrift if the proposed revetment alternative was not constructed is very small relative to the total sediment budget and this small amount is added back by some equally minor increase in erosion, a relatively short distance west of the revetment. Any adverse impacts from the proposed revetment alternative are not considered to be significant, and would not materially affect areas being considered for protection under the Fire Island Inlet to Montauk Point Reformulation Study.

Impacts to Surfing: There is a revetment in place at Montauk Point now, and the surfing is considered to be good. The proposed revetment will be in the same place as the existing revetment, made of similar rock material, and will be similar to it in all particulars which might effect waves. As shown in the Feasibility Report, Table 10, and discussed in Section 4.0 - Recreation, wave reflection coefficients are estimated at 13-19 percent less for the proposed revetment alternative than for the existing revetment. The proposed plan will not change wave conditions in any perceivable way.

Moving the Lighthouse: The moving of the Lighthouse was given considerable weight during the Feasibility phase of the project. However, several factors contributed to the decision not to make this proposal the preferred alternative. They included: a) the overall cost of the alternative b) the engineering requirements of having to build up land to meet the hill of Montauk Point to create a level moving surface, c) the destruction of a National Register Landmarked complex - by moving it, the setting is destroyed thus violating the spirit of the National Historic Preservation Act of 1966, as amended, d) the loss of value to the Town of Easthampton, Montauk Point and Montauk Point State Parks, as several hundred thousand visitors come to this area each year, in part to see "the end", i.e. Montauk Point Lighthouse, e) the New York State Office of Parks, Recreation and Historic Preservation (see Letter Number 01), the Regulatory Agency that would have to approve any move of a National Register structure has already stated, and has done so throughout the entire process, that they would not approve the moving of the Lighthouse, which would lead to the destruction of the Lighthouse complex area.

Additionally, while the Montauk Historical Society maintains the lighthouse complex, the U.S. Coast guard still operates the beacon and the foghorn as working aids-to-navigation. If the lighthouse were not present, the U.S. Coast Guard would likely erect a tower on which to mount a replacement beacon. As per the agreement signed during the transfer of the property from the Federal Government to the Montauk Historical Society, If the Montauk Historical Society fails to protect or maintain the lighthouse, the property would revert back to the USCG. Please note that in the analysis of the without and with-project conditions adjustments were made to account for sea level rise.

# APPENDIX B: ECONOMICS ANALYSIS

# MONTAUK POINT, N.Y. - ECONOMICS APPENDIX – Oct 2005

## General

1. The feasibility study is being conducted under the following study authority: 15 May 91:

*"Resolved by the Committee on Environment and Public Works of the United States Senate, that the Secretary of the Army is hereby requested to review the report of the Chief of Engineers on Fire Island to Montauk Point, New York, published as House Document Number 86-425, 86th Congress, 2nd session, and other pertinent reports, to determine whether modifications of the recommendations contained therein are advisable at the present time, with a view to preserving, restoring, and protecting Montauk Point and vicinity, including the historic Montauk Lighthouse and associated facilities, from erosion, environmental degradation, and coastal storm damage."*

2. In addition to the study authority, Section 110 of the National Historic Preservation Act of 1966, as amended (NHPA), imposes a duty to maintain and preserve historic properties. At the present time, this duty is presently borne directly by the Montauk Point Historical Society, the current owners of the Montauk Point Lighthouse complex. However, thru the operation of a reversionary interest, as provided for in the land transfer (a quitclaim dated 18 September 1998 from the U.S. Coast Guard to the Montauk Point Historical Society), this duty ultimately falls on the Federal Government. Section 110 of the NHPA imposes duties only on federal agencies. As a federal agency, the Coast Guard was required to preserve and maintain the property in accordance with the NHPA. The transfer of the property from the Coast Guard to the Historical Society would have been an adverse impact on the property under Section 110 of the NHPA, because the historic property would have passed to an entity, the Historical Society, that was not a Federal agency and therefore not required to adhere to the NHPA, removing the legal protection the historic property enjoyed under federal ownership. To remedy this adverse impact, the Coast Guard included a condition in the transfer agreement that requires the Historic Society to preserve/maintain the property under the NHPA, effectively making the Historical Society act as a Federal agency with regards to the preservation of the property.

3. Alternative ways to follow Section 110 of the NHPA at Montauk Point therefore include:

- Provide mitigation for adverse impacts following a storm event that causes damage to the bluff and other features of the historic property, or

- Take steps now to protect the integrity and significance of the historic property, thereby avoiding the costs of Section 110 compliance that would have been triggered by storm damage.

- Through a combination of Section 110 of the NHPA and the nature of the land conveyance, there is indeed a statutory duty to perform the cultural resources mitigation at Montauk Point. If triggered by coastal storm damage such mitigation would incur a cost; therefore, avoiding that cost should, therefore be counted as a benefit.

4. If the Federal government is not mandated to follow Section 110 of the NHPA and the nature of the land conveyance, then the most likely future without-project scenario is that the bluff will erode and the historic Montauk Point Lighthouse complex will collapse. The economic analysis that follows below is based on this assumption.

5. The proxy used to place a depreciated replacement value of the historic Montauk Point Lighthouse complex is based on the calculations for the costs of cultural mitigation. Moving the Montauk Point Lighthouse complex, a National Register listed property, will potentially preserve the existing structures, but allow for the eventual destruction of the bluff point and buried cultural resources. These archaeological materials, which are associated with the historic and prehistoric use of the bluff, must be documented and recovered. Prior to moving the structures, each structure would need to be documented on engineering drawings and in photographs so that they can be rebuilt properly on the new site. Subsurface archeological excavations would be performed to recover artifacts both at the present lighthouse site and at the new site. Alternatively, all of these costs could be avoided by protecting the property from the storm damage.

## Existing Conditions

6. The lighthouse complex and the surrounding Montauk Point State Park are valued Federal and State properties respectively. Montauk Point Lighthouse complex and the State Park annual attendance figures averaged 106,723 and 904,185 persons, respectively in the 1995-2002 period. The lighthouse complex does not have a parking lot, and visitors must use the state parking lot. The average attendance for the state park only is 797,462 (904,185-106,723). These figures were obtained from Montauk Point Lighthouse and Montauk State Park offices. Recent census data indicate that the populations for Long Island and New York's five boroughs have increased by 8.4% in ten years. The population for the surveyed area increased from 9,931,776 (1990 Census) to 10,762,191 (2000 Census). The economic analysis assumes the lighthouse and state park attendance will remain stable. Tables 1-3 show lighthouse admissions, parks admissions, and state population data.

**TABLE 1. Lighthouse Attendance**

| Year | Adults | Seniors | Children | Group | Total |
|---|---|---|---|---|---|
| 1995 | 90,664 | | 12,998 | 2,634 | 106,296 |
| 1996 | 83,184 | 7,130 | 13,601 | 2,647 | 106,562 |
| 1997 | 78,562 | 8,916 | 1,401 | 2,884 | 91,763 |
| 1998 | 78,768 | 8,927 | 19,896 | 3,889 | 111,480 |
| 1999 | 77,079 | 9,199 | 19,997 | 4,397 | 110,672 |
| 2000 | 78,719 | 9,330 | 20,269 | 5,901 | 114,219 |
| 2001 | 66,818 | 8,352 | 18,720 | 5,969 | 99,859 |
| 2002 | 77,615 | 9,133 | 20,123 | 6,062 | 112,933 |
| Total | 631,409 | 60,987 | 127,005 | 34,383 | 853,784 |
| **Avg.** | **78,926** | **8,712** | **15,876** | **4,298** | **106,723** |

**TABLE 2. Montauk State Park**

| Year | Attendance |
|---|---|
| 1995 | 905,535 |
| 1996 | 849,165 |
| 1997 | 900,894 |
| 1998 | 916,680 |
| 1999 | 929,585 |
| 2000 | 916,460 |
| 2001 | 906,149 |
| 2002 | 909,010 |
| Total | 7,233,478 |
| **Avg.** | **904,185** |

**TABLE 3. Population Data**

| County | 1980 | 1990 | 2000 | 2004* | 1990-2000 %Change |
|---|---|---|---|---|---|
| Nassau | 1,321,582 | 1,287,348 | 1,334,544 | 1,339,461 | 3.7% |
| Suffolk | 1,284,231 | 1,321,864 | 1,419,369 | 1,475,488 | 7.4% |
| Bronx | 1,168,972 | 1,203,789 | 1,332,650 | 1,365,536 | 10.7% |
| Kings | 2,231,028 | 2,300,664 | 2,465,326 | 2,475,290 | 7.2% |
| New York | 1,428,285 | 1,487,536 | 1,537,195 | 1,562,723 | 3.3% |
| Queens | 1,891,325 | 1,951,598 | 2,229,379 | 2,237,216 | 14.2% |
| Richmond | 352,029 | 378,977 | 443,728 | 463,314 | 17.1% |
| Total | 9,677,452 | 9,931,776 | 10,762,191 | 10,919,028 | 8.4% |

*Source: US Census Bureau, 2004 population data are estimates

## Without-Project Conditions

7. The Montauk Point Lighthouse complex sits on a high bluff underlain with glacial till, approximately 70-feet above Mean Sea Level (MSL). It is estimated that once the upper sections of the revetment that protects the bluff are displaced by a 15-year or greater storm event, the foundation soil underlying the displaced stone will become exposed and subject to subsequent erosion. To determine the extent of this erosion at the toe of the upper bluff above the damaged revetment that would cause significant bluff failure, a slope stability analysis was performed. The results of this analysis determined that for significant bluff failure, the damaged crest elevation of the revetment should degrade to approximately elevation +10 NGVD and the upper bluff toe at this +10 NGVD elevation recede horizontally approximately 10 ft. This is anticipated to cause approximately 26-30 ft. of loss of the bluff crest which will immediately threaten the lighthouse facility at the most critical area to the southeast of the lighthouse.

8. The period of time estimated for this condition to occur, subsequent to revetment failure, is an additional 10 years of long-term erosion at the upper bluff toe (at el. +10 NGVD). A decision tree analysis was applied to calculate the probability of revetment failure for any given year through the 50-year period of economic analysis due to a 15-year or greater storm event. When revetment failure occurs, the bluff crest will erode at an average rate of 3 feet per year. The lighthouse complex will be immediately threatened after 10 years, or 30 feet of erosion at the bluff crest.

### Proxy for Depreciated Replacement Value of Montauk Lighthouse Complex

9. The proxy used to place an economic value of the historic Montauk Point Lighthouse complex is based on the hypothetical calculations for the costs of cultural mitigation of the site. The economic analysis assumes that cultural mitigation of the site will be initiated after the revetment that protects the bluff is displaced. The estimated cost for moving the Montauk Point Lighthouse complex and complete cultural mitigation of the complex is $20,192,000. This figure does not take into account the creation of raised grades landward of the present location of the lighthouse for the move, which could add an additional cost of $6,780,000. The raised grade would be necessary to maintain the lighthouse elevation because the existing bluff elevation decreases significantly as one move away from the shorefront. The overall mitigation process would take approximately six years to complete, with a total cost of $26,972,000 (Oct. 2004 price level), as shown in Table 4. The cost flows for years 1 through 6 were discounted (collapsed) to the first year that mitigation would occur. This was done to convert 6 years of expenditures into an equivalent expenditure that will occur in one year. Table 5 shows the calculations for the one-year equivalent value of the lighthouse complex if the upper section of the revetment is displaced in year 2006. Since this expenditure only happens when a 15-year or greater storm occurs, a decision tree analysis was applied to calculate the probability of occurrence throughout the 50-year period of analysis. For example, the probability for the expenditure to occur in year 0 (base year) is (1/15) = 0.067; year 1 (base year +1) is (14/15)*(1/15) = .062; and so forth up to the fiftieth year. The expected value (sum of the products of the probability of occurrences

multiplied by the one-year equivalent cultural mitigation cost) was then amortized using a 5-$^{3}/_{8}$ percent discount rate and a 50-year period of analysis to calculate the average annual mitigation cost at an October 2004 price level.[1]

10. Another scenario would have the cultural mitigation initiated after the revetment is displaced thereby, exposing the bluff to erosion, in year one and completed by year four. The actual moving of the lighthouse complex would be done in years eight and nine. This scenario would prevent any cultural artifacts from being lost or recorded after the revetment are displaced and allow for a three year lag in which the money for moving the lighthouse will not be needed. The conversion of the expenditure flows for this nine-year time period is shown in Table 6.

**Table 4. Cultural Mitigation Costs of Lighthouse Complex**[2]

| Year | Tasks | | Costs |
|---|---|---|---|
| 1 | Public Hearings | $ | 60,000 |
| | Phase 1 Preliminary Survey | $ | 60,000 |
| | Coordination | $ | 60,000 |
| 2 | Phase 3 Archaeological Survey | $ | 1,000,000 |
| | Coordination | $ | 60,000 |
| 3 | Archaeological Lab Work | $ | 200,000 |
| | HABS Work (various) | $ | 600,000 |
| | Coordination | $ | 60,000 |
| 4 | Report Write-up | $ | 100,000 |
| | Coordination | $ | 60,000 |
| | Public Hearings | $ | 60,000 |
| 5 | Site Preparation for moving | $ | 6,720,000 |
| | Coordination | $ | 60,000 |
| 5 | Moving Lighthouse | $ | 8,876,000 |
| | Coordination | $ | 60,000 |
| 6 | Moving Lighthouse | $ | 8,876,000 |
| | Coordination | $ | 60,000 |
| | Total | $ | 26,972,000 |

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[1] Using the long-term erosion rate of one foot per year at the upper section of the displaced revetment, by year 10, the upper bluff will be in danger of collapse. If a 15-year or greater event will occur in 2005, then 2015 is the estimated date of lighthouse failure. Cultural mitigation will begin in year 2009 because it takes six years to mitigate the project site.

[2] When the Cape Hatteras Lighthouse was moved in 1997, the Park Service had estimated the value of the lighthouse to be $20 million (1997 price level); personal correspondence, Paul Cloyd, P.E., Nation Park Service (2/13/2004). This figure becomes $25.4 million in 2004 price level (Civil Works Construction Cost Index). The District's value of $27 million for the Montauk Lighthouse complex compares similarly to the Cape Hatteras Lighthouse valuation.

Table 5. Montauk Point Lighthouse Complex - Calculation for one-year equivalent value (Oct. 2004 P.L., 5.375% discount rate)

| Year | Present Value Factor | Mitigation Cost | Expected Value |
|---|---|---|---|
| 2006 BY-4 | 1.2329639 | $ 180,000 | $ 221,933 |
| 2007 BY-3 | 1.1700725 | $ 1,060,000 | $ 1,240,277 |
| 2008 BY-2 | 1.1103891 | $ 860,000 | $ 954,935 |
| 2009 BY-1 | 1.0537500 | $ 220,000 | $ 231,825 |
| 2010 BY | 1.0000000 | $ 15,716,000 | $ 15,716,000 |
| 2011 BY+1 | 0.9489917 | $ 8,936,000 | $ 8,480,190 |
| Total | | | $ 26,845,000 |

Table 6. Montauk Point Lighthouse Complex - Calculation for one-year equivalent value (Oct. 2004 discount rate)

| CY | Present Value Factor | Mitigation Cost | Expected Value |
|---|---|---|---|
| 2006 BY-4 | 1.2329639 | $ 180,000 | $ 221,933 |
| 2007 BY-3 | 1.1700725 | $ 1,060,000 | $ 1,240,277 |
| 2008 BY-2 | 1.1103891 | $ 860,000 | $ 954,935 |
| 2009 BY-1 | 1.0537500 | $ 220,000 | $ 231,825 |
| 2010 BY | 1.0000000 | | |
| 2011 BY+1 | 0.9489917 | | |
| 2012 BY+2 | 0.9005852 | | |
| 2013 BY+3 | 0.8546479 | $ 15,716,000 | $ 13,431,647 |
| 2014 BY+4 | 0.8110538 | $ 8,936,000 | $ 7,247,577 |
| Total | | | $ 23,328,000 |

11. The year 1994 was used to initiate the probability calculations for revetment failure because 1993 was the most recent occurrence of a 15-year or greater storm event. Tables 7 & 8 show the expected annual cultural mitigation costs that would be incurred in the without-project condition when the revetment fails and bluff erosion begins for the two mitigation scenarios. These calculations become the proxies for the depreciated replacement value of the Montauk Lighthouse complex.

## Table 7. Proxy for Depreciated Replacement Value of Lighthouse Complex - without-project (Oct. 2004 P.L., 5.375% discount rate)

Discount Rate 0.05375

| End of year n | | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value of Lighthouse Complex in Year n | Prob. Of Damage in Year n | Expected Damage in Year n |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.3806404 | 0.6193596 | | | |
| 2008 | 15 | 0.3552644 | 0.6447356 | | | |
| 2009 | 16 | 0.3315801 | 0.6684199 | | | |
| 2010 | 17 | 0.3094747 | 0.6905253 | $26,845,160 | 0.067 | $1,059,795 |
| 2011 | 18 | 0.2888431 | 0.7111569 | $25,475,834 | 0.062 | $981,786 |
| 2012 | 19 | 0.2695869 | 0.7304131 | $24,176,355 | 0.058 | $905,221 |
| 2013 | 20 | 0.2516144 | 0.7483856 | $22,943,160 | 0.054 | $831,231 |
| 2014 | 21 | 0.2348401 | 0.7651599 | $21,772,868 | 0.051 | $760,591 |
| 2015 | 22 | 0.2191841 | 0.7808159 | $20,662,271 | 0.047 | $693,803 |
| 2016 | 23 | 0.2045718 | 0.7954282 | $19,608,324 | 0.044 | $631,158 |
| 2017 | 24 | 0.1909337 | 0.8090663 | $18,608,136 | 0.041 | $572,789 |
| 2018 | 25 | 0.1782048 | 0.8217952 | $17,658,967 | 0.038 | $518,705 |
| 2019 | 26 | 0.1663245 | 0.8336755 | $16,758,213 | 0.036 | $468,831 |
| 2020 | 27 | 0.1552362 | 0.8447638 | $15,903,405 | 0.033 | $423,027 |
| 2021 | 28 | 0.1448871 | 0.8551129 | $15,092,199 | 0.031 | $381,110 |
| 2022 | 29 | 0.1352280 | 0.8647720 | $14,322,372 | 0.029 | $342,869 |
| 2023 | 30 | 0.1262128 | 0.8737872 | $13,591,812 | 0.027 | $308,078 |
| 2024 | 31 | 0.1177986 | 0.8822014 | $12,898,517 | 0.025 | $276,502 |
| 2025 | 32 | 0.1099453 | 0.8900547 | $12,240,585 | 0.024 | $247,905 |
| 2026 | 33 | 0.1026157 | 0.8973843 | $11,616,214 | 0.022 | $222,056 |
| 2027 | 34 | 0.0957746 | 0.9042254 | $11,023,690 | 0.021 | $198,731 |
| 2028 | 35 | 0.0893896 | 0.9106104 | $10,461,391 | 0.019 | $177,717 |
| 2029 | 36 | 0.0834303 | 0.9165697 | $9,927,773 | 0.018 | $158,809 |
| 2030 | 37 | 0.0778683 | 0.9221317 | $9,421,374 | 0.017 | $141,820 |
| 2031 | 38 | 0.0726771 | 0.9273229 | $8,940,806 | 0.016 | $126,571 |
| 2032 | 39 | 0.0678319 | 0.9321681 | $8,484,750 | 0.015 | $112,899 |
| 2033 | 40 | 0.0633098 | 0.9366902 | $8,051,958 | 0.014 | $100,652 |
| 2034 | 41 | 0.0590892 | 0.9409108 | $7,641,241 | 0.013 | $89,691 |
| 2035 | 42 | 0.0551499 | 0.9448501 | $7,251,474 | 0.012 | $79,889 |
| 2036 | 43 | 0.0514732 | 0.9485268 | $6,881,569 | 0.011 | $71,129 |
| 2037 | 44 | 0.0480417 | 0.9519583 | $6,530,571 | 0.010 | $63,307 |
| 2038 | 45 | 0.0448389 | 0.9551611 | $6,197,457 | 0.010 | $56,325 |
| 2039 | 46 | 0.0418496 | 0.9581504 | $5,881,335 | 0.009 | $50,097 |
| 2040 | 47 | 0.0390597 | 0.9609403 | $5,581,339 | 0.008 | $44,545 |
| 2041 | 48 | 0.0364557 | 0.9635443 | $5,296,644 | 0.008 | $39,597 |
| 2042 | 49 | 0.0340253 | 0.9659747 | $5,026,471 | 0.007 | $35,190 |
| 2043 | 50 | 0.0317570 | 0.9682430 | $4,770,079 | 0.007 | $31,267 |
| 2044 | 51 | 0.0296398 | 0.9703602 | $4,526,766 | 0.006 | $27,774 |
| 2045 | 52 | 0.0276638 | 0.9723362 | $4,295,863 | 0.006 | $24,667 |
| 2046 | 53 | 0.0258196 | 0.9741804 | $4,076,738 | 0.006 | $21,903 |
| 2047 | 54 | 0.0240983 | 0.9759017 | $3,868,791 | 0.005 | $19,446 |
| 2048 | 55 | 0.0224917 | 0.9775083 | $3,671,450 | 0.005 | $17,261 |
| 2049 | 56 | 0.0209923 | 0.9790077 | $3,484,176 | 0.005 | $15,320 |
| 2050 | 57 | 0.0195928 | 0.9804072 | $3,306,454 | 0.004 | $13,595 |
| 2051 | 58 | 0.0182866 | 0.9817134 | $3,137,797 | 0.004 | $12,063 |
| 2052 | 59 | 0.0170675 | 0.9829325 | $2,977,744 | 0.004 | $10,702 |
| 2053 | 60 | 0.0159297 | 0.9840703 | $2,825,854 | 0.003 | $9,493 |
| 2054 | 61 | 0.0148677 | 0.9851323 | $2,681,712 | 0.003 | $8,421 |
| 2055 | 62 | 0.0138765 | 0.9861235 | $2,544,922 | 0.003 | $7,468 |
| 2056 | 63 | 0.0129514 | 0.9870486 | $2,415,110 | 0.003 | $6,623 |
| 2057 | 64 | 0.0120880 | 0.9879120 | $2,291,920 | 0.003 | $5,873 |
| 2058 | 65 | 0.0112821 | 0.9887179 | $2,175,013 | 0.002 | $5,208 |
| 2059 | 66 | 0.0105300 | 0.9894700 | $1,412,045 | 0.002 | $3,159 |
| | | | | | | $11,412,671 |
| | | | | | Annual Damages | $661,714 |

## Table 8. Proxy for Depreciated Replacement Value of Lighthouse Complex - without-project (Oct. 2004 P.L., 5.375% discount rate)

Discount Rate 0.05375

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value of Lighthouse Complex in Year n | Prob. Of Damage in Year n | Expected Damage in Year n |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.3806404 | 0.6193596 | | | |
| 2008 | 15 | 0.3552644 | 0.6447356 | | | |
| 2009 | 16 | 0.3315801 | 0.6684199 | | | |
| 2010 | 17 | 0.3094747 | 0.6905253 | $23,328,193 | 0.067 | $920,952 |
| 2011 | 18 | 0.2888431 | 0.7111569 | $22,138,262 | 0.062 | $853,163 |
| 2012 | 19 | 0.2695869 | 0.7304131 | $21,009,026 | 0.058 | $786,629 |
| 2013 | 20 | 0.2516144 | 0.7483856 | $19,937,392 | 0.054 | $722,332 |
| 2014 | 21 | 0.2348401 | 0.7651599 | $16,170,297 | 0.051 | $564,876 |
| 2015 | 22 | 0.2191841 | 0.7808159 | $15,345,477 | 0.047 | $515,274 |
| 2016 | 23 | 0.2045718 | 0.7954282 | $14,562,730 | 0.044 | $468,749 |
| 2017 | 24 | 0.1909337 | 0.8090663 | $13,819,910 | 0.041 | $425,399 |
| 2018 | 25 | 0.1782048 | 0.8217952 | $13,114,980 | 0.038 | $385,232 |
| 2019 | 26 | 0.1663245 | 0.8336755 | $12,446,007 | 0.036 | $348,192 |
| 2020 | 27 | 0.1552362 | 0.8447638 | $11,811,158 | 0.033 | $314,174 |
| 2021 | 28 | 0.1448871 | 0.8551129 | $11,208,690 | 0.031 | $283,043 |
| 2022 | 29 | 0.1352280 | 0.8647720 | $10,636,954 | 0.029 | $254,643 |
| 2023 | 30 | 0.1262128 | 0.8737872 | $10,094,381 | 0.027 | $228,804 |
| 2024 | 31 | 0.1177986 | 0.8822014 | $9,579,484 | 0.025 | $205,353 |
| 2025 | 32 | 0.1099453 | 0.8900547 | $9,090,851 | 0.024 | $184,115 |
| 2026 | 33 | 0.1026157 | 0.8973843 | $8,627,142 | 0.022 | $164,917 |
| 2027 | 34 | 0.0957746 | 0.9042254 | $8,187,086 | 0.021 | $147,594 |
| 2028 | 35 | 0.0893896 | 0.9106104 | $7,769,477 | 0.019 | $131,987 |
| 2029 | 36 | 0.0834303 | 0.9165697 | $7,337,126 | 0.018 | $117,368 |
| 2030 | 37 | 0.0778683 | 0.9221317 | $6,997,076 | 0.017 | $105,327 |
| 2031 | 38 | 0.0726771 | 0.9273229 | $6,640,167 | 0.016 | $94,002 |
| 2032 | 39 | 0.0678319 | 0.9321681 | $6,301,463 | 0.015 | $83,848 |
| 2033 | 40 | 0.0633098 | 0.9366902 | $5,980,036 | 0.014 | $74,752 |
| 2034 | 41 | 0.0590892 | 0.9409108 | $5,675,005 | 0.013 | $66,612 |
| 2035 | 42 | 0.0551499 | 0.9448501 | $5,385,532 | 0.012 | $59,332 |
| 2036 | 43 | 0.0514732 | 0.9485268 | $5,110,826 | 0.011 | $52,826 |
| 2037 | 44 | 0.0480417 | 0.9519583 | $4,850,131 | 0.010 | $47,017 |
| 2038 | 45 | 0.0448389 | 0.9551611 | $4,602,734 | 0.010 | $41,831 |
| 2039 | 46 | 0.0418496 | 0.9581504 | $4,367,956 | 0.009 | $37,206 |
| 2040 | 47 | 0.0390597 | 0.9609403 | $4,145,154 | 0.008 | $33,083 |
| 2041 | 48 | 0.0364557 | 0.9635443 | $3,933,717 | 0.008 | $29,408 |
| 2042 | 49 | 0.0340253 | 0.9659747 | $3,733,065 | 0.007 | $26,135 |
| 2043 | 50 | 0.0317570 | 0.9682430 | $3,542,648 | 0.007 | $23,221 |
| 2044 | 51 | 0.0296398 | 0.9703602 | $3,361,943 | 0.006 | $20,627 |
| 2045 | 52 | 0.0276638 | 0.9723362 | $3,190,456 | 0.006 | $18,320 |
| 2046 | 53 | 0.0258196 | 0.9741804 | $3,027,716 | 0.006 | $16,267 |
| 2047 | 54 | 0.0240983 | 0.9759017 | $2,873,278 | 0.005 | $14,442 |
| 2048 | 55 | 0.0224917 | 0.9775083 | $2,726,717 | 0.005 | $12,820 |
| 2049 | 56 | 0.0209923 | 0.9790077 | $2,587,631 | 0.005 | $11,378 |
| 2050 | 57 | 0.0195928 | 0.9804072 | $2,455,641 | 0.004 | $10,097 |
| 2051 | 58 | 0.0182866 | 0.9817134 | $2,330,383 | 0.004 | $8,959 |
| 2052 | 59 | 0.0170675 | 0.9829325 | $2,211,514 | 0.004 | $7,948 |
| 2053 | 60 | 0.0159297 | 0.9840703 | $2,098,708 | 0.003 | $7,051 |
| 2054 | 61 | 0.0148677 | 0.9851323 | $1,991,657 | 0.003 | $6,254 |
| 2055 | 62 | 0.0138765 | 0.9861235 | $1,890,066 | 0.003 | $5,547 |
| 2056 | 63 | 0.0129514 | 0.9870486 | $1,236,405 | 0.003 | $3,391 |
| 2057 | 64 | 0.0120880 | 0.9879120 | $193,285 | 0.003 | $495 |
| 2058 | 65 | 0.0112821 | 0.9887179 | $183,426 | 0.002 | $439 |
| 2059 | 66 | 0.0105300 | 0.9894700 | $174,069 | 0.002 | $389 |
| | | | | | | $8,941,820 |
| | | | | | Annual Damages | $518,452 |

12. Of these two proxies for the depreciated value of the lighthouse complex, the economic analysis that follows will use the proxy least favorable to project justification, $518,500, for further analysis to determine if there is a viable solution to protecting Montauk Point and its vicinity.

Local Costs Forgone

13. The lighthouse complex is situated on 3 acres of land, specifically a bluff that has an appraised value of $12 million. It is estimated that the top of the bluff will erode at a rate of 3 feet per year when the revetment fails. Because of the complexity of actually replacing the bluff surface, a prorated amount of the appraised value of land lost was used as a proxy for the local costs forgone for this loss in the without-project condition. The local costs forgone for this land value due to long-term erosion is calculated to be $82,600 per year. The average annual local costs forgone are $74,100 as shown in Table 9. The two numbers differ because the average annual costs take into account the probability that revetment failure will not occur immediately.

## Table 9. Local Costs Forgone (Oct. 2004 P.L., 5.375% discount rate)

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value Factor | | |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.3806404 | 0.6193596 | | | |
| 2008 | 15 | 0.3552644 | 0.6447356 | | | |
| 2009 | 16 | 0.3315801 | 0.6684199 | | | |
| 2010 | 17 | 0.3094747 | 0.6905253 | 1.0000000 | $82,600 | $57,037 |
| 2011 | 18 | 0.2888431 | 0.7111569 | 0.9489917 | $82,600 | $55,745 |
| 2012 | 19 | 0.2695869 | 0.7304131 | 0.9005852 | $82,600 | $54,334 |
| 2013 | 20 | 0.2516144 | 0.7483856 | 0.8546479 | $82,600 | $52,831 |
| 2014 | 21 | 0.2348401 | 0.7651599 | 0.8110538 | $82,600 | $51,260 |
| 2015 | 22 | 0.2191841 | 0.7808159 | 0.7696833 | $82,600 | $49,641 |
| 2016 | 23 | 0.2045718 | 0.7954282 | 0.7304231 | $82,600 | $47,991 |
| 2017 | 24 | 0.1909337 | 0.8090663 | 0.6931654 | $82,600 | $46,323 |
| 2018 | 25 | 0.1782048 | 0.8217952 | 0.6578082 | $82,600 | $44,652 |
| 2019 | 26 | 0.1663245 | 0.8336755 | 0.6242545 | $82,600 | $42,987 |
| 2020 | 27 | 0.1552362 | 0.8447638 | 0.5924124 | $82,600 | $41,337 |
| 2021 | 28 | 0.1448871 | 0.8551129 | 0.5621944 | $82,600 | $39,709 |
| 2022 | 29 | 0.1352280 | 0.8647720 | 0.5335178 | $82,600 | $38,109 |
| 2023 | 30 | 0.1262128 | 0.8737872 | 0.5063040 | $82,600 | $36,542 |
| 2024 | 31 | 0.1177986 | 0.8822014 | 0.4804783 | $82,600 | $35,012 |
| 2025 | 32 | 0.1099453 | 0.8900547 | 0.4559699 | $82,600 | $33,522 |
| 2026 | 33 | 0.1026157 | 0.8973843 | 0.4327117 | $82,600 | $32,074 |
| 2027 | 34 | 0.0957746 | 0.9042254 | 0.4106398 | $82,600 | $30,670 |
| 2028 | 35 | 0.0893896 | 0.9106104 | 0.3896937 | $82,600 | $29,311 |
| 2029 | 36 | 0.0834303 | 0.9165697 | 0.3698161 | $82,600 | $27,998 |
| 2030 | 37 | 0.0778683 | 0.9221317 | 0.3509524 | $82,600 | $26,731 |
| 2031 | 38 | 0.0726771 | 0.9273229 | 0.3330509 | $82,600 | $25,511 |
| 2032 | 39 | 0.0678319 | 0.9321681 | 0.3160628 | $82,600 | $24,336 |
| 2033 | 40 | 0.0633098 | 0.9366902 | 0.2999408 | $82,600 | $23,207 |
| 2034 | 41 | 0.0590892 | 0.9409108 | 0.2846413 | $82,600 | $22,122 |
| 2035 | 42 | 0.0551499 | 0.9448501 | 0.2701222 | $82,600 | $21,082 |
| 2036 | 43 | 0.0514732 | 0.9485268 | 0.2563437 | $82,600 | $20,084 |
| 2037 | 44 | 0.0480417 | 0.9519583 | 0.2432681 | $82,600 | $19,129 |
| 2038 | 45 | 0.0448389 | 0.9551611 | 0.2308594 | $82,600 | $18,214 |
| 2039 | 46 | 0.0418496 | 0.9581504 | 0.2190838 | $82,600 | $17,339 |
| 2040 | 47 | 0.0390597 | 0.9609403 | 0.2079088 | $82,600 | $16,502 |
| 2041 | 48 | 0.0364557 | 0.9635443 | 0.1973035 | $82,600 | $15,703 |
| 2042 | 49 | 0.0340253 | 0.9659747 | 0.1872394 | $82,600 | $14,940 |
| 2043 | 50 | 0.0317570 | 0.9682430 | 0.1776886 | $82,600 | $14,211 |
| 2044 | 51 | 0.0296398 | 0.9703602 | 0.1686250 | $82,600 | $13,516 |
| 2045 | 52 | 0.0276638 | 0.9723362 | 0.1600237 | $82,600 | $12,852 |
| 2046 | 53 | 0.0258196 | 0.9741804 | 0.1518612 | $82,600 | $12,220 |
| 2047 | 54 | 0.0240983 | 0.9759017 | 0.1441150 | $82,600 | $11,617 |
| 2048 | 55 | 0.0224917 | 0.9775083 | 0.1367640 | $82,600 | $11,043 |
| 2049 | 56 | 0.0209923 | 0.9790077 | 0.1297879 | $82,600 | $10,495 |
| 2050 | 57 | 0.0195928 | 0.9804072 | 0.1231676 | $82,600 | $9,974 |
| 2051 | 58 | 0.0182866 | 0.9817134 | 0.1168850 | $82,600 | $9,478 |
| 2052 | 59 | 0.0170675 | 0.9829325 | 0.1109229 | $82,600 | $9,006 |
| 2053 | 60 | 0.0159297 | 0.9840703 | 0.1052649 | $82,600 | $8,556 |
| 2054 | 61 | 0.0148677 | 0.9851323 | 0.0998958 | $82,600 | $8,129 |
| 2055 | 62 | 0.0138765 | 0.9861235 | 0.0948000 | $82,600 | $7,722 |
| 2056 | 63 | 0.0129514 | 0.9870486 | 0.0899645 | $82,600 | $7,335 |
| 2057 | 64 | 0.0120880 | 0.9879120 | 0.0853755 | $82,600 | $6,967 |
| 2058 | 65 | 0.0112821 | 0.9887179 | 0.0810207 | $82,600 | $6,617 |
| 2059 | 66 | 0.0105300 | 0.9894700 | 0.0768879 | $82,600 | $6,284 |
| | | | | | | $1,278,010 |
| | | | | | Annual Damages | $74,100 |

## Recreation Loss

14. Another without-project consequence of storm damage to the bluff would be loss visitations to the lighthouse. Visitation losses associated with the lighthouse's closure were assessed using the Travel Cost Estimate of Willingness to Pay. The lighthouse has a log in which visitors indicate the places where they are traveling from to visit. A recent sample from the log was used to estimate the round-trip distance from each origin. The values of losses are the costs in cents per mile to operate an automobile, plus the opportunity costs of time spent in travel and on site. Surveys were conducted to determine the number of visitors that make the trip to Montauk, NY exclusively to visit the lighthouse. Based on the survey, 47% of the people sampled indicated that visiting the Montauk Lighthouse complex was the reason they drove to Montauk, New York. The remaining 53% of the people indicated that visiting the Montauk Lighthouse complex was part of their itinerary on their visit to Long Island, New York. The travel costs attributed to this category were prorated at 25% of their total travel costs.

15. A rate of $0.378 per mile[3] was used for calculating the operating costs per car, as shown in Table 10. Costs per person were calculated using state park figures of 3.5 persons per car. The opportunity cost of time is 1/3 and 1/12 the average wage rate for adults and children, respectively. The hourly wage rate is $18.11[4]. The estimated car driving speed is 40 mph. Tables 11 and 12 show the calculations for the Travel Cost Method. As a result, $3,040,200 in annual visitation losses has been projected for all visitors to the Montauk Point Lighthouse complex including admissions fees.

**Table 10. Variable Driving Costs for 2004**

| **Categories** | **Per mile** |
|---|---|
| gas and oil | $ 0.065 |
| maintenance | $ 0.054 |
| tires | $ 0.007 |
| Subtotal cost per mile | $ 0.126 |
| | **Per year** |
| depreciation | $ 3,782.00 |
| (15,000 miles annually) | |
| | **Per mile** |
| depreciation | $ 0.252 |
| **Total variable costs per mile** | **$ 0.378** |

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[3] U.S. Department of Transportation.

[4] The estimated average payroll tax rate for the region is 30%. The current hourly wage rate is $25.46 (US Dept. of Labor, April 2004) multiplied by the CPI factor to bring the price level to October 2004 (207.3/204.0). The after-tax hourly wage rate is 0.7 x $25.46(207.3/204.0) = $18.11.

## Table 11. Montauk Point Lighthouse Travel Cost Method

| | | | | |
|---|---|---|---|---|
| Per Capita Income | Oct-04 | Adult time cost/hr | Child time cost/hr | Annual Admission Fees |
| NY&NJ metropolitan area | $18.11 | $6.04 | $1.51 | $482,121 |
| Cost per mile | 0.378 | Avg. time spent at lighthouse | 1 hour | |
| Round Trip Factor | 2 | | | |
| People per car | 3.5 | No. Adults per year | 88851 | |
| Avg. driving speed | 40 | No. Children per year | 17872 | |

| Residence | No. of people sampled | Multiply Factor | No. of Adults | No. of Children | Miles to Montauk | Travel Cost Per Car | Car Travel Cost per Person | Total Car Travel Cost | Travel time cost per adult | Travel time cost per child | Total travel time cost | Total time cost spent at lighthouse |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E. Hampton | 40 | 0.02247191 | 1997 | 402 | 16 | $12.10 | $3.46 | 8,288 | $4.83 | $1.21 | $10,128 | $12,659 |
| So. Hampton(1) | 6 | 0.003370787 | 299 | 60 | 31 | $23.44 | $6.70 | 2,409 | $9.36 | $2.34 | $2,943 | $1,899 |
| So. Hampton(2) | 7 | 0.003932584 | 349 | 70 | 45 | $34.02 | $9.72 | 4,079 | $13.58 | $3.40 | $4,985 | $2,215 |
| Southhold | 11 | 0.006179775 | 549 | 110 | 42 | $31.75 | $9.07 | 5,983 | $12.68 | $3.17 | $7,311 | $3,481 |
| Riverhead | 10 | 0.005617978 | 499 | 100 | 48 | $36.29 | $10.37 | 6,216 | $14.49 | $3.62 | $7,596 | $3,165 |
| Brookhaven(1) | 73 | 0.041011236 | 3644 | 733 | 61 | $46.12 | $13.18 | 57,669 | $18.41 | $4.60 | $70,466 | $23,103 |
| Brookhaven(2) | 74 | 0.041573034 | 3694 | 743 | 67 | $50.65 | $14.47 | 64,209 | $20.22 | $5.06 | $78,457 | $23,420 |
| Islip | 100 | 0.056179775 | 4992 | 1004 | 74 | $55.94 | $15.98 | 95,835 | $22.34 | $5.58 | $117,100 | $31,649 |
| Smithtown | 16 | 0.008988764 | 799 | 161 | 76 | $57.46 | $16.42 | 15,748 | $22.94 | $5.73 | $19,242 | $5,064 |
| Babylon | 83 | 0.046629213 | 4143 | 833 | 83 | $62.75 | $17.93 | 89,217 | $25.05 | $6.26 | $109,014 | $26,268 |
| Huntington | 48 | 0.026966292 | 2396 | 482 | 88 | $66.53 | $19.01 | 54,704 | $26.56 | $6.64 | $66,842 | $15,191 |
| Oyster Bay | 21 | 0.011797753 | 1048 | 211 | 95 | $71.82 | $20.52 | 25,837 | $28.67 | $7.17 | $31,569 | $6,646 |
| So. Oyster Bay | 21 | 0.011797753 | 1048 | 211 | 90 | $68.04 | $19.44 | 24,477 | $27.17 | $6.79 | $29,908 | $6,646 |
| Hempstead | 143 | 0.080337079 | 7138 | 1436 | 100 | $75.60 | $21.60 | 185,194 | $30.18 | $7.55 | $226,287 | $45,257 |
| No. Hempstead | 19 | 0.010674157 | 948 | 191 | 103 | $77.87 | $22.25 | 25,344 | $31.09 | $7.77 | $30,968 | $6,013 |
| Queens | 99 | 0.055617978 | 4942 | 994 | 115 | $86.94 | $24.84 | 147,443 | $34.71 | $8.68 | $180,160 | $31,332 |
| Brooklyn | 40 | 0.02247191 | 1997 | 402 | 115 | $86.94 | $24.84 | 59,573 | $34.71 | $8.68 | $72,792 | $12,659 |
| Manhattan | 106 | 0.059550562 | 5291 | 1064 | 116 | $87.70 | $25.06 | 159,241 | $35.01 | $8.75 | $194,576 | $33,548 |
| Bronx | 24 | 0.013483146 | 1198 | 241 | 120 | $90.72 | $25.92 | 37,298 | $36.22 | $9.06 | $45,574 | $7,596 |
| Staten Island | 12 | 0.006741573 | 599 | 120 | 120 | $90.72 | $25.92 | 18,649 | $36.22 | $9.06 | $22,787 | $3,798 |
| Others | 827 | 0.464606742 | 41281 | 8303 | 20 | $15.12 | $4.32 | 214,204 | $6.04 | $1.51 | $261,734 | $261,734 |
| Total | 1780 | 1 | 88851 | 17872 | | | | 1,301,619 | | | $1,590,437 | $563,345 |
| Prorated Travel Cost | | | | | | | | $897,749 | | | $1,096,953 | $563,345 |

| **Table 12. Summary of Travel Cost Method** (Oct. 2004 P.L.) | | |
|---|---|---|
| Prorated Car Travel Cost | $ | 897,749 |
| Prorated Travel Time Cost | $ | 1,096,953 |
| Time Spent at Lighthouse Cost | $ | 563,345 |
| Admissions Cost | $ | 482,121 |
| Total | $ | 3,040,167 |

16. Lighthouse visitations will be lost when the existing revetment is damaged by a 15-year or greater storm event, followed by 10 years of erosion to the bluff. If the revetment is damaged in year 2005, the lighthouse visitations will be lost starting in year 2015. Since the base year is 2009, the lighthouse visitations will be lost from 2015 through 2058. The $3,040,200 per year of lighthouse visitations from 2015 through 2058 is discounted to the first year that visitations are lost, year 2015. This was done to convert 44 years of lost visitations into a one-year equivalent loss that will occur in 2015. Similar calculations converted the lost visitations into one-year equivalents losses that will occur in years 2016 through 2058. These results are shown in Table 13. The average annual lighthouse visitations are calculated to be $882,700 as shown in Table 14.

## Table 13. Montauk Point Lighthouse Visitations – Calculation for one-year equivalent value in year n (Oct. 2004 P.L., 5.375% discount rate)

| Year | Present Value Factor | Lighthouse Visitations in year n | Lighthouse Visitations Present Value | Lighthouse Visitations 1-yr equivalent value in year n |
|---|---|---|---|---|
| 2010 | 1 | | | |
| 2011 | 0.948991696 | | | |
| 2012 | 0.90058524 | | | |
| 2013 | 0.854647914 | | | |
| 2014 | 0.811053774 | | | |
| 2015 | 0.769683297 | | | |
| 2016 | 0.730423057 | $3,040,167 | $2,220,608 | $39,185,369 |
| 2017 | 0.693165416 | $3,040,167 | $2,107,339 | $36,964,761 |
| 2018 | 0.657808224 | $3,040,167 | $1,999,847 | $34,857,422 |
| 2019 | 0.624254543 | $3,040,167 | $1,897,838 | $32,857,576 |
| 2020 | 0.592412377 | $3,040,167 | $1,801,033 | $30,959,738 |
| 2021 | 0.562194427 | $3,040,167 | $1,709,165 | $29,158,705 |
| 2022 | 0.533517843 | $3,040,167 | $1,621,983 | $27,449,540 |
| 2023 | 0.506304003 | $3,040,167 | $1,539,249 | $25,827,557 |
| 2024 | 0.480478294 | $3,040,167 | $1,460,734 | $24,288,308 |
| 2025 | 0.455969912 | $3,040,167 | $1,386,225 | $22,827,574 |
| 2026 | 0.43271166 | $3,040,167 | $1,315,516 | $21,441,349 |
| 2027 | 0.410639772 | $3,040,167 | $1,248,413 | $20,125,833 |
| 2028 | 0.389693734 | $3,040,167 | $1,184,734 | $18,877,420 |
| 2029 | 0.369816118 | $3,040,167 | $1,124,303 | $17,692,686 |
| 2030 | 0.350952425 | $3,040,167 | $1,066,954 | $16,568,383 |
| 2031 | 0.333050937 | $3,040,167 | $1,012,530 | $15,501,429 |
| 2032 | 0.316062574 | $3,040,167 | $960,883 | $14,488,899 |
| 2033 | 0.299940758 | $3,040,167 | $911,870 | $13,528,016 |
| 2034 | 0.284641289 | $3,040,167 | $865,357 | $12,616,146 |
| 2035 | 0.270122219 | $3,040,167 | $821,217 | $11,750,789 |
| 2036 | 0.256343743 | $3,040,167 | $779,328 | $10,929,572 |
| 2037 | 0.243268084 | $3,040,167 | $739,576 | $10,150,244 |
| 2038 | 0.230859391 | $3,040,167 | $701,851 | $9,410,669 |
| 2039 | 0.219083645 | $3,040,167 | $666,051 | $8,708,817 |
| 2040 | 0.20790856 | $3,040,167 | $632,077 | $8,042,767 |
| 2041 | 0.197303497 | $3,040,167 | $599,836 | $7,410,690 |
| 2042 | 0.187239381 | $3,040,167 | $569,239 | $6,810,854 |
| 2043 | 0.177688617 | $3,040,167 | $540,203 | $6,241,615 |
| 2044 | 0.168625022 | $3,040,167 | $512,648 | $5,701,412 |
| 2045 | 0.160023746 | $3,040,167 | $486,499 | $5,188,764 |
| 2046 | 0.151861206 | $3,040,167 | $461,683 | $4,702,265 |
| 2047 | 0.144115024 | $3,040,167 | $438,134 | $4,240,582 |
| 2048 | 0.136763961 | $3,040,167 | $415,785 | $3,802,448 |
| 2049 | 0.129787863 | $3,040,167 | $394,577 | $3,386,663 |
| 2050 | 0.123167604 | $3,040,167 | $374,450 | $2,992,086 |
| 2051 | 0.116885034 | $3,040,167 | $355,350 | $2,617,636 |
| 2052 | 0.110922927 | $3,040,167 | $337,224 | $2,262,286 |
| 2053 | 0.105264936 | $3,040,167 | $320,023 | $1,925,061 |
| 2054 | 0.09989555 | $3,040,167 | $303,699 | $1,605,038 |
| 2055 | 0.094800048 | $3,040,167 | $288,208 | $1,301,339 |
| 2056 | 0.089964458 | $3,040,167 | $273,507 | $1,013,131 |
| 2057 | 0.085375524 | $3,040,167 | $259,556 | $739,624 |
| 2058 | 0.081020663 | $3,040,167 | $246,316 | $480,069 |
| 2059 | 0.076887937 | $3,040,167 | $233,752 | $233,752 |

## Table 14. Lighthouse Visitations Damages - without-project

(Oct. 2004 P.L., 5.375% discount rate)

Discount Rate 0.05375

| | End of year n | Probebility that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value of Visitations for Year n | Prob. Of Damage in Year n | Expected Damage in Year n |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.3806404 | 0.6193596 | | | |
| 2008 | 15 | 0.3552644 | 0.6447356 | | | |
| 2009 | 16 | 0.3315801 | 0.6684199 | | | |
| 2010 | 17 | 0.3094747 | 0.6905253 | | | |
| 2011 | 18 | 0.2888431 | 0.7111569 | | | |
| 2012 | 19 | 0.2695869 | 0.7304131 | | | |
| 2013 | 20 | 0.2516144 | 0.7483856 | | | |
| 2014 | 21 | 0.2348401 | 0.7651599 | | | |
| 2015 | 22 | 0.2191841 | 0.7808159 | | | |
| 2016 | 23 | 0.2045718 | 0.7954282 | $39,185,369 | 0.067 | $1,546,963 |
| 2017 | 24 | 0.1909337 | 0.8090663 | $36,964,761 | 0.062 | $1,424,545 |
| 2018 | 25 | 0.1782048 | 0.8217952 | $34,857,422 | 0.058 | $1,305,146 |
| 2019 | 26 | 0.1663245 | 0.8336755 | $32,857,576 | 0.054 | $1,190,430 |
| 2020 | 27 | 0.1552362 | 0.8447638 | $30,959,738 | 0.051 | $1,081,515 |
| 2021 | 28 | 0.1448871 | 0.8551129 | $29,158,705 | 0.047 | $979,098 |
| 2022 | 29 | 0.1352280 | 0.8647720 | $27,449,540 | 0.044 | $883,554 |
| 2023 | 30 | 0.1262128 | 0.8737872 | $25,827,557 | 0.041 | $795,014 |
| 2024 | 31 | 0.1177986 | 0.8822014 | $24,288,308 | 0.038 | $713,432 |
| 2025 | 32 | 0.1099453 | 0.8900547 | $22,827,574 | 0.036 | $638,628 |
| 2026 | 33 | 0.1026157 | 0.8973843 | $21,441,349 | 0.033 | $570,334 |
| 2027 | 34 | 0.0957746 | 0.9042254 | $20,125,833 | 0.031 | $508,219 |
| 2028 | 35 | 0.0893896 | 0.9106104 | $18,877,420 | 0.029 | $451,915 |
| 2029 | 36 | 0.0834303 | 0.9165697 | $17,692,686 | 0.027 | $401,031 |
| 2030 | 37 | 0.0778683 | 0.9221317 | $16,568,383 | 0.025 | $355,172 |
| 2031 | 38 | 0.0726771 | 0.9273229 | $15,501,429 | 0.024 | $313,946 |
| 2032 | 39 | 0.0678319 | 0.9321681 | $14,488,899 | 0.022 | $276,971 |
| 2033 | 40 | 0.0633098 | 0.9366902 | $13,528,016 | 0.021 | $243,879 |
| 2034 | 41 | 0.0590892 | 0.9409108 | $12,616,146 | 0.019 | $214,321 |
| 2035 | 42 | 0.0551499 | 0.9448501 | $11,750,789 | 0.018 | $187,971 |
| 2036 | 43 | 0.0514732 | 0.9485268 | $10,929,572 | 0.017 | $164,523 |
| 2037 | 44 | 0.0480417 | 0.9519583 | $10,150,244 | 0.016 | $143,693 |
| 2038 | 45 | 0.0448389 | 0.9551611 | $9,410,669 | 0.015 | $125,219 |
| 2039 | 46 | 0.0418496 | 0.9581504 | $8,708,817 | 0.014 | $108,863 |
| 2040 | 47 | 0.0390597 | 0.9609403 | $8,042,767 | 0.013 | $94,404 |
| 2041 | 48 | 0.0364557 | 0.9635443 | $7,410,690 | 0.012 | $81,643 |
| 2042 | 49 | 0.0340253 | 0.9659747 | $6,810,854 | 0.011 | $70,398 |
| 2043 | 50 | 0.0317570 | 0.9682430 | $6,241,615 | 0.010 | $60,505 |
| 2044 | 51 | 0.0296398 | 0.9703602 | $5,701,412 | 0.010 | $51,817 |
| 2045 | 52 | 0.0276638 | 0.9723362 | $5,188,764 | 0.009 | $44,198 |
| 2046 | 53 | 0.0258196 | 0.9741804 | $4,702,265 | 0.008 | $37,529 |
| 2047 | 54 | 0.0240983 | 0.9759017 | $4,240,582 | 0.008 | $31,702 |
| 2048 | 55 | 0.0224917 | 0.9775083 | $3,802,448 | 0.007 | $26,621 |
| 2049 | 56 | 0.0209923 | 0.9790077 | $3,386,663 | 0.007 | $22,199 |
| 2050 | 57 | 0.0195928 | 0.9804072 | $2,992,086 | 0.006 | $18,358 |
| 2051 | 58 | 0.0182866 | 0.9817134 | $2,617,636 | 0.006 | $15,031 |
| 2052 | 59 | 0.0170675 | 0.9829325 | $2,262,286 | 0.006 | $12,155 |
| 2053 | 60 | 0.0159297 | 0.9840703 | $1,925,061 | 0.005 | $9,676 |
| 2054 | 61 | 0.0148677 | 0.9851323 | $1,605,038 | 0.005 | $7,546 |
| 2055 | 62 | 0.0138765 | 0.9861235 | $1,301,339 | 0.005 | $5,722 |
| 2056 | 63 | 0.0129514 | 0.9870486 | $1,013,131 | 0.004 | $4,166 |
| 2057 | 64 | 0.0120880 | 0.9879120 | $739,624 | 0.004 | $2,843 |
| 2058 | 65 | 0.0112821 | 0.9887179 | $480,069 | 0.004 | $1,725 |
| 2059 | 66 | 0.0105300 | 0.9894700 | $233,752 | 0.003 | $785 |
| | | | | | | $15,223,407 |
| | | | | | Annual Damages | $882,662 |

17. The Montauk Point Lighthouse complex resides within the Montauk Point State Park. The Montauk Point Lighthouse complex offers a unique experience that is not found elsewhere in the New York metropolitan area. Part of the state park experience is its connection with the lighthouse complex. There will be a reduction to the overall aesthetics and recreational value of the state park visitations if the lighthouse complex did not exist. Per ER1105-2-100, Planning Guidance Notebook, the Unit Day Value method was used to assign visitation values to the state park for the with-project and without-project conditions. It is estimated that the current value for the recreational experience is $6.86. Without the lighthouse complex, the recreational experience is reduced to an estimate of $5.95. The annual benefits lost from state park visitations experience are $682,500 based on 750,000 visitations[5]. Table 15 shows the calculations for the state park recreation values based on Unit Day Value calculations. The average annual reduced state park usage values will be incurred when the existing revetment is damaged by a 15-year or greater storm event, and after 10 years of long-term erosion have occurred to the bluff. Tables 16 shows the one-year equivalent reduced state park visitation usages for years 2015 through 2058 and Table17 shows calculations for the average annual reduced state park recreational experience to be $198,200.

**Table 15. State Park Visitations, Unit Day Values**

| | Without-Project | With-Project |
|---|---|---|
| Recreation Experience | 10 | 15 |
| Availability of opportunity | 6 | 14 |
| Carrying capacity | 6 | 6 |
| Accessibility | 10 | 10 |
| Environmental | 10 | 10 |
| Total | 42 | 55 |
| Unit Day Value | $5.95 | $6.86 |

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[5] Unit Day Value was used due to study cost considerations. The difference in state park usage value is $0.91 per visit. 750,000 visitations x $0.91 = $682,500 (Oct. 2004 P.L.). Although the actual visitations to the State Park are 797,462, the method of using Unit Day Value to evaluate recreation usage imposes a visitation cap of 750,000 persons.

## Table 16. Montauk Point State Park Visitations - Calculation for one-year equivalent value in year n (Oct. 2004 P.L., 5.375% discount rate)

| Year | Present Value Factor | State Park Visitetions in year n | State Park Visitations Present Value | State Park Visitations 1-yr equivalent value in year n |
|---|---|---|---|---|
| 2010 | 1 | | | |
| 2011 | 0.948991696 | | | |
| 2012 | 0.90058524 | | | |
| 2013 | 0.854647914 | | | |
| 2014 | 0.811053774 | | | |
| 2015 | 0.769683297 | | | |
| 2016 | 0.730423057 | $682,500 | $498,514 | $8,796,890 |
| 2017 | 0.693165416 | $682,500 | $473,085 | $8,298,376 |
| 2018 | 0.657808224 | $682,500 | $448,954 | $7,825,291 |
| 2019 | 0.624254543 | $682,500 | $426,054 | $7,376,337 |
| 2020 | 0.592412377 | $682,500 | $404,321 | $6,950,283 |
| 2021 | 0.562194427 | $682,500 | $383,698 | $6,545,962 |
| 2022 | 0.533517843 | $682,500 | $364,126 | $6,162,264 |
| 2023 | 0.506304003 | $682,500 | $345,552 | $5,798,138 |
| 2024 | 0.480478294 | $682,500 | $327,926 | $5,452,585 |
| 2025 | 0.455969912 | $682,500 | $311,199 | $5,124,659 |
| 2026 | 0.43271166 | $682,500 | $295,326 | $4,813,459 |
| 2027 | 0.410639772 | $682,500 | $280,262 | $4,518,134 |
| 2028 | 0.389693734 | $682,500 | $265,966 | $4,237,872 |
| 2029 | 0.369816118 | $682,500 | $252,400 | $3,971,906 |
| 2030 | 0.350952425 | $682,500 | $239,525 | $3,719,507 |
| 2031 | 0.333050937 | $682,500 | $227,307 | $3,479,982 |
| 2032 | 0.316062574 | $682,500 | $215,713 | $3,252,674 |
| 2033 | 0.299940758 | $682,500 | $204,710 | $3,036,962 |
| 2034 | 0.284641289 | $682,500 | $194,268 | $2,832,252 |
| 2035 | 0.270122219 | $682,500 | $184,358 | $2,637,984 |
| 2036 | 0.256343743 | $682,500 | $174,955 | $2,453,626 |
| 2037 | 0.243268084 | $682,500 | $166,030 | $2,278,671 |
| 2038 | 0.230859391 | $682,500 | $157,562 | $2,112,641 |
| 2039 | 0.219083645 | $682,500 | $149,525 | $1,955,079 |
| 2040 | 0.20790856 | $682,500 | $141,898 | $1,805,555 |
| 2041 | 0.197303497 | $682,500 | $134,660 | $1,663,657 |
| 2042 | 0.187239381 | $682,500 | $127,791 | $1,528,998 |
| 2043 | 0.177688617 | $682,500 | $121,272 | $1,401,207 |
| 2044 | 0.168625022 | $682,500 | $115,087 | $1,279,934 |
| 2045 | 0.160023746 | $682,500 | $109,216 | $1,164,848 |
| 2046 | 0.151861206 | $682,500 | $103,645 | $1,055,631 |
| 2047 | 0.144115024 | $682,500 | $98,359 | $951,986 |
| 2048 | 0.136763961 | $682,500 | $93,341 | $853,628 |
| 2049 | 0.129787863 | $682,500 | $88,580 | $760,286 |
| 2050 | 0.123167604 | $682,500 | $84,062 | $671,706 |
| 2051 | 0.116885034 | $682,500 | $79,774 | $587,644 |
| 2052 | 0.110922927 | $682,500 | $75,705 | $507,870 |
| 2053 | 0.105264936 | $682,500 | $71,843 | $432,165 |
| 2054 | 0.09989555 | $682,500 | $68,179 | $360,322 |
| 2055 | 0.094800048 | $682,500 | $64,701 | $292,143 |
| 2056 | 0.089964458 | $682,500 | $61,401 | $227,442 |
| 2057 | 0.085375524 | $682,500 | $58,269 | $166,041 |
| 2058 | 0.081020663 | $682,500 | $55,297 | $107,773 |
| 2059 | 0.076887937 | $682,500 | $52,476 | $52,476 |

## Table 17. Park Visitation Damages - without-project design

(Oct. 2004 P.L., 5.375% discount rate)

Discount Rate 0.05375

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value of Visitations for Year n | Prob. Of Damage in Year n | Expected Damage in Year n |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.3806404 | 0.6193596 | | | |
| 2008 | 15 | 0.3552644 | 0.6447356 | | | |
| 2009 | 16 | 0.3315801 | 0.6684199 | | | |
| 2010 | 17 | 0.3094747 | 0.6905253 | | | |
| 2011 | 18 | 0.2888431 | 0.7111569 | | | |
| 2012 | 19 | 0.2695869 | 0.7304131 | | | |
| 2013 | 20 | 0.2516144 | 0.7483856 | | | |
| 2014 | 21 | 0.2348401 | 0.7651599 | | | |
| 2015 | 22 | 0.2191841 | 0.7808159 | | | |
| 2016 | 23 | 0.2045718 | 0.7954282 | $8,796,890 | 0.067 | $347,284 |
| 2017 | 24 | 0.1909337 | 0.8090663 | $8,298,376 | 0.062 | $319,802 |
| 2018 | 25 | 0.1782048 | 0.8217952 | $7,825,291 | 0.058 | $292,998 |
| 2019 | 26 | 0.1663245 | 0.8336755 | $7,376,337 | 0.054 | $267,245 |
| 2020 | 27 | 0.1552362 | 0.8447638 | $6,950,283 | 0.051 | $242,794 |
| 2021 | 28 | 0.1448871 | 0.8551129 | $6,545,962 | 0.047 | $219,802 |
| 2022 | 29 | 0.1352280 | 0.8647720 | $6,162,264 | 0.044 | $198,353 |
| 2023 | 30 | 0.1262128 | 0.8737872 | $5,798,138 | 0.041 | $178,476 |
| 2024 | 31 | 0.1177986 | 0.8822014 | $5,452,585 | 0.038 | $160,161 |
| 2025 | 32 | 0.1099453 | 0.8900547 | $5,124,659 | 0.036 | $143,368 |
| 2026 | 33 | 0.1026157 | 0.8973843 | $4,813,459 | 0.033 | $128,037 |
| 2027 | 34 | 0.0957746 | 0.9042254 | $4,518,134 | 0.031 | $114,092 |
| 2028 | 35 | 0.0893896 | 0.9106104 | $4,237,872 | 0.029 | $101,452 |
| 2029 | 36 | 0.0834303 | 0.9165697 | $3,971,906 | 0.027 | $90,029 |
| 2030 | 37 | 0.0778683 | 0.9221317 | $3,719,507 | 0.025 | $79,734 |
| 2031 | 38 | 0.0726771 | 0.9273229 | $3,479,982 | 0.024 | $70,479 |
| 2032 | 39 | 0.0678319 | 0.9321681 | $3,252,674 | 0.022 | $62,178 |
| 2033 | 40 | 0.0633098 | 0.9366902 | $3,036,962 | 0.021 | $54,749 |
| 2034 | 41 | 0.0590892 | 0.9409108 | $2,832,252 | 0.019 | $48,114 |
| 2035 | 42 | 0.0551499 | 0.9448501 | $2,637,984 | 0.018 | $42,198 |
| 2036 | 43 | 0.0514732 | 0.9485268 | $2,453,626 | 0.017 | $36,934 |
| 2037 | 44 | 0.0480417 | 0.9519583 | $2,278,671 | 0.016 | $32,258 |
| 2038 | 45 | 0.0448389 | 0.9551611 | $2,112,641 | 0.015 | $28,111 |
| 2039 | 46 | 0.0418496 | 0.9581504 | $1,955,079 | 0.014 | $24,439 |
| 2040 | 47 | 0.0390597 | 0.9609403 | $1,805,555 | 0.013 | $21,193 |
| 2041 | 48 | 0.0364557 | 0.9635443 | $1,663,657 | 0.012 | $18,328 |
| 2042 | 49 | 0.0340253 | 0.9659747 | $1,528,998 | 0.011 | $15,804 |
| 2043 | 50 | 0.0317570 | 0.9682430 | $1,401,207 | 0.010 | $13,583 |
| 2044 | 51 | 0.0296398 | 0.9703602 | $1,279,934 | 0.010 | $11,633 |
| 2045 | 52 | 0.0276638 | 0.9723362 | $1,164,848 | 0.009 | $9,922 |
| 2046 | 53 | 0.0258196 | 0.9741804 | $1,055,631 | 0.008 | $8,425 |
| 2047 | 54 | 0.0240983 | 0.9759017 | $951,986 | 0.008 | $7,117 |
| 2048 | 55 | 0.0224917 | 0.9775083 | $853,628 | 0.007 | $5,976 |
| 2049 | 56 | 0.0209923 | 0.9790077 | $760,286 | 0.007 | $4,983 |
| 2050 | 57 | 0.0195928 | 0.9804072 | $671,706 | 0.006 | $4,121 |
| 2051 | 58 | 0.0182866 | 0.9817134 | $587,644 | 0.006 | $3,374 |
| 2052 | 59 | 0.0170675 | 0.9829325 | $507,870 | 0.006 | $2,729 |
| 2053 | 60 | 0.0159297 | 0.9840703 | $432,165 | 0.005 | $2,172 |
| 2054 | 61 | 0.0148677 | 0.9851323 | $360,322 | 0.005 | $1,694 |
| 2055 | 62 | 0.0138765 | 0.9861235 | $292,143 | 0.005 | $1,285 |
| 2056 | 63 | 0.0129514 | 0.9870486 | $227,442 | 0.004 | $935 |
| 2057 | 64 | 0.0120880 | 0.9879120 | $166,041 | 0.004 | $638 |
| 2058 | 65 | 0.0112821 | 0.9887179 | $107,773 | 0.004 | $387 |
| 2059 | 66 | 0.0105300 | 0.9894700 | $52,476 | 0.003 | $176 |
| | | | | | | $3,417,567 |
| | | | | | Annual Damages | $198,153 |

## With-Project Conditions

### Preliminary Alternatives

18. Preliminary alternative approaches need to be considered in order to develop the most appropriate form of shoreline stabilization for the area. Criteria for evaluating preliminary alternatives will include appropriateness to site conditions, compliance with New York State Coastal Zone Management criteria, effectiveness of protection, impacts on environmental and cultural resources, and costs (including interest during construction and maintenance). Alternatives that are feasible approaches to storm protection and shoreline stabilization need to address both present and future needs. The present need is to eliminate the threat of erosion and to provide acceptable levels of protection from the impacts of wave attack and storm recession. Preliminary cost estimates are included so that the most cost effective and efficient solutions, considering coastal processes impacts, can be selected for detailed design and economic optimization.

19. The initial screening of hurricane storm damage reduction measures resulted in the following alternatives:

- Alternative 1 - No Action. While the no action plan fails to meet objectives and needs of the project area, it does provide the basis against which project benefits are measured.
- Alternative 2 – Stone Revetment. Revetments are a proven method of shore protection in this area and have a record of acceptance by state and local authorities. Revetment alternatives such as this can utilize much of the stone already on site in the existing structure, thus making good use of existing resources.
- Alternative 3 – Offshore Breakwater with Beach Fill. Breakwaters will be difficult to construct due to difficult site access and in-water construction. Tidal currents are significant and breaking waves arrive from almost all onshore directions. The breakwater requires very large stone and a substantial width and elevation to be effective. The gaps between the breakwaters may induce significant currents that could increase scour to the bottom, potentially compromising the foundation of the breakwaters sometime in the future.
- Alternative 4 – T-groins with Beach Fill. T-groins will be difficult to construct due to difficult site access, however, land-based equipment can be utilized. Tidal currents are significant and breaking waves arrive from almost all onshore directions. The shore-parallel structures would require very large stone and a substantial width and elevation to be effective. The gaps between the shore-parallel structures may induce significant currents that could scour the bottom, potentially compromising the foundation of the t-groins sometime in the future.
- Alternative 5 – Beach Fill. This alternative is considered not feasible for many reasons. High longshore transport rates will remove the fill rapidly at an unpredictable rate and the area will require constant renourishment. A berm at +11 feet NGVD will provide some short-term reduction in the recession of the toe

of the bluff, but will not impede higher water levels and waves from impacting the bluff face and therefore will not provide adequate storm damage protection. Seasonal beach surveys (potentially monthly) will be required during the first two to three years after construction to refine the design of the beach fill cross section and to estimate the renourishment requirements. Because of the lack of adequate storm damage protection, this beach fill alternative will not be considered further.

- Alternative 6 – Relocation of the Lighthouse Complex. The moving of the lighthouse itself is a precarious task at best. Unlike the Cape Hatteras Lighthouse (which rested on a relatively flat, level surface that permitted the National Park Service to move the structure for a cost of approximately $12 Million) the Montauk Point Lighthouse rests upon a hill on top of the bluff. Raised grades would have to be built to raise the level of the ground to the west of the bluff up to the lighthouse grade to insure a stable move. The relocation of the Montauk Point Lighthouse will have an adverse effect on the above and below ground resources. Moving the Lighthouse would have an adverse impact on the archaeological resources and compromise the integrity of the lighthouse and associated structures. Environmental degradation of habitats and historic views would continue. This alternative will not be considered further.

Comparison of Alternatives

20. Based on the advantages and disadvantages of each of the alternatives discussed, alternatives 2, 3, and 4 were carried forth for further analysis. Alternatives 2 through 4 are developed at the same storm design for plan comparison. They are designed to withstand a 73-year return period storm. This level of design is commensurate with a project evaluation over a 50-year period, because over 50 years there would be a 50% risk of a 73-year or greater storm event. The benefits claimed are the same because each of the alternatives protects the same structures and land to the same degree, and each alternative prevents the same average annual project damages. The estimated average annual costs were calculated and compared to the average annual benefits. Alternative 3 is the plan that maximizes the net benefits, and therefore will be selected for plan optimization (See Table 18).

**Table 18. Comparison of Alternatives**

| | Alternative 2 Stone Revetment | Alternative 3 Offshore Breakwater and Beach Fill | Alternative 4 T-Groins and Beach Fill |
|---|---|---|---|
| Total Annual Costs | $971,000 | $1,443,000 | $1,287,000 |
| Total Annual Benefits | $1,578,700 | $1,578,700 | $1,578,700 |
| Total Net Benefits | $607,700 | $135,700 | $291,700 |

Optimization of Selected Plan

21. Preliminary screening of various alternatives identified that the Stone Revetment Plan is the most feasible alternative both economically and environmentally in providing protection to Montauk Point and its vicinity. Three storm design levels were considered, the 15-year, 73-year, and 150-year alternatives, to determine the optimal plan. The three alternatives provide protection to the Montauk Point Lighthouse complex until storm exceedance starts to displace the armor stones at the upper portion of the stone revetment for each storm protection design. Residual damages were calculated for the three alternatives and used for plan evaluation. Table 19 shows the three design alternatives and their associated storm exceedance levels that would cause the upper part of the stone revetment to be displaced, thereby exposing the bluff to erosion.

**Table 19. Storm Exceedance for Stone Revetment Alternatives**

| Storm Design | Storm Exceedance |
|---|---|
| 15 year | 0.04 |
| 73 year | 0.008 |
| 150 year | 0.005 |

22. The existing revetment has been in place since 1994. In the with-project condition, construction will commence in 2008 and will be completed by January 2010. The 15-year storm design, therefore, is pertinent through 2007, with the improved storm exceedance design pertinent from 2008, thereafter. With-project damages were calculated for the following storm damage categories: Storm damage to the lighthouse complex, and local costs forgone for the land loss values due to erosion. With-project damages were also calculated for two recreation loss categories: lost lighthouse visitations, and lost state park visitations benefits.

Montauk Point Lighthouse Complex

23. Tables 20-22 show the residual damages that occur to the lighthouse complex under the with-project conditions for the 15-year, 73-year, and 150-year storm design stone revetment alternatives.

## Table 20. Lighthouse Complex - 15yr storm design

## Residual Damages (Oct. 2004 P.L., 5.375% discount rate)

Discount Rate 0.05375

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value of Lighthouse Complex in Year n | Prob. Of Damage in Year n | Expected Damage in Year n |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.5646733 | 0.4353267 | | | |
| 2008 | 15 | 0.5420864 | 0.4579136 | | | |
| 2009 | 16 | 0.5204029 | 0.4795971 | | | |
| 2010 | 17 | 0.4995868 | 0.5004132 | $23,328,193 | 0.040 | $552,571 |
| 2011 | 18 | 0.4796033 | 0.5203967 | $22,138,262 | 0.038 | $370,075 |
| 2012 | 19 | 0.4604192 | 0.5395808 | $21,009,026 | 0.037 | $354,643 |
| 2013 | 20 | 0.4420024 | 0.5579976 | $19,937,392 | 0.035 | $338,391 |
| 2014 | 21 | 0.4243223 | 0.5756777 | $16,170,297 | 0.034 | $274,911 |
| 2015 | 22 | 0.4073494 | 0.5926506 | $15,345,477 | 0.033 | $260,454 |
| 2016 | 23 | 0.3910555 | 0.6089445 | $14,562,730 | 0.031 | $246,029 |
| 2017 | 24 | 0.3754132 | 0.6245868 | $13,819,910 | 0.030 | $231,791 |
| 2018 | 25 | 0.3603967 | 0.6396033 | $13,114,980 | 0.029 | $217,860 |
| 2019 | 26 | 0.3459808 | 0.6540192 | $12,446,007 | 0.028 | $204,329 |
| 2020 | 27 | 0.3321416 | 0.6678584 | $11,811,158 | 0.027 | $191,268 |
| 2021 | 28 | 0.3188559 | 0.6811441 | $11,208,690 | 0.026 | $178,727 |
| 2022 | 29 | 0.3061017 | 0.6938983 | $10,636,954 | 0.025 | $166,741 |
| 2023 | 30 | 0.2938576 | 0.7061424 | $10,094,381 | 0.024 | $155,330 |
| 2024 | 31 | 0.2821033 | 0.7178967 | $9,579,484 | 0.023 | $144,505 |
| 2025 | 32 | 0.2708192 | 0.7291808 | $9,090,851 | 0.022 | $134,268 |
| 2026 | 33 | 0.2599864 | 0.7400136 | $8,627,142 | 0.021 | $124,613 |
| 2027 | 34 | 0.2495870 | 0.7504130 | $8,187,086 | 0.020 | $115,529 |
| 2028 | 35 | 0.2396035 | 0.7603965 | $7,769,477 | 0.019 | $107,003 |
| 2029 | 36 | 0.2300194 | 0.7699806 | $7,337,126 | 0.018 | $98,531 |
| 2030 | 37 | 0.2208186 | 0.7791814 | $6,997,076 | 0.018 | $91,546 |
| 2031 | 38 | 0.2119858 | 0.7880142 | $6,640,167 | 0.017 | $84,574 |
| 2032 | 39 | 0.2035064 | 0.7964936 | $6,301,463 | 0.016 | $78,074 |
| 2033 | 40 | 0.1953662 | 0.8046338 | $5,980,036 | 0.016 | $72,025 |
| 2034 | 41 | 0.1875515 | 0.8124485 | $5,675,005 | 0.015 | $66,401 |
| 2035 | 42 | 0.1800494 | 0.8199506 | $5,385,532 | 0.014 | $61,179 |
| 2036 | 43 | 0.1728475 | 0.8271525 | $5,110,826 | 0.014 | $56,336 |
| 2037 | 44 | 0.1659336 | 0.8340664 | $4,850,131 | 0.013 | $51,848 |
| 2038 | 45 | 0.1592962 | 0.8407038 | $4,602,734 | 0.013 | $47,694 |
| 2039 | 46 | 0.1529244 | 0.8470756 | $4,367,956 | 0.012 | $43,852 |
| 2040 | 47 | 0.1468074 | 0.8531926 | $4,145,154 | 0.012 | $40,302 |
| 2041 | 48 | 0.1409351 | 0.8590649 | $3,933,717 | 0.011 | $37,023 |
| 2042 | 49 | 0.1352977 | 0.8647023 | $3,733,065 | 0.011 | $33,998 |
| 2043 | 50 | 0.1298858 | 0.8701142 | $3,542,648 | 0.010 | $31,208 |
| 2044 | 51 | 0.1246904 | 0.8753096 | $3,361,943 | 0.010 | $28,636 |
| 2045 | 52 | 0.1197027 | 0.8802973 | $3,190,456 | 0.010 | $26,268 |
| 2046 | 53 | 0.1149146 | 0.8850854 | $3,027,716 | 0.009 | $24,088 |
| 2047 | 54 | 0.1103181 | 0.8896819 | $2,873,278 | 0.009 | $22,083 |
| 2048 | 55 | 0.1059053 | 0.8940947 | $2,726,717 | 0.008 | $20,238 |
| 2049 | 56 | 0.1016691 | 0.8983309 | $2,587,631 | 0.008 | $18,543 |
| 2050 | 57 | 0.0976024 | 0.9023976 | $2,455,641 | 0.008 | $16,985 |
| 2051 | 58 | 0.0936983 | 0.9063017 | $2,330,383 | 0.008 | $15,554 |
| 2052 | 59 | 0.0899503 | 0.9100497 | $2,211,514 | 0.007 | $14,240 |
| 2053 | 60 | 0.0863523 | 0.9136477 | $2,098,708 | 0.007 | $13,035 |
| 2054 | 61 | 0.0828982 | 0.9171018 | $1,991,657 | 0.007 | $11,929 |
| 2055 | 62 | 0.0795823 | 0.9204177 | $1,890,066 | 0.006 | $10,915 |
| 2056 | 63 | 0.0763990 | 0.9236010 | $1,236,405 | 0.006 | $6,883 |
| 2057 | 64 | 0.0733430 | 0.9266570 | $193,285 | 0.006 | $1,037 |
| 2058 | 65 | 0.0704093 | 0.9295907 | $183,426 | 0.006 | $948 |
| 2059 | 66 | 0.0675929 | 0.9324071 | $174,069 | 0.005 | $867 |
| | | | | | | $5,495,860 |
| | | | | | Annual Damages | $318,655 |

## Table 21. Lighthouse Complex - 73yr storm design
## Residual Damages (Oct. 2004 P.L., 5.375% discount rate)

Discount Rate 0.05375

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value of Lighthouse Complex in Year n | Prob. Of Damage in Year n | Expected Damage in Year n |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.8936417 | 0.1063583 | | | |
| 2008 | 15 | 0.8864925 | 0.1135075 | | | |
| 2009 | 16 | 0.8794006 | 0.1205994 | | | |
| 2010 | 17 | 0.8723654 | 0.1276346 | $23,328,193 | 0.008 | $110,514 |
| 2011 | 18 | 0.8653865 | 0.1346135 | $22,138,262 | 0.007936 | $18,686 |
| 2012 | 19 | 0.8584634 | 0.1415366 | $21,009,026 | 0.007872512 | $18,773 |
| 2013 | 20 | 0.8515957 | 0.1484043 | $19,937,392 | 0.007809532 | $18,778 |
| 2014 | 21 | 0.8447829 | 0.1552171 | $16,170,297 | 0.007747056 | $15,989 |
| 2015 | 22 | 0.8380246 | 0.1619754 | $15,345,477 | 0.007685079 | $15,875 |
| 2016 | 23 | 0.8313204 | 0.1686796 | $14,562,730 | 0.007623599 | $15,713 |
| 2017 | 24 | 0.8246699 | 0.1753301 | $13,819,910 | 0.00756261 | $15,510 |
| 2018 | 25 | 0.8180725 | 0.1819275 | $13,114,980 | 0.007502109 | $15,272 |
| 2019 | 26 | 0.8115279 | 0.1884721 | $12,446,007 | 0.007442092 | $15,003 |
| 2020 | 27 | 0.8050357 | 0.1949643 | $11,811,158 | 0.007382555 | $14,708 |
| 2021 | 28 | 0.7985954 | 0.2014046 | $11,208,690 | 0.007323495 | $14,392 |
| 2022 | 29 | 0.7922067 | 0.2077933 | $10,636,954 | 0.007264907 | $14,059 |
| 2023 | 30 | 0.7858690 | 0.2141310 | $10,094,381 | 0.007206788 | $13,711 |
| 2024 | 31 | 0.7795821 | 0.2204179 | $9,579,484 | 0.007149133 | $13,352 |
| 2025 | 32 | 0.7733454 | 0.2266546 | $9,090,851 | 0.00709194 | $12,985 |
| 2026 | 33 | 0.7671586 | 0.2328414 | $8,627,142 | 0.007035205 | $12,612 |
| 2027 | 34 | 0.7610214 | 0.2389786 | $8,187,086 | 0.006978923 | $12,235 |
| 2028 | 35 | 0.7549332 | 0.2450668 | $7,769,477 | 0.006923092 | $11,856 |
| 2029 | 36 | 0.7488937 | 0.2511063 | $7,337,126 | 0.006867707 | $11,421 |
| 2030 | 37 | 0.7429026 | 0.2570974 | $6,997,076 | 0.006812765 | $11,099 |
| 2031 | 38 | 0.7369594 | 0.2630406 | $6,640,167 | 0.006758263 | $10,724 |
| 2032 | 39 | 0.7310637 | 0.2689363 | $6,301,463 | 0.006704197 | $10,353 |
| 2033 | 40 | 0.7252152 | 0.2747848 | $5,980,036 | 0.006650564 | $9,987 |
| 2034 | 41 | 0.7194135 | 0.2805865 | $5,675,005 | 0.006597359 | $9,626 |
| 2035 | 42 | 0.7136582 | 0.2863418 | $5,385,532 | 0.00654458 | $9,271 |
| 2036 | 43 | 0.7079489 | 0.2920511 | $5,110,826 | 0.006492224 | $8,923 |
| 2037 | 44 | 0.7022853 | 0.2977147 | $4,850,131 | 0.006440286 | $8,583 |
| 2038 | 45 | 0.6966670 | 0.3033330 | $4,602,734 | 0.006388763 | $8,251 |
| 2039 | 46 | 0.6910937 | 0.3089063 | $4,367,956 | 0.006337653 | $7,927 |
| 2040 | 47 | 0.6855649 | 0.3144351 | $4,145,154 | 0.006286952 | $7,611 |
| 2041 | 48 | 0.6800804 | 0.3199196 | $3,933,717 | 0.006236656 | $7,304 |
| 2042 | 49 | 0.6746398 | 0.3253602 | $3,733,065 | 0.006186763 | $7,006 |
| 2043 | 50 | 0.6692426 | 0.3307574 | $3,542,648 | 0.006137269 | $6,716 |
| 2044 | 51 | 0.6638887 | 0.3361113 | $3,361,943 | 0.006088171 | $6,436 |
| 2045 | 52 | 0.6585776 | 0.3414224 | $3,190,456 | 0.006039466 | $6,164 |
| 2046 | 53 | 0.6533090 | 0.3466910 | $3,027,716 | 0.00599115 | $5,902 |
| 2047 | 54 | 0.6480825 | 0.3519175 | $2,873,278 | 0.005943221 | $5,648 |
| 2048 | 55 | 0.6428978 | 0.3571022 | $2,726,717 | 0.005895675 | $5,403 |
| 2049 | 56 | 0.6377547 | 0.3622453 | $2,587,631 | 0.00584851 | $5,167 |
| 2050 | 57 | 0.6326526 | 0.3673474 | $2,455,641 | 0.005801721 | $4,939 |
| 2051 | 58 | 0.6275914 | 0.3724086 | $2,330,383 | 0.005755308 | $4,720 |
| 2052 | 59 | 0.6225707 | 0.3774293 | $2,211,514 | 0.005709265 | $4,509 |
| 2053 | 60 | 0.6175901 | 0.3824099 | $2,098,708 | 0.005663591 | $4,306 |
| 2054 | 61 | 0.6126494 | 0.3873506 | $1,991,657 | 0.005618282 | $4,111 |
| 2055 | 62 | 0.6077482 | 0.3922518 | $1,890,066 | 0.005573336 | $3,923 |
| 2056 | 63 | 0.6028862 | 0.3971138 | $1,236,405 | 0.005528749 | $2,580 |
| 2057 | 64 | 0.5980631 | 0.4019369 | $193,285 | 0.005484519 | $405 |
| 2058 | 65 | 0.5932786 | 0.4067214 | $183,426 | 0.005440643 | $387 |
| 2059 | 66 | 0.5885324 | 0.4114676 | $174,069 | 0.005397118 | $369 |
| | | | | | | $579,795 |
| | | | | | Annual Damages | $33,617 |

# Table 22. Lighthouse Complex - 150yr storm design
## Residual Damages (Oct. 2004 P.L., 5.375% discount rate)

Discount Rate 0.05375

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value of Lighthouse Complex In Year n | Prob. Of Damage in Year n | Expected Damege in Year n |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.9322301 | 0.0677699 | | | |
| 2008 | 15 | 0.9275690 | 0.0724310 | | | |
| 2009 | 16 | 0.9229311 | 0.0770689 | | | |
| 2010 | 17 | 0.9183165 | 0.0816835 | $23,328,193 | 0.005 | $69,071 |
| 2011 | 18 | 0.9137249 | 0.0862751 | $22,138,262 | 0.004975 | $7,464 |
| 2012 | 19 | 0.9091563 | 0.0908437 | $21,009,026 | 0.004950125 | $7,533 |
| 2013 | 20 | 0.9046105 | 0.0953895 | $19,937,392 | 0.004925374 | $7,568 |
| 2014 | 21 | 0.9000874 | 0.0999126 | $16,170,297 | 0.004900748 | $6,473 |
| 2015 | 22 | 0.8955870 | 0.1044130 | $15,345,477 | 0.004876244 | $6,456 |
| 2016 | 23 | 0.8911091 | 0.1088909 | $14,562,730 | 0.004851863 | $6,419 |
| 2017 | 24 | 0.8866535 | 0.1133465 | $13,819,910 | 0.004827603 | $6,364 |
| 2018 | 25 | 0.8822202 | 0.1177798 | $13,114,980 | 0.004803465 | $6,294 |
| 2019 | 26 | 0.8778091 | 0.1221909 | $12,446,007 | 0.004779448 | $6,211 |
| 2020 | 27 | 0.8734201 | 0.1265799 | $11,811,158 | 0.004755551 | $6,116 |
| 2021 | 28 | 0.8690530 | 0.1309470 | $11,208,690 | 0.004731773 | $6,012 |
| 2022 | 29 | 0.8647077 | 0.1352923 | $10,636,954 | 0.004708114 | $5,898 |
| 2023 | 30 | 0.8603842 | 0.1396158 | $10,094,381 | 0.004684573 | $5,778 |
| 2024 | 31 | 0.8560823 | 0.1439177 | $9,579,484 | 0.004661151 | $5,652 |
| 2025 | 32 | 0.8518019 | 0.1481981 | $9,090,851 | 0.004637845 | $5,521 |
| 2026 | 33 | 0.8475429 | 0.1524571 | $8,627,142 | 0.004614656 | $5,386 |
| 2027 | 34 | 0.8433051 | 0.1566949 | $8,187,086 | 0.004591582 | $5,248 |
| 2028 | 35 | 0.8390886 | 0.1609114 | $7,769,477 | 0.004568624 | $5,108 |
| 2029 | 36 | 0.8348932 | 0.1651068 | $7,337,126 | 0.004545781 | $4,943 |
| 2030 | 37 | 0.8307187 | 0.1692813 | $6,997,076 | 0.004523052 | $4,825 |
| 2031 | 38 | 0.8265651 | 0.1734349 | $6,640,167 | 0.004500437 | $4,683 |
| 2032 | 39 | 0.8224323 | 0.1775677 | $6,301,463 | 0.004477935 | $4,541 |
| 2033. | 40 | 0.8183201 | 0.1816799 | $5,980,036 | 0.004455545 | $4,399 |
| 2034 | 41 | 0.8142285 | 0.1857715 | $5,675,005 | 0.004433268 | $4,259 |
| 2035 | 42 | 0.8101574 | 0.1898426 | $5,385,532 | 0.004411101 | $4,120 |
| 2036 | 43 | 0.8061066 | 0.1938934 | $5,110,826 | 0.004389046 | $3,983 |
| 2037 | 44 | 0.8020761 | 0.1979239 | $4,850,131 | 0.0043671 | $3,848 |
| 2038 | 45 | 0.7980657 | 0.2019343 | $4,602,734 | 0.004345265 | $3,715 |
| 2039 | 46 | 0.7940753 | 0.2059247 | $4,367,956 | 0.004323539 | $3,585 |
| 2040 | 47 | 0.7901050 | 0.2098950 | $4,145,154 | 0.004301921 | $3,458 |
| 2041 | 48 | 0.7861544 | 0.2138456 | $3,933,717 | 0.004280411 | $3,333 |
| 2042 | 49 | 0.7822237 | 0.2177763 | $3,733,065 | 0.004259009 | $3,211 |
| 2043 | 50 | 0.7783126 | 0.2216874 | $3,542,648 | 0.004237714 | $3,091 |
| 2044 | 51 | 0.7744210 | 0.2255790 | $3,361,943 | 0.004216526 | $2,975 |
| 2045 | 52 | 0.7705489 | 0.2294511 | $3,190,456 | 0.004195443 | $2,862 |
| 2046 | 53 | 0.7666961 | 0.2333039 | $3,027,716 | 0.004174466 | $2,752 |
| 2047 | 54 | 0.7628627 | 0.2371373 | $2,873,278 | 0.004153594 | $2,646 |
| 2048 | 55 | 0.7590484 | 0.2409516 | $2,726,717 | 0.004132826 | $2,542 |
| 2049 | 56 | 0.7552531 | 0.2447469 | $2,587,631 | 0.004112161 | $2,442 |
| 2050 | 57 | 0.7514768 | 0.2485232 | $2,455,641 | 0.004091601 | $2,344 |
| 2051 | 58 | 0.7477195 | 0.2522805 | $2,330,383 | 0.004071143 | $2,250 |
| 2052 | 59 | 0.7439809 | 0.2560191 | $2,211,514 | 0.004050787 | $2,159 |
| 2053 | 60 | 0.7402610 | 0.2597390 | $2,098,708 | 0.004030533 | $2,070 |
| 2054 | 61 | 0.7365597 | 0.2634403 | $1,991,657 | 0.00401038 | $1,985 |
| 2055 | 62 | 0.7328769 | 0.2671231 | $1,890,066 | 0.003990328 | $1,903 |
| 2056 | 63 | 0.7292125 | 0.2707875 | $1,236,405 | 0.003970377 | $1,257 |
| 2057 | 64 | 0.7255664 | 0.2744336 | $193,285 | 0.003950525 | $198 |
| 2058 | 65 | 0.7219386 | 0.2780614 | $183,426 | 0.003930772 | $190 |
| 2059 | 66 | 0.7183289 | 0.2816711 | $174,069 | 0.003911118 | $182 |
| | | | | | | $271,324 |
| | | | | | Annual Damages | $15,732 |

Local Costs Forgone

24. Local costs forgone for loss of land value were calculated for the three alternatives based on the different probabilities that the stone revetment will be displaced, thereby exposing the bluff to erosion. The long-term erosion rate that is used is three feet per year at the top of the bluff. Tables 23-25 show the residual damages for local costs forgone for loss of land value for the three alternatives.

**Table 23. Local Costs Forgone- 15yr storm design Residual Damages**
(Oct. 2004 P.L., 5.375% discount rate)

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value Factor | | |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.5646733 | 0.4353267 | | | |
| 2008 | 15 | 0.5420864 | 0.4579136 | | | |
| 2009 | 16 | 0.5204029 | 0.4795971 | | | |
| 2010 | 17 | 0.4995868 | 0.5004132 | 1.0000000 | $82,600 | $41,334 |
| 2011 | 18 | 0.4796033 | 0.5203967 | 0.9489917 | $82,600 | $40,792 |
| 2012 | 19 | 0.4604192 | 0.5395808 | 0.9005852 | $82,600 | $40,139 |
| 2013 | 20 | 0.4420024 | 0.5579976 | 0.8546479 | $82,600 | $39,391 |
| 2014 | 21 | 0.4243223 | 0.5756777 | 0.8110538 | $82,600 | $38,566 |
| 2015 | 22 | 0.4073494 | 0.5926506 | 0.7696833 | $82,600 | $37,678 |
| 2016 | 23 | 0.3910555 | 0.6089445 | 0.7304231 | $82,600 | $36,739 |
| 2017 | 24 | 0.3754132 | 0.6245868 | 0.6931654 | $82,600 | $35,761 |
| 2018 | 25 | 0.3603967 | 0.6396033 | 0.6578082 | $82,600 | $34,753 |
| 2019 | 26 | 0.3459808 | 0.6540192 | 0.6242545 | $82,600 | $33,723 |
| 2020 | 27 | 0.3321416 | 0.6678584 | 0.5924124 | $82,600 | $32,680 |
| 2021 | 28 | 0.3188559 | 0.6811441 | 0.5621944 | $82,600 | $31,630 |
| 2022 | 29 | 0.3061017 | 0.6938983 | 0.5335178 | $82,600 | $30,579 |
| 2023 | 30 | 0.2938576 | 0.7061424 | 0.5063040 | $82,600 | $29,531 |
| 2024 | 31 | 0.2821033 | 0.7178967 | 0.4804783 | $82,600 | $28,492 |
| 2025 | 32 | 0.2708192 | 0.7291808 | 0.4559699 | $82,600 | $27,463 |
| 2026 | 33 | 0.2599864 | 0.7400136 | 0.4327117 | $82,600 | $26,450 |
| 2027 | 34 | 0.2495870 | 0.7504130 | 0.4106398 | $82,600 | $25,453 |
| 2028 | 35 | 0.2396035 | 0.7603965 | 0.3896937 | $82,600 | $24,476 |
| 2029 | 36 | 0.2300194 | 0.7699806 | 0.3698181 | $82,600 | $23,520 |
| 2030 | 37 | 0.2208186 | 0.7791814 | 0.3509524 | $82,600 | $22,587 |
| 2031 | 38 | 0.2119858 | 0.7880142 | 0.3330509 | $82,600 | $21,678 |
| 2032 | 39 | 0.2035064 | 0.7964936 | 0.3160628 | $82,600 | $20,794 |
| 2033 | 40 | 0.1953662 | 0.8046338 | 0.2999408 | $82,600 | $19,935 |
| 2034 | 41 | 0.1875515 | 0.8124485 | 0.2846413 | $82,600 | $19,102 |
| 2035 | 42 | 0.1800494 | 0.8199506 | 0.2701222 | $82,600 | $18,295 |
| 2036 | 43 | 0.1728475 | 0.8271525 | 0.2563437 | $82,600 | $17,514 |
| 2037 | 44 | 0.1659336 | 0.8340664 | 0.2432681 | $82,600 | $16,760 |
| 2038 | 45 | 0.1592962 | 0.8407038 | 0.2308594 | $82,600 | $16,031 |
| 2039 | 46 | 0.1529244 | 0.8470756 | 0.2190836 | $82,600 | $15,329 |
| 2040 | 47 | 0.1468074 | 0.8531926 | 0.2079086 | $82,600 | $14,652 |
| 2041 | 48 | 0.1409351 | 0.8590649 | 0.1973035 | $82,600 | $14,000 |
| 2042 | 49 | 0.1352977 | 0.8647023 | 0.1872394 | $82,600 | $13,373 |
| 2043 | 50 | 0.1298858 | 0.8701142 | 0.1776888 | $82,600 | $12,771 |
| 2044 | 51 | 0.1246904 | 0.8753096 | 0.1686250 | $82,600 | $12,192 |
| 2045 | 52 | 0.1197027 | 0.8802973 | 0.1600237 | $82,600 | $11,636 |
| 2046 | 53 | 0.1149146 | 0.8850854 | 0.1518612 | $82,600 | $11,102 |
| 2047 | 54 | 0.1103181 | 0.8896819 | 0.1441150 | $82,600 | $10,591 |
| 2048 | 55 | 0.1059053 | 0.8940947 | 0.1367640 | $82,600 | $10,100 |
| 2049 | 56 | 0.1016691 | 0.8983309 | 0.1297879 | $82,600 | $9,631 |
| 2050 | 57 | 0.0976024 | 0.9023976 | 0.1231676 | $82,600 | $9,181 |
| 2051 | 58 | 0.0936983 | 0.9063017 | 0.1168850 | $82,600 | $8,750 |
| 2052 | 59 | 0.0899503 | 0.9100497 | 0.1109229 | $82,600 | $8,338 |
| 2053 | 60 | 0.0863523 | 0.9136477 | 0.1052649 | $82,600 | $7,944 |
| 2054 | 61 | 0.0828982 | 0.9171018 | 0.0998956 | $82,600 | $7,567 |
| 2055 | 62 | 0.0795823 | 0.9204177 | 0.0948000 | $82,600 | $7,207 |
| 2056 | 63 | 0.0763990 | 0.9236010 | 0.0899645 | $82,600 | $6,863 |
| 2057 | 64 | 0.0733430 | 0.9266570 | 0.0853755 | $82,600 | $6,535 |
| 2058 | 65 | 0.0704093 | 0.9295907 | 0.0810207 | $82,600 | $6,221 |
| 2059 | 66 | 0.0675929 | 0.9324071 | 0.0768879 | $82,600 | $5,922 |
| | | | | | | $1,041,755 |
| | | | | | Annual Damages | $60,402 |

## Table 24. Local Costs Forgone - 73yr storm design Residual Damages

(Oct. 2004 P.L., 5.375% discount rate)

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value Factor | | |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.8936417 | 0.1063583 | | | |
| 2008 | 15 | 0.8864925 | 0.1135075 | | | |
| 2009 | 16 | 0.8794006 | 0.1205994 | | | |
| 2010 | 17 | 0.8723654 | 0.1276346 | 1.0000000 | $82,600 | $10,543 |
| 2011 | 18 | 0.8653865 | 0.1346135 | 0.9489917 | $82,600 | $10,552 |
| 2012 | 19 | 0.8584634 | 0.1415366 | 0.9005852 | $82,600 | $10,529 |
| 2013 | 20 | 0.8515957 | 0.1484043 | 0.8546479 | $82,600 | $10,476 |
| 2014 | 21 | 0.8447829 | 0.1552171 | 0.8110538 | $82,600 | $10,398 |
| 2015 | 22 | 0.8380246 | 0.1619754 | 0.7696833 | $82,600 | $10,298 |
| 2016 | 23 | 0.8313204 | 0.1686796 | 0.7304231 | $82,600 | $10,177 |
| 2017 | 24 | 0.8246699 | 0.1753301 | 0.6931654 | $82,600 | $10,039 |
| 2018 | 25 | 0.8180725 | 0.1819275 | 0.6578082 | $82,600 | $9,885 |
| 2019 | 26 | 0.8115279 | 0.1884721 | 0.6242545 | $82,600 | $9,718 |
| 2020 | 27 | 0.8050357 | 0.1949643 | 0.5924124 | $82,600 | $9,540 |
| 2021 | 28 | 0.7985954 | 0.2014046 | 0.5621944 | $82,600 | $9,353 |
| 2022 | 29 | 0.7922067 | 0.2077933 | 0.5335178 | $82,600 | $9,157 |
| 2023 | 30 | 0.7858690 | 0.2141310 | 0.5063040 | $82,600 | $8,955 |
| 2024 | 31 | 0.7795821 | 0.2204179 | 0.4804783 | $82,600 | $8,748 |
| 2025 | 32 | 0.7733454 | 0.2266546 | 0.4559699 | $82,600 | $8,537 |
| 2026 | 33 | 0.7671586 | 0.2328414 | 0.4327117 | $82,600 | $8,322 |
| 2027 | 34 | 0.7610214 | 0.2389786 | 0.4106398 | $82,600 | $8,106 |
| 2028 | 35 | 0.7549332 | 0.2450668 | 0.3896937 | $82,600 | $7,888 |
| 2029 | 36 | 0.7488937 | 0.2511063 | 0.3698161 | $82,600 | $7,670 |
| 2030 | 37 | 0.7429026 | 0.2570974 | 0.3509524 | $82,600 | $7,453 |
| 2031 | 38 | 0.7369594 | 0.2630406 | 0.3330509 | $82,600 | $7,236 |
| 2032 | 39 | 0.7310637 | 0.2689363 | 0.3160626 | $82,600 | $7,021 |
| 2033 | 40 | 0.7252152 | 0.2747848 | 0.2999408 | $82,600 | $6,808 |
| 2034 | 41 | 0.7194135 | 0.2805865 | 0.2846413 | $82,600 | $6,597 |
| 2035 | 42 | 0.7136582 | 0.2863418 | 0.2701222 | $82,600 | $6,389 |
| 2036 | 43 | 0.7079489 | 0.2920511 | 0.2563437 | $82,600 | $6,184 |
| 2037 | 44 | 0.7022853 | 0.2977147 | 0.2432681 | $82,600 | $5,982 |
| 2038 | 45 | 0.6966670 | 0.3033330 | 0.2308594 | $82,600 | $5,784 |
| 2039 | 46 | 0.6910937 | 0.3089063 | 0.2190836 | $82,600 | $5,590 |
| 2040 | 47 | 0.6855649 | 0.3144351 | 0.2079086 | $82,600 | $5,400 |
| 2041 | 48 | 0.6800804 | 0.3199196 | 0.1973035 | $82,600 | $5,214 |
| 2042 | 49 | 0.6746398 | 0.3253602 | 0.1872394 | $82,600 | $5,032 |
| 2043 | 50 | 0.6692426 | 0.3307574 | 0.1776886 | $82,600 | $4,855 |
| 2044 | 51 | 0.6638887 | 0.3361113 | 0.1686250 | $82,600 | $4,682 |
| 2045 | 52 | 0.6585776 | 0.3414224 | 0.1600237 | $82,600 | $4,513 |
| 2046 | 53 | 0.6533090 | 0.3466910 | 0.1518612 | $82,600 | $4,349 |
| 2047 | 54 | 0.6480825 | 0.3519175 | 0.1441150 | $82,600 | $4,189 |
| 2048 | 55 | 0.6428978 | 0.3571022 | 0.1367640 | $82,600 | $4,034 |
| 2049 | 56 | 0.6377547 | 0.3622453 | 0.1297879 | $82,600 | $3,883 |
| 2050 | 57 | 0.6326526 | 0.3673474 | 0.1231676 | $82,600 | $3,737 |
| 2051 | 58 | 0.6275914 | 0.3724086 | 0.1168850 | $82,600 | $3,595 |
| 2052 | 59 | 0.6225707 | 0.3774293 | 0.1109229 | $82,600 | $3,458 |
| 2053 | 60 | 0.6175901 | 0.3824099 | 0.1052649 | $82,600 | $3,325 |
| 2054 | 61 | 0.6126494 | 0.3873506 | 0.0998956 | $82,600 | $3,196 |
| 2055 | 62 | 0.6077482 | 0.3922518 | 0.0948000 | $82,600 | $3,072 |
| 2056 | 63 | 0.6028862 | 0.3971138 | 0.0899645 | $82,600 | $2,951 |
| 2057 | 64 | 0.5980631 | 0.4019369 | 0.0853755 | $82,600 | $2,834 |
| 2058 | 65 | 0.5932786 | 0.4067214 | 0.0810207 | $82,600 | $2,722 |
| 2059 | 66 | 0.5885324 | 0.4114676 | 0.0768879 | $82,600 | $2,613 |
| | | | | | | $331,590 |
| | | | | | Annual Damages | $19,226 |

## Table 25. Local Costs Forgone - 150yr storm design Residual Damages

(Oct. 2004 P.L., 5.375% discount rate)

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value Factor | | |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.9322301 | 0.0677699 | | | |
| 2008 | 15 | 0.9275690 | 0.0724310 | | | |
| 2009 | 16 | 0.9229311 | 0.0770689 | | | |
| 2010 | 17 | 0.9183165 | 0.0816835 | 1.0000000 | $82,600 | $6,747 |
| 2011 | 18 | 0.9137249 | 0.0862751 | 0.9489917 | $82,600 | $6,763 |
| 2012 | 19 | 0.9091563 | 0.0908437 | 0.9005852 | $82,600 | $6,758 |
| 2013 | 20 | 0.9046105 | 0.0953895 | 0.8546479 | $82,600 | $6,734 |
| 2014 | 21 | 0.9000874 | 0.0999126 | 0.8110538 | $82,600 | $6,693 |
| 2015 | 22 | 0.8955870 | 0.1044130 | 0.7696833 | $82,600 | $6,638 |
| 2016 | 23 | 0.8911091 | 0.1088909 | 0.7304231 | $82,600 | $6,570 |
| 2017 | 24 | 0.8866535 | 0.1133465 | 0.6931654 | $82,600 | $6,490 |
| 2018 | 25 | 0.8822202 | 0.1177798 | 0.6578082 | $82,600 | $6,400 |
| 2019 | 26 | 0.8778091 | 0.1221909 | 0.6242545 | $82,600 | $6,301 |
| 2020 | 27 | 0.8734201 | 0.1265799 | 0.5924124 | $82,600 | $6,194 |
| 2021 | 28 | 0.8690530 | 0.1309470 | 0.5621944 | $82,600 | $6,081 |
| 2022 | 29 | 0.8647077 | 0.1352923 | 0.5335178 | $82,600 | $5,962 |
| 2023 | 30 | 0.8603842 | 0.1396158 | 0.5063040 | $82,600 | $5,839 |
| 2024 | 31 | 0.8560823 | 0.1439177 | 0.4804783 | $82,600 | $5,712 |
| 2025 | 32 | 0.8518019 | 0.1481981 | 0.4559699 | $82,600 | $5,582 |
| 2026 | 33 | 0.8475429 | 0.1524571 | 0.4327117 | $82,600 | $5,449 |
| 2027 | 34 | 0.8433051 | 0.1566949 | 0.4106398 | $82,600 | $5,315 |
| 2028 | 35 | 0.8390886 | 0.1609114 | 0.3896937 | $82,600 | $5,180 |
| 2029 | 36 | 0.8348932 | 0.1651068 | 0.3698161 | $82,600 | $5,043 |
| 2030 | 37 | 0.8307187 | 0.1692813 | 0.3509524 | $82,600 | $4,907 |
| 2031 | 38 | 0.8265651 | 0.1734349 | 0.3330509 | $82,600 | $4,771 |
| 2032 | 39 | 0.8224323 | 0.1775677 | 0.3160626 | $82,600 | $4,636 |
| 2033 | 40 | 0.8183201 | 0.1816799 | 0.2999408 | $82,600 | $4,501 |
| 2034 | 41 | 0.8142285 | 0.1857715 | 0.2846413 | $82,600 | $4,368 |
| 2035 | 42 | 0.8101574 | 0.1898426 | 0.2701222 | $82,600 | $4,236 |
| 2036 | 43 | 0.8061066 | 0.1938934 | 0.2563437 | $82,600 | $4,105 |
| 2037 | 44 | 0.8020761 | 0.1979239 | 0.2432681 | $82,600 | $3,977 |
| 2038 | 45 | 0.7980657 | 0.2019343 | 0.2308594 | $82,600 | $3,851 |
| 2039 | 46 | 0.7940753 | 0.2059247 | 0.2190836 | $82,600 | $3,726 |
| 2040 | 47 | 0.7901050 | 0.2098950 | 0.2079086 | $82,600 | $3,605 |
| 2041 | 48 | 0.7861544 | 0.2138456 | 0.1973035 | $82,600 | $3,485 |
| 2042 | 49 | 0.7822237 | 0.2177763 | 0.1872394 | $82,600 | $3,368 |
| 2043 | 50 | 0.7783126 | 0.2216874 | 0.1776886 | $82,600 | $3,254 |
| 2044 | 51 | 0.7744210 | 0.2255790 | 0.1686250 | $82,600 | $3,142 |
| 2045 | 52 | 0.7705489 | 0.2294511 | 0.1600237 | $82,600 | $3,033 |
| 2046 | 53 | 0.7666961 | 0.2333039 | 0.1518612 | $82,600 | $2,927 |
| 2047 | 54 | 0.7628627 | 0.2371373 | 0.1441150 | $82,600 | $2,823 |
| 2048 | 55 | 0.7590484 | 0.2409516 | 0.1367640 | $82,600 | $2,722 |
| 2049 | 56 | 0.7552531 | 0.2447469 | 0.1297879 | $82,600 | $2,624 |
| 2050 | 57 | 0.7514768 | 0.2485232 | 0.1231676 | $82,600 | $2,528 |
| 2051 | 58 | 0.7477195 | 0.2522805 | 0.1168850 | $82,600 | $2,436 |
| 2052 | 59 | 0.7439809 | 0.2560191 | 0.1109229 | $82,600 | $2,346 |
| 2053 | 60 | 0.7402610 | 0.2597390 | 0.1052649 | $82,600 | $2,258 |
| 2054 | 61 | 0.7365597 | 0.2634403 | 0.0998956 | $82,600 | $2,174 |
| 2055 | 62 | 0.7328769 | 0.2671231 | 0.0948000 | $82,600 | $2,092 |
| 2056 | 63 | 0.7292125 | 0.2707875 | 0.0899645 | $82,600 | $2,012 |
| 2057 | 64 | 0.7255664 | 0.2744336 | 0.0853755 | $82,600 | $1,935 |
| 2058 | 65 | 0.7219386 | 0.2780614 | 0.0810207 | $82,600 | $1,861 |
| 2059 | 66 | 0.7183289 | 0.2816711 | 0.0768879 | $82,600 | $1,789 |
| | | | | | | $217,940 |
| | | | | | Annual Damages | $12,636 |

Recreation Loss

25. Residual loss of Montauk Point Lighthouse visitation benefits was calculated for the three with-project alternatives based on the probability that the stone revetment will be displaced, thereby exposing the bluff to erosion. The long-term erosion rate that is used is three feet per year. Therefore, by the tenth year after the upper sections of the revetment that protects the bluff are displaced the stone revetment the lighthouse will be immediately threatened and closed to the public. Tables 26-28 show the residual lost visitations benefits for the three with-project alternatives.

26. Similarly, residual losses of the Montauk Point State Park visitations benefits were calculated for the three with-project alternatives and are shown in Tables 29-31.

## Table 26. Lighthouse Visitations Damages - 15yr with-project design Residual Damages (Oct. 2004 P.L., 5.375% discount rate)

Discount Rate 0.05375

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value of Visitations for Year n | Prob. Of Damage in Year n | Expected Damage in Year n |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.3806404 | 0.6193596 | | | |
| 2008 | 15 | 0.5420864 | 0.4579136 | | | |
| 2009 | 16 | 0.5204029 | 0.4795971 | | | |
| 2010 | 17 | 0.4995868 | 0.5004132 | | | |
| 2011 | 18 | 0.4796033 | 0.5203967 | | | |
| 2012 | 19 | 0.4604192 | 0.5395808 | | | |
| 2013 | 20 | 0.4420024 | 0.5579976 | | | |
| 2014 | 21 | 0.4243223 | 0.5756777 | | | |
| 2015 | 22 | 0.4073494 | 0.5926506 | | | |
| 2016 | 23 | 0.3910555 | 0.6089445 | | | |
| 2017 | 24 | 0.3754132 | 0.6245868 | | | |
| 2018 | 25 | 0.3603967 | 0.6396033 | | | |
| 2019 | 26 | 0.3459808 | 0.6540192 | | | |
| 2020 | 27 | 0.3321416 | 0.6678584 | $30,959,738 | 0.04 | $619,706 |
| 2021 | 28 | 0.3188559 | 0.6811441 | $29,158,705 | 0.0384 | $582,685 |
| 2022 | 29 | 0.3061017 | 0.6938983 | $27,449,540 | 0.036864 | $546,002 |
| 2023 | 30 | 0.2938576 | 0.7061424 | $25,827,557 | 0.0353894 | $510,022 |
| 2024 | 31 | 0.2821033 | 0.7178967 | $24,288,308 | 0.0339739 | $475,031 |
| 2025 | 32 | 0.2708192 | 0.7291808 | $22,827,574 | 0.0326149 | $441,240 |
| 2026 | 33 | 0.2599864 | 0.7400136 | $21,441,349 | 0.0313103 | $408,806 |
| 2027 | 34 | 0.2495870 | 0.7504130 | $20,125,833 | 0.0300579 | $377,838 |
| 2028 | 35 | 0.2396035 | 0.7603965 | $18,877,420 | 0.0288556 | $348,404 |
| 2029 | 36 | 0.2300194 | 0.7699806 | $17,692,686 | 0.0277014 | $320,542 |
| 2030 | 37 | 0.2208186 | 0.7791814 | $16,568,383 | 0.0265933 | $294,264 |
| 2031 | 38 | 0.2119858 | 0.7880142 | $15,501,429 | 0.0255296 | $269,559 |
| 2032 | 39 | 0.2035064 | 0.7964936 | $14,488,899 | 0.0245084 | $246,403 |
| 2033 | 40 | 0.1953662 | 0.8046338 | $13,528,016 | 0.0235281 | $224,757 |
| 2034 | 41 | 0.1875515 | 0.8124485 | $12,616,146 | 0.0225869 | $204,572 |
| 2035 | 42 | 0.1800494 | 0.8199506 | $11,750,789 | 0.0216835 | $185,794 |
| 2036 | 43 | 0.1728475 | 0.8271525 | $10,929,572 | 0.0208161 | $168,361 |
| 2037 | 44 | 0.1659336 | 0.8340664 | $10,150,244 | 0.0199835 | $152,212 |
| 2038 | 45 | 0.1592962 | 0.8407038 | $9,410,669 | 0.0191841 | $137,279 |
| 2039 | 46 | 0.1529244 | 0.8470756 | $8,708,817 | 0.0184168 | $123,496 |
| 2040 | 47 | 0.1468074 | 0.8531926 | $8,042,767 | 0.0176801 | $110,797 |
| 2041 | 48 | 0.1409351 | 0.8590649 | $7,410,690 | 0.0169729 | $99,117 |
| 2042 | 49 | 0.1352977 | 0.8647023 | $6,810,854 | 0.016294 | $88,392 |
| 2043 | 50 | 0.1298858 | 0.8701142 | $6,241,615 | 0.0156422 | $78,559 |
| 2044 | 51 | 0.1246904 | 0.8753096 | $5,701,412 | 0.0150165 | $69,558 |
| 2045 | 52 | 0.1197027 | 0.8802973 | $5,188,764 | 0.0144159 | $61,333 |
| 2046 | 53 | 0.1149146 | 0.8850854 | $4,702,265 | 0.0138392 | $53,828 |
| 2047 | 54 | 0.1103181 | 0.8896819 | $4,240,582 | 0.0132857 | $46,990 |
| 2048 | 55 | 0.1059053 | 0.8940947 | $3,802,448 | 0.0127542 | $40,772 |
| 2049 | 56 | 0.1016691 | 0.8983309 | $3,386,663 | 0.0122441 | $35,125 |
| 2050 | 57 | 0.0976024 | 0.9023976 | $2,992,086 | 0.0117543 | $30,007 |
| 2051 | 58 | 0.0936983 | 0.9063017 | $2,617,636 | 0.0112841 | $25,375 |
| 2052 | 59 | 0.0899503 | 0.9100497 | $2,262,286 | 0.0108328 | $21,191 |
| 2053 | 60 | 0.0863523 | 0.9136477 | $1,925,061 | 0.0103995 | $17,419 |
| 2054 | 61 | 0.0828982 | 0.9171018 | $1,605,038 | 0.0099835 | $14,026 |
| 2055 | 62 | 0.0795823 | 0.9204177 | $1,301,339 | 0.0095841 | $10,979 |
| 2056 | 63 | 0.0763990 | 0.9236010 | $1,013,131 | 0.0092008 | $8,250 |
| 2057 | 64 | 0.0733430 | 0.9266570 | $739,624 | 0.0088327 | $5,812 |
| 2058 | 65 | 0.0704093 | 0.9295907 | $480,069 | 0.0084794 | $3,640 |
| 2059 | 66 | 0.0675929 | 0.9324071 | $233,752 | 0.0081403 | $1,709 |
| | | | | | | $7,459,851 |
| | | | | | Annual Damages | $432,527 |

## Table 27. Lighthouse Visitations Damages - 73yr with-project design Residual Damages (Oct. 2004 P.L. 5.375% discount rate)

Discount Rate 0.05375

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value of Visitations for Year n | Prob. Of Damage in Year n | Expected Damage in Year n |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.8936417 | 0.1063583 | | | |
| 2008 | 15 | 0.8864925 | 0.1135075 | | | |
| 2009 | 16 | 0.8794006 | 0.1205994 | | | |
| 2010 | 17 | 0.8723654 | 0.1276346 | | | |
| 2011 | 18 | 0.8653865 | 0.1346135 | | | |
| 2012 | 19 | 0.8584634 | 0.1415366 | | | |
| 2013 | 20 | 0.8515957 | 0.1484043 | | | |
| 2014 | 21 | 0.8447829 | 0.1552171 | | | |
| 2015 | 22 | 0.8380246 | 0.1619754 | | | |
| 2016 | 23 | 0.8313204 | 0.1686796 | | | |
| 2017 | 24 | 0.8246699 | 0.1753301 | | | |
| 2018 | 25 | 0.8180725 | 0.1819275 | | | |
| 2019 | 26 | 0.8115279 | 0.1884721 | | | |
| 2020 | 27 | 0.8050357 | 0.1949643 | $30,959,738 | 0.008 | $31,612 |
| 2021 | 28 | 0.7985954 | 0.2014046 | $29,158,705 | 0.007936 | $31,150 |
| 2022 | 29 | 0.7922067 | 0.2077933 | $27,449,540 | 0.0078725 | $30,586 |
| 2023 | 30 | 0.7858690 | 0.2141310 | $25,827,557 | 0.0078095 | $29,933 |
| 2024 | 31 | 0.7795821 | 0.2204179 | $24,288,308 | 0.0077471 | $29,206 |
| 2025 | 32 | 0.7733454 | 0.2266546 | $22,827,574 | 0.0076851 | $28,416 |
| 2026 | 33 | 0.7671586 | 0.2328414 | $21,441,349 | 0.0076236 | $27,572 |
| 2027 | 34 | 0.7610214 | 0.2389786 | $20,125,833 | 0.0075626 | $26,686 |
| 2028 | 35 | 0.7549332 | 0.2450668 | $18,877,420 | 0.0075021 | $25,765 |
| 2029 | 36 | 0.7488937 | 0.2511063 | $17,692,686 | 0.0074421 | $24,816 |
| 2030 | 37 | 0.7429026 | 0.2570974 | $16,568,383 | 0.0073826 | $23,847 |
| 2031 | 38 | 0.7369594 | 0.2630406 | $15,501,429 | 0.0073235 | $22,864 |
| 2032 | 39 | 0.7310637 | 0.2689363 | $14,488,899 | 0.0072649 | $21,872 |
| 2033 | 40 | 0.7252152 | 0.2747848 | $13,528,016 | 0.0072068 | $20,876 |
| 2034 | 41 | 0.7194135 | 0.2805865 | $12,616,146 | 0.0071491 | $19,880 |
| 2035 | 42 | 0.7136582 | 0.2863418 | $11,750,789 | 0.0070919 | $18,888 |
| 2036 | 43 | 0.7079489 | 0.2920511 | $10,929,572 | 0.0070352 | $17,904 |
| 2037 | 44 | 0.7022853 | 0.2977147 | $10,150,244 | 0.0069789 | $16,929 |
| 2038 | 45 | 0.6966670 | 0.3033330 | $9,410,669 | 0.0069231 | $15,966 |
| 2039 | 46 | 0.6910937 | 0.3089063 | $8,708,817 | 0.0068677 | $15,019 |
| 2040 | 47 | 0.6855649 | 0.3144351 | $8,042,767 | 0.0068128 | $14,087 |
| 2041 | 48 | 0.6800804 | 0.3199196 | $7,410,690 | 0.0067583 | $13,174 |
| 2042 | 49 | 0.6746398 | 0.3253602 | $6,810,854 | 0.0067042 | $12,280 |
| 2043 | 50 | 0.6692426 | 0.3307574 | $6,241,615 | 0.0066506 | $11,406 |
| 2044 | 51 | 0.6638887 | 0.3361113 | $5,701,412 | 0.0065974 | $10,554 |
| 2045 | 52 | 0.6585776 | 0.3414224 | $5,188,764 | 0.0065446 | $9,724 |
| 2046 | 53 | 0.6533090 | 0.3466910 | $4,702,265 | 0.0064922 | $8,916 |
| 2047 | 54 | 0.6480825 | 0.3519175 | $4,240,582 | 0.0064403 | $8,131 |
| 2048 | 55 | 0.6428978 | 0.3571022 | $3,802,448 | 0.0063888 | $7,369 |
| 2049 | 56 | 0.6377547 | 0.3622453 | $3,386,663 | 0.0063377 | $6,630 |
| 2050 | 57 | 0.6326526 | 0.3673474 | $2,992,086 | 0.006287 | $5,915 |
| 2051 | 58 | 0.6275914 | 0.3724086 | $2,617,636 | 0.0062367 | $5,223 |
| 2052 | 59 | 0.6225707 | 0.3774293 | $2,262,286 | 0.0061868 | $4,554 |
| 2053 | 60 | 0.6175901 | 0.3824099 | $1,925,061 | 0.0061373 | $3,908 |
| 2054 | 61 | 0.6126494 | 0.3873506 | $1,605,038 | 0.0060882 | $3,284 |
| 2055 | 62 | 0.6077482 | 0.3922518 | $1,301,339 | 0.0060395 | $2,683 |
| 2056 | 63 | 0.6028862 | 0.3971138 | $1,013,131 | 0.0059911 | $2,104 |
| 2057 | 64 | 0.5980631 | 0.4019369 | $739,624 | 0.0059432 | $1,547 |
| 2058 | 65 | 0.5932786 | 0.4067214 | $480,069 | 0.0058957 | $1,011 |
| 2059 | 66 | 0.5885324 | 0.4114676 | $233,752 | 0.0058485 | $495 |
| | | | | | | $612,784 |
| | | | | | Annual Damages | $35,530 |

## Table 28. Lighthouse Visitations Damages - 150yr with-project design Residual Damages (Oct. 2004 P.L., 5.375% discount rate)

Discount Rate 0.05375

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value of Visitations for Year n | Prob. Of Damage in Year n | Expected Damage in Year n |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.9322301 | 0.0677699 | | | |
| 2008 | 15 | 0.9275690 | 0.0724310 | | | |
| 2009 | 16 | 0.9229311 | 0.0770689 | | | |
| 2010 | 17 | 0.9183165 | 0.0816835 | | | |
| 2011 | 18 | 0.9137249 | 0.0862751 | | | |
| 2012 | 19 | 0.9091563 | 0.0908437 | | | |
| 2013 | 20 | 0.9046105 | 0.0953895 | | | |
| 2014 | 21 | 0.9000874 | 0.0999126 | | | |
| 2015 | 22 | 0.8955870 | 0.1044130 | | | |
| 2016 | 23 | 0.8911091 | 0.1088909 | | | |
| 2017 | 24 | 0.8866535 | 0.1133465 | | | |
| 2018 | 25 | 0.8822202 | 0.1177798 | | | |
| 2019 | 26 | 0.8778091 | 0.1221909 | | | |
| 2020 | 27 | 0.8734201 | 0.1265799 | $30,959,738 | 0.005 | $12,645 |
| 2021 | 28 | 0.8690530 | 0.1309470 | $29,158,705 | 0.004975 | $12,515 |
| 2022 | 29 | 0.8647077 | 0.1352923 | $27,449,540 | 0.004950125 | $12,344 |
| 2023 | 30 | 0.8603842 | 0.1396158 | $25,827,557 | 0.004925374 | $12,135 |
| 2024 | 31 | 0.8560823 | 0.1439177 | $24,288,308 | 0.004900748 | $11,893 |
| 2025 | 32 | 0.8518019 | 0.1481981 | $22,827,574 | 0.004876244 | $11,623 |
| 2026 | 33 | 0.8475429 | 0.1524571 | $21,441,349 | 0.004851863 | $11,328 |
| 2027 | 34 | 0.8433051 | 0.1566949 | $20,125,833 | 0.004827603 | $11,013 |
| 2028 | 35 | 0.8390886 | 0.1609114 | $18,877,420 | 0.004803465 | $10,680 |
| 2029 | 36 | 0.8348932 | 0.1651068 | $17,692,686 | 0.004779448 | $10,333 |
| 2030 | 37 | 0.8307187 | 0.1692813 | $16,568,383 | 0.004755551 | $9,973 |
| 2031 | 38 | 0.8265651 | 0.1734349 | $15,501,429 | 0.004731773 | $9,605 |
| 2032 | 39 | 0.8224323 | 0.1775677 | $14,488,899 | 0.004708114 | $9,229 |
| 2033 | 40 | 0.8183201 | 0.1816799 | $13,528,016 | 0.004684573 | $8,848 |
| 2034 | 41 | 0.8142285 | 0.1857715 | $12,616,146 | 0.004661151 | $8,463 |
| 2035 | 42 | 0.8101574 | 0.1898426 | $11,750,789 | 0.004637845 | $8,077 |
| 2036 | 43 | 0.8061066 | 0.1938934 | $10,929,572 | 0.004614656 | $7,689 |
| 2037 | 44 | 0.8020761 | 0.1979239 | $10,150,244 | 0.004591582 | $7,303 |
| 2038 | 45 | 0.7980657 | 0.2019343 | $9,410,669 | 0.004568624 | $6,918 |
| 2039 | 46 | 0.7940753 | 0.2059247 | $8,708,817 | 0.004545781 | $6,536 |
| 2040 | 47 | 0.7901050 | 0.2098950 | $8,042,767 | 0.004523052 | $6,158 |
| 2041 | 48 | 0.7861544 | 0.2138456 | $7,410,690 | 0.004500437 | $5,784 |
| 2042 | 49 | 0.7822237 | 0.2177763 | $6,810,854 | 0.004477935 | $5,416 |
| 2043 | 50 | 0.7783126 | 0.2216874 | $6,241,615 | 0.004455545 | $5,052 |
| 2044 | 51 | 0.7744210 | 0.2255790 | $5,701,412 | 0.004433268 | $4,696 |
| 2045 | 52 | 0.7705489 | 0.2294511 | $5,188,764 | 0.004411101 | $4,345 |
| 2046 | 53 | 0.7666961 | 0.2333039 | $4,702,265 | 0.004389046 | $4,002 |
| 2047 | 54 | 0.7628627 | 0.2371373 | $4,240,582 | 0.0043671 | $3,665 |
| 2048 | 55 | 0.7590484 | 0.2409516 | $3,802,448 | 0.004345265 | $3,336 |
| 2049 | 56 | 0.7552531 | 0.2447469 | $3,386,663 | 0.004323539 | $3,015 |
| 2050 | 57 | 0.7514768 | 0.2485232 | $2,992,086 | 0.004301921 | $2,702 |
| 2051 | 58 | 0.7477195 | 0.2522805 | $2,617,636 | 0.004280411 | $2,396 |
| 2052 | 59 | 0.7439809 | 0.2560191 | $2,262,286 | 0.004259009 | $2,098 |
| 2053 | 60 | 0.7402610 | 0.2597390 | $1,925,061 | 0.004237714 | $1,808 |
| 2054 | 61 | 0.7365597 | 0.2634403 | $1,605,038 | 0.004216526 | $1,527 |
| 2055 | 62 | 0.7328769 | 0.2671231 | $1,301,339 | 0.004195443 | $1,253 |
| 2056 | 63 | 0.7292125 | 0.2707875 | $1,013,131 | 0.004174466 | $987 |
| 2057 | 64 | 0.7255664 | 0.2744336 | $739,624 | 0.004153594 | $729 |
| 2058 | 65 | 0.7219386 | 0.2780614 | $480,069 | 0.004132826 | $478 |
| 2059 | 66 | 0.7183289 | 0.2816711 | $233,752 | 0.004112161 | $235 |
| | | | | | | $258,831 |
| | | | | | Annual Damages | $15,007 |

## Table 29. Park Visitations - 15yr storm design Residual Damages

(Oct. 2004 P.L., 5.375% discount rate)

Discount Rate 0.05375

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value of Visitations for Year n | Prob. Of Damage in Year n | Expected Damage in Year n |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.5646733 | 0.4353267 | | | |
| 2008 | 15 | 0.5420864 | 0.4579136 | | | |
| 2009 | 16 | 0.5204029 | 0.4795971 | | | |
| 2010 | 17 | 0.4995868 | 0.5004132 | | | |
| 2011 | 18 | 0.4796033 | 0.5203967 | | | |
| 2012 | 19 | 0.4604192 | 0.5395808 | | | |
| 2013 | 20 | 0.4420024 | 0.5579976 | | | |
| 2014 | 21 | 0.4243223 | 0.5756777 | | | |
| 2015 | 22 | 0.4073494 | 0.5926506 | | | |
| 2016 | 23 | 0.3910555 | 0.6089445 | | | |
| 2017 | 24 | 0.3754132 | 0.6245868 | | | |
| 2018 | 25 | 0.3603967 | 0.6396033 | | | |
| 2019 | 26 | 0.3459808 | 0.6540192 | | | |
| 2020 | 27 | 0.3321416 | 0.6678584 | $6,950,283 | 0.040 | $139,121 |
| 2021 | 28 | 0.3188559 | 0.6811441 | $6,545,962 | 0.038 | $130,809 |
| 2022 | 29 | 0.3061017 | 0.6938983 | $6,162,264 | 0.037 | $122,574 |
| 2023 | 30 | 0.2938576 | 0.7061424 | $5,798,138 | 0.035 | $114,497 |
| 2024 | 31 | 0.2821033 | 0.7178967 | $5,452,585 | 0.034 | $106,642 |
| 2025 | 32 | 0.2708192 | 0.7291808 | $5,124,659 | 0.033 | $99,056 |
| 2026 | 33 | 0.2599864 | 0.7400136 | $4,813,459 | 0.031 | $91,775 |
| 2027 | 34 | 0.2495870 | 0.7504130 | $4,518,134 | 0.030 | $84,822 |
| 2028 | 35 | 0.2396035 | 0.7603965 | $4,237,872 | 0.029 | $78,215 |
| 2029 | 36 | 0.2300194 | 0.7699806 | $3,971,906 | 0.028 | $71,960 |
| 2030 | 37 | 0.2208186 | 0.7791814 | $3,719,507 | 0.027 | $66,061 |
| 2031 | 38 | 0.2119858 | 0.7880142 | $3,479,982 | 0.026 | $60,515 |
| 2032 | 39 | 0.2035064 | 0.7964936 | $3,252,674 | 0.025 | $55,316 |
| 2033 | 40 | 0.1953662 | 0.8046338 | $3,036,962 | 0.024 | $50,457 |
| 2034 | 41 | 0.1875515 | 0.8124485 | $2,832,252 | 0.023 | $45,925 |
| 2035 | 42 | 0.1800494 | 0.8199506 | $2,637,984 | 0.022 | $41,710 |
| 2036 | 43 | 0.1728475 | 0.8271525 | $2,453,626 | 0.021 | $37,796 |
| 2037 | 44 | 0.1659336 | 0.8340664 | $2,278,671 | 0.020 | $34,171 |
| 2038 | 45 | 0.1592962 | 0.8407038 | $2,112,641 | 0.019 | $30,818 |
| 2039 | 46 | 0.1529244 | 0.8470756 | $1,955,079 | 0.018 | $27,724 |
| 2040 | 47 | 0.1468074 | 0.8531926 | $1,805,555 | 0.018 | $24,873 |
| 2041 | 48 | 0.1409351 | 0.8590649 | $1,663,657 | 0.017 | $22,251 |
| 2042 | 49 | 0.1352977 | 0.8647023 | $1,528,998 | 0.016 | $19,843 |
| 2043 | 50 | 0.1298858 | 0.8701142 | $1,401,207 | 0.016 | $17,636 |
| 2044 | 51 | 0.1246904 | 0.8753096 | $1,279,934 | 0.015 | $15,615 |
| 2045 | 52 | 0.1197027 | 0.8802973 | $1,164,848 | 0.014 | $13,769 |
| 2046 | 53 | 0.1149146 | 0.8850854 | $1,055,631 | 0.014 | $12,084 |
| 2047 | 54 | 0.1103181 | 0.8896819 | $951,986 | 0.013 | $10,549 |
| 2048 | 55 | 0.1059053 | 0.8940947 | $853,628 | 0.013 | $9,153 |
| 2049 | 56 | 0.1016691 | 0.8983309 | $760,286 | 0.012 | $7,885 |
| 2050 | 57 | 0.0976024 | 0.9023976 | $671,706 | 0.012 | $6,736 |
| 2051 | 58 | 0.0936983 | 0.9063017 | $587,644 | 0.011 | $5,697 |
| 2052 | 59 | 0.0899503 | 0.9100497 | $507,870 | 0.011 | $4,757 |
| 2053 | 60 | 0.0863523 | 0.9136477 | $432,165 | 0.010 | $3,911 |
| 2054 | 61 | 0.0828982 | 0.9171018 | $360,322 | 0.010 | $3,149 |
| 2055 | 62 | 0.0795823 | 0.9204177 | $292,143 | 0.010 | $2,465 |
| 2056 | 63 | 0.0763990 | 0.9236010 | $227,442 | 0.009 | $1,852 |
| 2057 | 64 | 0.0733430 | 0.9266570 | $166,041 | 0.009 | $1,305 |
| 2058 | 65 | 0.0704093 | 0.9295907 | $107,773 | 0.008 | $817 |
| 2059 | 66 | 0.0675929 | 0.9324071 | $52,476 | 0.008 | $384 |
| | | | | | | $1,674,694 |
| | | | | | Annual Damages | $97,100 |

## Table 30. Park Visitations - 73yr storm design Residual Damages

(Oct. 2004 P.L., 5.375% discount rate)

Discount Rate 0.05375

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value of Visitations for Year n | Prob. Of Damage In Year n | Expected Damage In Year n |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.8936417 | 0.1063583 | | | |
| 2008 | 15 | 0.8864925 | 0.1135075 | | | |
| 2009 | 16 | 0.8794006 | 0.1205994 | | | |
| 2010 | 17 | 0.8723654 | 0.1276346 | | | |
| 2011 | 18 | 0.8653865 | 0.1346135 | | | |
| 2012 | 19 | 0.8584634 | 0.1415366 | | | |
| 2013 | 20 | 0.8515957 | 0.1484043 | | | |
| 2014 | 21 | 0.8447829 | 0.1552171 | | | |
| 2015 | 22 | 0.8380246 | 0.1619754 | | | |
| 2016 | 23 | 0.8313204 | 0.1686796 | | | |
| 2017 | 24 | 0.8246699 | 0.1753301 | | | |
| 2018 | 25 | 0.8180725 | 0.1819275 | | | |
| 2019 | 26 | 0.8115279 | 0.1884721 | | | |
| 2020 | 27 | 0.8050357 | 0.1949643 | $6,950,283 | 0.008 | $7,097 |
| 2021 | 28 | 0.7985954 | 0.2014046 | $6,545,962 | 0.007936 | $6,993 |
| 2022 | 29 | 0.7922067 | 0.2077933 | $6,162,264 | 0.007872512 | $6,866 |
| 2023 | 30 | 0.7858690 | 0.2141310 | $5,798,138 | 0.007809532 | $6,720 |
| 2024 | 31 | 0.7795821 | 0.2204179 | $5,452,585 | 0.007747056 | $6,557 |
| 2025 | 32 | 0.7733454 | 0.2266546 | $5,124,659 | 0.007685079 | $6,379 |
| 2026 | 33 | 0.7671586 | 0.2328414 | $4,813,459 | 0.007623599 | $6,190 |
| 2027 | 34 | 0.7610214 | 0.2389786 | $4,518,134 | 0.00756261 | $5,991 |
| 2028 | 35 | 0.7549332 | 0.2450668 | $4,237,872 | 0.007502109 | $5,784 |
| 2029 | 36 | 0.7488937 | 0.2511063 | $3,971,906 | 0.007442092 | $5,571 |
| 2030 | 37 | 0.7429026 | 0.2570974 | $3,719,507 | 0.007382555 | $5,354 |
| 2031 | 38 | 0.7369594 | 0.2630406 | $3,479,982 | 0.007323495 | $5,133 |
| 2032 | 39 | 0.7310637 | 0.2689363 | $3,252,674 | 0.007264907 | $4,910 |
| 2033 | 40 | 0.7252152 | 0.2747848 | $3,036,962 | 0.007206788 | $4,687 |
| 2034 | 41 | 0.7194135 | 0.2805865 | $2,832,252 | 0.007149133 | $4,463 |
| 2035 | 42 | 0.7136582 | 0.2863418 | $2,637,984 | 0.00709194 | $4,240 |
| 2036 | 43 | 0.7079489 | 0.2920511 | $2,453,626 | 0.007035205 | $4,019 |
| 2037 | 44 | 0.7022853 | 0.2977147 | $2,278,671 | 0.006978923 | $3,800 |
| 2038 | 45 | 0.6966670 | 0.3033330 | $2,112,641 | 0.006923092 | $3,584 |
| 2039 | 46 | 0.6910937 | 0.3089063 | $1,955,079 | 0.006867707 | $3,372 |
| 2040 | 47 | 0.6855649 | 0.3144351 | $1,805,555 | 0.006812765 | $3,163 |
| 2041 | 48 | 0.6800804 | 0.3199196 | $1,663,657 | 0.006758263 | $2,957 |
| 2042 | 49 | 0.6746398 | 0.3253602 | $1,528,998 | 0.006704197 | $2,757 |
| 2043 | 50 | 0.6692426 | 0.3307574 | $1,401,207 | 0.006650564 | $2,561 |
| 2044 | 51 | 0.6638887 | 0.3361113 | $1,279,934 | 0.006597359 | $2,369 |
| 2045 | 52 | 0.6585776 | 0.3414224 | $1,164,848 | 0.00654458 | $2,183 |
| 2046 | 53 | 0.6533090 | 0.3466910 | $1,055,631 | 0.006492224 | $2,002 |
| 2047 | 54 | 0.6480825 | 0.3519175 | $951,986 | 0.006440286 | $1,825 |
| 2048 | 55 | 0.6428978 | 0.3571022 | $853,628 | 0.006388763 | $1,654 |
| 2049 | 56 | 0.6377547 | 0.3622453 | $760,286 | 0.006337653 | $1,488 |
| 2050 | 57 | 0.6326526 | 0.3673474 | $671,706 | 0.006286952 | $1,328 |
| 2051 | 58 | 0.6275914 | 0.3724086 | $587,644 | 0.006236656 | $1,172 |
| 2052 | 59 | 0.6225707 | 0.3774293 | $507,870 | 0.006186763 | $1,022 |
| 2053 | 60 | 0.6175901 | 0.3824099 | $432,165 | 0.006137269 | $877 |
| 2054 | 61 | 0.6126494 | 0.3873506 | $360,322 | 0.006088171 | $737 |
| 2055 | 62 | 0.6077482 | 0.3922518 | $292,143 | 0.006039466 | $602 |
| 2056 | 63 | 0.6028862 | 0.3971138 | $227,442 | 0.00599115 | $472 |
| 2057 | 64 | 0.5980631 | 0.4019369 | $166,041 | 0.005943221 | $347 |
| 2058 | 65 | 0.5932786 | 0.4067214 | $107,773 | 0.005895675 | $227 |
| 2059 | 66 | 0.5885324 | 0.4114676 | $52,476 | 0.00584851 | $111 |
| | | | | | | $137,567 |
| | | | | | Annual Damages | $7,976 |

## Table 31. Park Visitations - 150yr storm design Residual Damages

(Oct. 2004 P.L., 5.375% discount rate)

Discount Rate 0.05375

| | End of year n | Probability that armor stone will be there at end of year n | Probability that armor stone won't be there at end of year n | Present Value of Visitations for Year n | Prob. Of Damage in Year n | Expected Damage in Year n |
|---|---|---|---|---|---|---|
| 1994 | 1 | 0.9333333 | 0.0666667 | | | |
| 1995 | 2 | 0.8711111 | 0.1288889 | | | |
| 1996 | 3 | 0.8130370 | 0.1869630 | | | |
| 1997 | 4 | 0.7588346 | 0.2411654 | | | |
| 1998 | 5 | 0.7082456 | 0.2917544 | | | |
| 1999 | 6 | 0.6610292 | 0.3389708 | | | |
| 2000 | 7 | 0.6169606 | 0.3830394 | | | |
| 2001 | 8 | 0.5758299 | 0.4241701 | | | |
| 2002 | 9 | 0.5374412 | 0.4625588 | | | |
| 2003 | 10 | 0.5016118 | 0.4983882 | | | |
| 2004 | 11 | 0.4681710 | 0.5318290 | | | |
| 2005 | 12 | 0.4369596 | 0.5630404 | | | |
| 2006 | 13 | 0.4078290 | 0.5921710 | | | |
| 2007 | 14 | 0.9322301 | 0.0677699 | | | |
| 2008 | 15 | 0.9275690 | 0.0724310 | | | |
| 2009 | 16 | 0.9229311 | 0.0770689 | | | |
| 2010 | 17 | 0.9183165 | 0.0816835 | | | |
| 2011 | 18 | 0.9137249 | 0.0862751 | | | |
| 2012 | 19 | 0.9091563 | 0.0908437 | | | |
| 2013 | 20 | 0.9046105 | 0.0953895 | | | |
| 2014 | 21 | 0.9000874 | 0.0999126 | | | |
| 2015 | 22 | 0.8955870 | 0.1044130 | | | |
| 2016 | 23 | 0.8911091 | 0.1088909 | | | |
| 2017 | 24 | 0.8866535 | 0.1133465 | | | |
| 2018 | 25 | 0.8822202 | 0.1177798 | | | |
| 2019 | 26 | 0.8778091 | 0.1221909 | | | |
| 2020 | 27 | 0.8734201 | 0.1265799 | $6,950,283 | 0.005 | $2,839 |
| 2021 | 28 | 0.8690530 | 0.1309470 | $6,545,962 | 0.004975 | $2,810 |
| 2022 | 29 | 0.8647077 | 0.1352923 | $6,162,264 | 0.004950125 | $2,771 |
| 2023 | 30 | 0.8603842 | 0.1396158 | $5,798,138 | 0.004925374 | $2,724 |
| 2024 | 31 | 0.8560823 | 0.1439177 | $5,452,585 | 0.004900748 | $2,670 |
| 2025 | 32 | 0.8518019 | 0.1481981 | $5,124,659 | 0.004876244 | $2,609 |
| 2026 | 33 | 0.8475429 | 0.1524571 | $4,813,459 | 0.004851863 | $2,543 |
| 2027 | 34 | 0.8433051 | 0.1566949 | $4,518,134 | 0.004827603 | $2,472 |
| 2028 | 35 | 0.8390886 | 0.1609114 | $4,237,872 | 0.004803465 | $2,398 |
| 2029 | 36 | 0.8348932 | 0.1651068 | $3,971,906 | 0.004779448 | $2,320 |
| 2030 | 37 | 0.8307187 | 0.1692813 | $3,719,507 | 0.004755551 | $2,239 |
| 2031 | 38 | 0.8265651 | 0.1734349 | $3,479,982 | 0.004731773 | $2,156 |
| 2032 | 39 | 0.8224323 | 0.1775677 | $3,252,674 | 0.004708114 | $2,072 |
| 2033 | 40 | 0.8183201 | 0.1816799 | $3,036,962 | 0.004684573 | $1,986 |
| 2034 | 41 | 0.8142285 | 0.1857715 | $2,832,252 | 0.004661151 | $1,900 |
| 2035 | 42 | 0.8101574 | 0.1898426 | $2,637,984 | 0.004637845 | $1,813 |
| 2036 | 43 | 0.8061066 | 0.1938934 | $2,453,626 | 0.004614656 | $1,726 |
| 2037 | 44 | 0.8020761 | 0.1979239 | $2,278,671 | 0.004591582 | $1,639 |
| 2038 | 45 | 0.7980657 | 0.2019343 | $2,112,641 | 0.004568624 | $1,553 |
| 2039 | 46 | 0.7940753 | 0.2059247 | $1,955,079 | 0.004545781 | $1,467 |
| 2040 | 47 | 0.7901050 | 0.2098950 | $1,805,555 | 0.004523052 | $1,382 |
| 2041 | 48 | 0.7861544 | 0.2138456 | $1,663,657 | 0.004500437 | $1,299 |
| 2042 | 49 | 0.7822237 | 0.2177763 | $1,528,998 | 0.004477935 | $1,216 |
| 2043 | 50 | 0.7783126 | 0.2216874 | $1,401,207 | 0.004455545 | $1,134 |
| 2044 | 51 | 0.7744210 | 0.2255790 | $1,279,934 | 0.004433268 | $1,054 |
| 2045 | 52 | 0.7705489 | 0.2294511 | $1,164,848 | 0.004411101 | $975 |
| 2046 | 53 | 0.7666961 | 0.2333039 | $1,055,631 | 0.004389046 | $898 |
| 2047 | 54 | 0.7628627 | 0.2371373 | $951,986 | 0.0043671 | $823 |
| 2048 | 55 | 0.7590484 | 0.2409516 | $853,628 | 0.004345265 | $749 |
| 2049 | 56 | 0.7552531 | 0.2447469 | $760,286 | 0.004323539 | $677 |
| 2050 | 57 | 0.7514768 | 0.2485232 | $671,706 | 0.004301921 | $607 |
| 2051 | 58 | 0.7477195 | 0.2522805 | $587,644 | 0.004280411 | $538 |
| 2052 | 59 | 0.7439809 | 0.2560191 | $507,870 | 0.004259009 | $471 |
| 2053 | 60 | 0.7402610 | 0.2597390 | $432,165 | 0.004237714 | $406 |
| 2054 | 61 | 0.7365597 | 0.2634403 | $360,322 | 0.004216526 | $343 |
| 2055 | 62 | 0.7328769 | 0.2671231 | $292,143 | 0.004195443 | $281 |
| 2056 | 63 | 0.7292125 | 0.2707875 | $227,442 | 0.004174466 | $222 |
| 2057 | 64 | 0.7255664 | 0.2744336 | $166,041 | 0.004153594 | $164 |
| 2058 | 65 | 0.7219386 | 0.2780614 | $107,773 | 0.004132826 | $107 |
| 2059 | 66 | 0.7183289 | 0.2816711 | $52,476 | 0.004112161 | $53 |
| | | | | | | $58,106 |
| | | | | | Annual Damages | $3,369 |

## Benefits

27. Benefits are estimated to be annual damages in the without-project conditions minus any residual damages in the with-project alternatives. The benefits claimed are avoided storm damage costs when compared to the existing condition, specifically avoided loss of the lighthouse complex and its associated costs for the preservation of artifacts, prevented local costs forgone for loss of land values, avoided lost visitation benefits to the lighthouse and to the State Park. The project benefits for the three alternatives are summarized in Table 32 below. All benefits are discounted using a 5-$^{3}/_{8}$ percent interest rate and amortized over the 50-year period of analysis. Table 33 summarized the annual cost for the stone revetment alternatives.

**Table 32. Benefit Summary** (Oct. 2004 P.L., 5.375% discount rate)

| Description | Without-Project Damages | Residual Damages - 15yr storm design | Benefits - 15yr storm design | Residual Damages - 73yr storm design | Benefits - 73yr storm design | Residual Damages - 150yr storm design | Benefits - 150yr storm design |
|---|---|---|---|---|---|---|---|
| Storm Damage Reduction | | | | | | | |
| Lighthouse Complex | $518,452 | $318,655 | $199,797 | $33,617 | $484,835 | $15,732 | $502,720 |
| Local Costs Forgone | $74,100 | $60,402 | $13,698 | $19,226 | $56,520 | $12,636 | $61,464 |
| Subtotal | $592,600 | $379,100 | $213,500 | $52,800 | $541,400 | $28,400 | $564,200 |
| Recreation | | | | | | | |
| Lighthouse Visitations | $882,662 | $432,527 | $450,135 | $35,530 | $847,132 | $15,007 | $867,655 |
| Park Visitations | $198,153 | $97,100 | $101,053 | $7,976 | $190,177 | $3,369 | $194,784 |
| Subtotal | $1,080,800 | $529,600 | $551,200 | $43,500 | $1,037,300 | $18,400 | $1,062,400 |

**Table 33. Cost Summary** (Oct. 2004 P.L., 5.375% discount rate)

| Description | 15yr storm design | 73yr storm design | 150yr storm design |
|---|---|---|---|
| Total First Cost | $5,804,000 | $13,722,900 | $15,998,900 |
| Interest During Construction | $301,400 | $712,700 | $1,057,000 |
| Total Investment Cost | $6,105,400 | $14,435,600 | $17,055,900 |
| Annual Investment Cost | $354,000 | $837,000 | $988,900 |
| Annual Revetment Maintenance Cost | $170,700 | $52,300 | $61,500 |
| Total Annual Cost | $524,700 | $889,300 | $1,050,400 |

## Summary

28. The Planning Guidance Notebook, ER 1105-2-100, 22 April 2000, Chapter 3-4b(4)(a), reads in pertinent part,

> *"The Corps participates in single purpose projects formulated exclusively for hurricane and storm damage reduction, with economic benefits equal to or exceeding the costs, based solely on damage reduction benefits, or a combination of damage reduction benefits and recreation benefits. Under current policy, recreation must be incidental in the formulation process and may not be more than fifty percent of the total benefits required for justification. If the criterion for federal participation project cost sharing is met, then all recreation benefits are included in the benefit to cost analysis."*

29. Federal participation in this recreation benefit generating shore protection project is warranted since the recreation benefits are incidental, and when combined with and limited to an equivalent amount of primary hurricane and storm damage reduction benefits, they produce an economically justified project. The incidental recreation benefits are limited because the storm damage reduction benefits must be at least 50 percent of the total benefits used for project evaluation. Table 34 shows that the 73-year design has the highest net benefits among the three alternatives and is therefore, the National Economic Development (NED) plan. After the NED plan is determined, all recreation benefits are included in the final benefit cost ratio (BCR) because the criterion for federal participation project cost sharing with limited recreation benefits has been met.

**Table 34. NED Plan Selection** (Oct. 2004 P.L., 5.375% discount rate)

| **Description** | **15yr Storm Design** | ***73yr Storm Design*** | **150yr Storm Design** |
|---|---|---|---|
| | | | |
| Annual Storm Damage Benefits | $213,500 | *$541,400* | $564,200 |
| Annual Recreation Benefits | $551,200 | *$1,037,300* | $1,062,400 |
| Annual Recreation Benefits Used for Project Justification[6] | $213,500 | *$541,400* | $564,200 |
| Total Benefits Used for Project Justification[7] | $427,000 | *$1,082,800* | $1,128,400 |
| Annual Costs | $524,700 | *$889,300* | $1,050,400 |
| Net Benefits | -$97,700 | *$193,500* | $78,000 |
| BCR | 0.81 | *1.22* | 1.07 |
| | | | |
| Total Benefits[8] | | *$1,578,700* | |
| Total Net Benefits | | *$689,400* | |
| Final BCR | | *1.78* | |

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[6] Annual recreation benefits limited to an equivalent amount of annual storm reduction damage benefits.

[7] Sum of annual storm damage reduction benefits and annual recreation benefits used for project justification.

[8] Includes all annual recreation benefits.

# APPENDIX C: COST ESTIMATES & MCACES

OCTOBER 2005

# MONTAUK POINT EROSION CONTROL FEASIBILITY STUDY MONTAUK POINT, NEW YORK

## QUANTITIES AND COST

## APPENDIX C

U.S. ARMY CORPS OF ENGINEERS
NEW YORK DISTRICT

## Table of Contents

## List of Tables

## List of Attachments

## Introduction

### General

C-1 This document contains the first costs for the Montauk Point Erosion Control Project. Methods for deriving the costs of the various project elements of the recommended plan are discussed.

C-2 The MCACES summary sheets reflecting feasibility level costs is shown in Attachment C-1 at the end of this support document.

### Basis of Estimates

C-3 All estimates are based on October 2004 price levels for labor, materials, equipment, 2000 topographic surveys and beach profiles. Quantities for the alternative plans of improvement have been developed from the detailed plans shown in the Feasibility Report, as well as detailed design data reflected in accompanying support documents.

C-4 The quantities for the alternative plans for the Montauk Point erosion control project were computed as follows and are presented in Table C-1:

| TABLE C-1<br>INITIAL CONSTRUCTION<br>QUANTITIES | ALTERNATIVE 2A 150-year Level of Protection Crest Elev. +30' NGVD | ALTERNATIVE 2B 73-year Level of Protection Crest Elev. +25' NGVD | ALTERNATIVE 2C 15-year Level of Protection Crest Elev. +25' NGVD |
|---|---|---|---|
| | | | |
| **Material** | | | |
| Armor Stone (tons) | 57,100 | 46,700 | 15,600 * |
| Armor Stone- Rehandled (tons) | 19,100 | 19,300 | 1,000 |
| Underlayer (tons) | 23,700 | 18,600 | 1,000 |
| Bedding Stone (tons) | 12,100 | 11,100 | 11,500 |
| Excavation (cy) | 34,200 | 32,000 | 15,000 |

* Includes construction of cofferdam offshore and reuse in revetment. Alternative cost also includes the disposal of 7,300 tons of unusable existing armor stone to be disposed on site at the structure toe. Also included is 8,000 sf. of temporary exposed bank protection during construction.

Construction Quantity Estimate. The 2000 beach profile survey was used as existing conditions, forming the basis for the initial construction quantity estimate. The design cross-section was superimposed on each of the existing beach profiles. Quantity estimates for the alternative levels of protection appear in Table C-1. A detailed quantity estimate for the selected alternative (73-year level of protection) appears in Table C-2.

Armor Stone Construction Tolerance. Armor stone quantities include an additional 15 inch construction template tolerance.

Quarry Stone Source. Tilcon Quarry, CT

# TABLE C-2

## SELECTED ALTERNATIVE – QUANTITY ESTIMATE

|  |  | ARMOR STONE |  |  |  |  |  |  |  | UNDERLAYER STONE |  |  |  | BEDDING STONE |  |  |  | EXCAVATION |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | 4.5 - 5.0 Ton Armor Units |  |  |  | 12.6 Ton Quarrystone Armor |  |  |  | 1.3 Ton Quarrystone |  |  |  | 100 LB. Quarry Run |  |  |  |  |  |  |  |
| STATION | LENGTH | AREA | AREA | VOLUME | VOLUME | AREA | AREA | VOLUME | VOLUME | AREA | AREA | VOLUME | VOLUME | AREA | AREA | VOLUME | VOLUME | AREA | AREA | VOLUME | VOLUME |
|  |  | Sq. Ft. | AVG. | Cu. Ft. | Cu. Yards | Sq. Ft. | AVG. | Cu. Ft. | Cu. Yards | Sq. Ft. | AVG. | Cu. Ft. | Cu. Yards | Sq. Ft. | AVG. | Cu. Ft. | Cu. Yards | Sq. Ft. | AVG. | Cu. Ft. | Cu. Yards |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0-55 |  | 0 |  |  |  | 0 |  |  |  | 0 |  |  |  | 0 |  |  |  | 0 |  |  |  |
|  | 55 |  | 213.5 | 11742.5 | 434.9 |  | 500 | 27500 | 1018.5 |  | 200.5 | 11027.5 | 408.4 |  | 118.5 | 6517.5 | 241.4 |  | 503.5 | 27692.5 | 1025.6 |
| 0+00 |  | 427 |  |  |  | 1000 |  |  |  | 401 |  |  |  | 237 |  |  |  | 1007 |  |  |  |
|  | 100 |  | 427 | 42700 | 1581.5 |  | 979 | 97900 | 3625.9 |  | 389.5 | 38950 | 1442.6 |  | 236 | 23600 | 874.1 |  | 1019 | 101900 | 3774.1 |
| 1+00 |  | 427 |  |  |  | 958 |  |  |  | 378 |  |  |  | 235 |  |  |  | 1031 |  |  |  |
|  | 100 |  | 427 | 42700 | 1581.5 |  | 973.5 | 97350 | 3605.6 |  | 384.5 | 38450 | 1424.1 |  | 235 | 23500 | 870.4 |  | 1094.5 | 109450 | 4053.7 |
| 2+00 |  | 427 |  |  |  | 989 |  |  |  | 391 |  |  |  | 235 |  |  |  | 1158 |  |  |  |
|  | 100 |  | 427 | 42700 | 1581.5 |  | 1043 | 104300 | 3863.0 |  | 412.5 | 41250 | 1527.8 |  | 244 | 24400 | 903.7 |  | 1185 | 118500 | 4388.9 |
| 3+00 |  | 427 |  |  |  | 1097 |  |  |  | 434 |  |  |  | 253 |  |  |  | 1212 |  |  |  |
|  | 100 |  | 427 | 42700 | 1581.5 |  | 1079 | 107900 | 3996.3 |  | 427 | 42700 | 1581.5 |  | 253 | 25300 | 937.0 |  | 1184.5 | 118450 | 4387.0 |
| 4+00 |  | 427 |  |  |  | 1061 |  |  |  | 420 |  |  |  | 253 |  |  |  | 1157 |  |  |  |
|  | 100 |  | 427 | 42700 | 1581.5 |  | 1041.5 | 104150 | 3857.4 |  | 412 | 41200 | 1525.9 |  | 247 | 24700 | 914.8 |  | 1202 | 120200 | 4451.9 |
| 5+00 |  | 427 |  |  |  | 1022 |  |  |  | 404 |  |  |  | 241 |  |  |  | 1247 |  |  |  |
|  | 100 |  | 427 | 42700 | 1581.5 |  | 1028.5 | 102850 | 3809.3 |  | 406.5 | 40650 | 1505.6 |  | 244.5 | 24450 | 905.6 |  | 1207.5 | 120750 | 4472.2 |
| 6+00 |  | 427 |  |  |  | 1035 |  |  |  | 409 |  |  |  | 248 |  |  |  | 1168 |  |  |  |
|  | 100 |  | 427 | 42700 | 1581.5 |  | 1060.5 | 106050 | 3927.8 |  | 425.5 | 42550 | 1575.9 |  | 250.5 | 25050 | 927.8 |  | 1097 | 109700 | 4063.0 |
| 7+00 |  | 427 |  |  |  | 1086 |  |  |  | 442 |  |  |  | 253 |  |  |  | 1026 |  |  |  |
|  | 74 |  | 213.5 | 15799 | 585.1 |  | 543 | 40182 | 1488.2 |  | 221 | 16354 | 605.7 |  | 126.5 | 9361 | 346.7 |  | 513 | 37962 | 1406.0 |
| 7+74 |  | 0 |  |  |  | 0 |  |  |  | 0 |  |  |  | 0 |  |  |  | 0 |  |  |  |
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| TOTAL | 829 |  |  | 326442 | 12090 |  |  | 788182 | 29192 |  |  | 313132 | 11597 |  |  | 186879 | 6921 |  |  | 864605 | 32022 |
|  |  |  | TONS (cy x 1.6) |  | 19345 |  |  |  | 46707 |  |  |  | 18556 |  |  |  | 11074 |  |  |  |  |

## Work Breakdown Structure

C-5 The estimate was compiled using MCACES and patterned after the Civil Works Template as a model. The estimate makes use of all six reporting levels available in the following format:

| | | |
|---|---|---|
| Level 1 | Construction Element | One of five major account codes used to estimate the total project cost. |
| Level 2 | Sub-element/Segment | An individual segment of construction activity comprising one or more categories of work or features (cost accounts) |
| Level 3 | Feature | A sub-component of a major type of work (cost accounts) |
| Level 4-6 | Sub-Feature, Bid Item, And Assembly | Increasingly detailed levels of descriptions and estimating dependant on the information and design level developed for the Feasibility Report |

## Project Description

C-6 The project is located at Montauk Point in Suffolk County, approximately 125 miles east of New York City. The Recommended Plan which is fully described in the Feasibility Report, consists of the construction of a stone revetment section, 840 feet in length, with a crest width of 40' at elevation +25' NGVD, 1V:2H side slopes, and 12.6-ton quarry armor stone units extending from the crest down to the embedded toe. Three layers of 4-5 ton armor units are used atop the splash apron. It is assumed that some of these stones from the present structure can be re-used in the proposed revetment. . The bottom of the armor stone layer in the toe is located at a depth of 12' from the existing bottom. A heavily embedded toe is incorporated to protect against breaking waves and scour at the toe of the structure. Stone sub-layers are specified in accordance with standard design procedures.

**Formulation of Project First Costs**

C-7 First costs include the charges arising from the construction of the stone revetment, as well as the costs of contingencies, engineering, design, supervision and administration. The detailed estimates include such items as: lands, seawalls/revetment, engineering & design and construction management. Given in Attachment C-1 are the MCACES estimate's title, table of contents, and summary pages for the recommended plan of protection.

C-8 Table C-3 provides first cost estimates for the recommended plan (i.e. stone revetment crest at +25 feet NGVD). Table C-4 provides the Fully Funded Costs for the recommended plan initial construction escalated to the midpoint of construction, January 2009. Tables C-6 and C-7 provide first cost estimates for the other two alternative level of protection plans analyzed.

# TABLE C-3- RECOMMENDED PLAN
# TOTAL FIRST COST - MONTAUK POINT
# EROSION CONTROL FEASIBILITY STUDY (Plan 2B)
## October 2004 Price Level

| Account Code | Description | QTY | UOM | Unit Price | Amount | % Cont'g | Cont'g Amt | Total |
|---|---|---|---|---|---|---|---|---|
| 10 | Breakwaters & Seawalls | | | | | | | |
| 10.46.01 | Mob/Demob | 1 | LS | | $ 522,000 | 15.00% | $ 78,300 | $ 600,300 |
| 10.46.02.01 | Armor Stone | 46,700 | Ton | $ 110.68 | $ 5,168,700 | 15.00% | $ 775,300 | $ 5,944,000 |
| 10.46.02.02 | Armor Stone Rehandle | 19,300 | Ton | $ 58.78 | $ 1,134,500 | 15.00% | $ 170,200 | $ 1,304,700 |
| 10.46.02.03 | Underlayer Stone | 18,600 | Ton | $ 111.42 | $ 2,072,400 | 15.00% | $ 310,900 | $ 2,383,300 |
| 10.46.02.04 | Bedding Stone | 11,000 | Ton | $ 94.76 | $ 1,042,400 | 15.00% | $ 156,400 | $ 1,198,800 |
| 10.46.02.05 | Excavation | 32,000 | CY | $ 16.08 | $ 514,400 | 15.01% | $ 77,200 | $ 591,600 |
| 10 | **TOTAL Breakwaters & Seawalls** | | | | **$ 10,454,400** | | **$ 1,568,300** | **$ 12,022,700** |
| 01 | **LAND & DAMAGES** | | | | $ 30,000 | 6.67% | $ 2,000 | $ 32,000 |
| 30 | **PLANNING, ENGINEERING, & DESIGN** | | | | $ 547,800 | 15.00% | $ 82,200 | $ 630,000 |
| 31 | **CONSTRUCTION MANAGEMENT** | | | | $ 902,800 | 15.00% | $ 135,400 | $ 1,038,200 |
| | **TOTAL PROJECT FIRST COST** | | | | **$ 11,935,000** | | **$ 1,787,900** | **$ 13,722,900** |

# TABLE C-4

## * * * TOTAL FEDERAL COST-SHARED SUMMARIES * * *

This Estimate is based on the scope contained in the Feasibility Report

## Project: Montauk Point, NY

District: New York
POC: P Harimohan

| | | Current MCACES Estimate Prepared: February 2005<br>Effective Pricing Level: October 2004 | | | | ……………Fully Funded Estimate…………… | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Acct. No. | Feature Description | Cost ($K) | Cont. ($K) | Cont. (%) | Total ($K) | % | Midpoint Date | Cost ($K) | Cont. ($K) | Total ($K) |
| 10 | Breakwaters & Seawall | 10,454.4 | 1,568.3 | 15% | 12,022.7 | 7.78% | Jan-09 | 11,268.0 | 1,690.3 | 12,958.3 |
| | Total | 10,454.4 | 1,568.3 | | 12,022.7 | | | 11268.0 | 1,690.3 | 12,958.3 |
| 01 | Lands & Damages | 30.0 | 2.0 | 7% | 32.0 | 18.42% | Jan-08 | 35.5 | 2.4 | 37.9 |
| 30--- | Engineering & Design | 547.8 | 82.2 | 15% | 630.0 | 18.42% | Jan-08 | 648.7 | 97.3 | 746.1 |
| 31--- | Construction Management | 902.8 | 135.4 | 15% | 1,038.2 | 20.99% | Jan-09 | 1,092.3 | 163.8 | 1,256.1 |
| | Total Federal Cost Summary | 11,935.0 | 1,787.9 | | 13,722.9 | | | 13,044.5 | 1,953.9 | 14,998.4 |

NOTE:
Acct 1, 30, 31 escalation using EC11-2-187 dtd 28 Apr 2005 Table A Class 1
Acct 10 escalation using EM1110-2-1304 dated Mar 2005 Table A-1

| | |
|---|---|
| Total Federal Costs (50%) | 7,499.2 |
| Total Non-Federal Costs (50%) | 7,499.2 |

# TABLE C-5

## TOTAL FIRST COST - MONTAUK POINT
## EROSION CONTROL FEASIBILITY STUDY
## ALTERNATIVE 2A
## October 2004 Price Level

| Account Code | Description | QTY | UOM | Unit Price | Amount | % Cont'g | Cont'g Amt | Total |
|---|---|---|---|---|---|---|---|---|
| 10 | Breakwaters & Seawalls | | | | | | | |
| 10.46.01 | Mob/Demob | 1 | LS | | $ 522,000 | 15.00% | $ 78,300 | $ 600,300 |
| 10.46.02.01 | Armor Stone | 57,100 | Ton | $ 110.68 | $ 6,319,828 | 15.00% | $ 947,974 | $ 7,267,800 |
| 10.46.02.02 | Armor Stone Rehandle | 19,100 | Ton | $ 58.78 | $ 1,122,698 | 15.00% | $ 168,405 | $ 1,291,100 |
| 10.46.02.03 | Underlayer Stone | 23,700 | Ton | $ 111.42 | $ 2,640,654 | 15.00% | $ 396,098 | $ 3,036,800 |
| 10.46.02.04 | Bedding Stone | 12,100 | Ton | $ 94.76 | $ 1,146,596 | 15.00% | $ 171,989 | $ 1,318,600 |
| 10.46.02.05 | Excavation | 34,200 | CY | $ 16.08 | $ 549,936 | 15.00% | $ 82,490 | $ 632,400 |
| 10 | **TOTAL Breakwaters & Seawalls** | | | | **$ 12,301,712** | | **$ 1,845,257** | **$ 14,147,000** |
| 01 | **LAND & DAMAGES** | | | | $ 30,000 | 6.67% | $ 2,000 | $ 32,000 |
| 30 | **PLANNING, ENGINEERING, & DESIGN** | | | | $ 547,800 | 15.00% | $ 82,200 | $ 630,000 |
| 31 | **CONSTRUCTION MANAGEMENT** | | | | $ 1,034,700 | 15.00% | $ 155,200 | $ 1,189,900 |
| | **TOTAL PROJECT FIRST COST** | | | | **$ 13,914,212** | | **$ 2,084,657** | **$ 15,998,900** |

# TABLE C-6

## TOTAL FIRST COST - MONTAUK POINT
## EROSION CONTROL FEASIBILITY STUDY
## ALTERNATIVE 2C
## October 2004 Price Level

| Account Code | Description | QTY | UOM | Unit Price | Amount | % Cont'g | Cont'g Amt | Total |
|---|---|---|---|---|---|---|---|---|
| 10 | Breakwaters & Seawalls | | | | | | | |
| 10.46.01 | Mob/Demob | 1 | LS | | $ 522,000 | 15.00% | $ 78,300 | $ 600,300 |
| 10.46.02.01 | Armor Stone | 15,600 | Ton | $ 110.68 | $ 1,726,608 | 15.00% | $ 258,991 | $ 1,985,600 |
| 10.46.02.02 | Armor Stone Rehandle | 1,000 | Ton | $ 58.78 | $ 58,780 | 15.00% | $ 8,817 | $ 67,600 |
| 10.46.02.03 | Underlayer Stone | 1,000 | Ton | $ 111.42 | $ 111,420 | 15.00% | $ 16,713 | $ 128,100 |
| 10.46.02.04 | Bedding Stone | 11,500 | Ton | $ 94.76 | $ 1,089,740 | 15.00% | $ 163,461 | $ 1,253,200 |
| 10.46.02.05 | Excavation | 15,000 | CY | $ 16.08 | $ 241,200 | 15.00% | $ 36,180 | $ 277,400 |
| 10.46.02.06 | Armor Stone Disposal | 7,300 | CY | $ 30.00 | $ 219,000 | 15.00% | $ 32,850 | $ 251,900 |
| 10.46.02.07 | Bank Protection | 8,000 | SF | $ 10.00 | $ 80,000 | 15.00% | $ 12,000 | $ 92,000 |
| 10 | **TOTAL Breakwaters & Seawalls** | | | | **$ 4,048,748** | | **$ 607,312** | **$ 4,656,100** |
| 01 | **LAND & DAMAGES** | | | | $ 30,000 | 6.67% | $ 2,000 | $ 32,000 |
| 30 | **PLANNING, ENGINEERING, & DESIGN** | | | | $ 547,800 | 15.00% | $ 82,200 | $ 630,000 |
| 31 | **CONSTRUCTION MANAGEMENT** | | | | $ 422,500 | 15.00% | $ 63,400 | $ 485,900 |
| | **TOTAL PROJECT FIRST COST** | | | | **$ 5,049,048** | | **$ 754,912** | **$ 5,804,000** |

C-9 Unit Costs. Unit costs for material and equipment were developed and based on: the Unit Price Book (UPB) associated with MCACES; current New York DOT and N.Y. District bid unit costs (adjusted appropriately for the size of the project, construction period, inflation and profit), actual costs and productions on projects and construction similar in nature; contact with manufacturers, dealers, distributors, and material suppliers in the vicinity of the proposed project; current labor rates for the northern Long Island area and cost estimating judgement based on experience.

C-10 Lump Sum Items. Based on experience, certain items of cost such as mobilization and demobilization were assigned a "lump sum" cost. These items were estimated in this way due to the multiplicity of activities required to accomplish each of these items.

C-11 Market Research. To accurately estimate unit prices for individual work items, manufacturers, distributors, vendors and suppliers, and state agencies were contacted for price information on materials and types of construction. When more than one source of information or price quote was obtained for a single item, the average cost was calculated and used in the MCACES estimate.

C-12 Labor Rates. The labor rates for the estimate were taken from the prevailing Davis-Bacon wage rates for the State of New York for building, heavy, and highway construction as detailed in General Decision Number Y020013. The wage rate data was received in detail, listed by counties, and is current as of October 2004. Wage rates were reviewed and averages were calculated for use in the development for each trade listing of the MCACES model. These average labor and fringe benefit costs were input into the MCACES system in the labor rates database.

C-13 Contingencies. As stated in ER 1110-2-1302 (31 Mar 94), the goal in contingency development is to identify the uncertainty associated with an item of work or task, forecast the risk/cost relationship, and assign a value to this task that would limit the cost risk to an acceptable degree of confidence. Consideration has been given to the level of detail available at the current stage of planning for which this cost estimate has been prepared.

C-14 Based on the current level of design development for the project, the following general contingency factors (%) were used.

- Seawall and revetments 15 % - Cost based on final design but subject to differing condition of the existing revetment at the time of construction.

## Estimates of Project Features

C-15 Seawalls and Revetments. Seawalls and revetments represent the only construction feature of the project.

C-16 The estimate for the construction of the revetment was approached from the viewpoint of heavy stonework and earthwork operations characterized by large cranes, loaders and haul trucks. Approximately 840 linear feet of revetment will be constructed along the Montauk Point shoreline.

C-17 Productivity considerations were based on the relative configuration of the existing revetment and bank, wave and tide conditions, stone size, placement criteria, distance of truck-delivered stone material from off-site and on-site stockpiles, access, haul roads, entrances, and construction easements.

C-18 A construction access berm will be adjacent to the slope of the existing stone revetment by temporarily relocating the existing stone. This construction will be completed on both the Northerly and Southerly ends of the revetment. The elevation of the access berms will be +8' NGVD. An additional temporary road is proposed on the Northerly end of the revetment to provide access to the project site.

C-19 Two separate crews are anticipated to perform the work. One crew will operate on the Northerly end and the other operating on the Southerly end of the revetment. Each crew should have one large crane for excavation and stone placement.

C-20 The excavation and stone placement construction will be conducted from the construction berm at el. +8' NGVD. No access via water is proposed. Excavation and stone placement will be performed by the same crew since there is not enough room on the construction berm for two crews to work at one location concurrently.

C-21 Ten (10) 38-ton trucks with 16-23.5 cy trailers are anticipated to be used for hauling the bedding, underlayer and armor stone from the quarry to the project site. Two (2) 25-ton (16-19 cy) off-highway trucks are proposed to deliver stone from the stockpile area to the work area.

C-22 Excavated bottom material from the revetment toe area will be transported directly to a Dredge Material Placement (DMP) site on-site within the grounds of Montauk State Park using the 25-ton off-highway dump trucks. The exact site of the DMP area is to be determined.

C-23 It is assumed that about 19,300 tons of existing revetment stone will be re-used in the new revetment. Any unusable stone from the existing revetment will be placed overlying the restored ocean bottom after the buried toe is constructed.

C-24 Three (3) deep draft offshore barges are proposed to provide wave protection to the work area. The cost for the barges is included within Preparatory Work under Mob/Demob.

**Estimates of Additional Costs**

C-25 Planning, Engineering and Design. Costs were developed for all activities associated with the pre-construction, planning, engineering, and design effort. These costs include the preparation of a Design Documentation Report, plans and specifications for the construction contract and engineering support through project construction.

C-26 Construction Management. Costs were developed for all construction management activities from pre-award requirements through final contract closeout.

C-27 Interest During Construction. Interest during construction (IDC) is the cost of construction money invested before the beginning of the period of economic analysis and before the accumulation of benefits by the project. IDC costs have been added to the project cost to determine the total investment costs. Average annual costs were determined based on investment costs which include IDC. Interest during construction was considered for a 24 month construction period at 5.375%.

C-28 Planning Guidance Notebook (EP 1105-2-45, Paragraph 2-6, page 2-2) states that costs incurred during the pre-construction and construction period should be increased by adding compound interest at the applicable project discount rate from the date the expenditures are made to the beginning of the period of analysis (base year). For the purposes of this study, these expenditures were assumed to occur in monthly increments.

**Annual Charges**

C-29 Period of Analysis. It is estimated that the stone revetment would have a useful life expectancy of 50 years.

Interest and Amortization

C-30 The interest rate used in converting investment costs to equivalent annual costs is the rate set by the

Water Resources Council for the evaluation of Federal Government water resources projects. This rate has been set at 5.375 % for FY2005.

C-31 Amortization is the financial or economic process of recovering an investment in a project. Th amortization period is the period of time assumed or selected for economic recovery of the net investment in a project. When combined, interest and amortization become the capital recovery factor which, when applied to project costs, will result in the annual cost of the project investment.

## Maintenance

C-32 For the purposes of the Feasibility Study, the annual cost of maintenance of the alternatives considered is estimated to be 0.5% of the total direct (without contingency) first cost of construction. This maintenance is associated with 0% - 5% damage levels up to the design storm.

C-38 Future impacts on annual maintenance costs due to sea level rise are considered to be minor given the predicted rate of sea level rise of 0.014 feet per year. For example, at this rate at the mid-point of the project life, 25 years, the rise in water level would be 0.35 feet. Without sea level rise, the proposed design wave for Alternative 2B is $H_{73\ \mathrm{Yr.}} = 13.4'$ calculated using Figure 7-4 (SPM 1984) and $\mathrm{DSWL}_{73\ \mathrm{Yr}} = +10.94'$ NGVD which results in a design armor stone weight of 12.6 tons. Adding the sea level rise to the $\mathrm{DSWL}_{73\ \mathrm{Yr}} = +10.94'$ NGVD would result in $\mathrm{DSWL}_{73\ \mathrm{Yr} + \mathrm{Sea\ Level\ Rise}} = 11.3'$ NGVD which would result in a design wave for this structure, $H_{73\ \mathrm{Yr.} + \mathrm{Sea\ Level\ Rise}} = 13.8'$. This design wave results in a design armor stone weight of 13.8 tons or a 9.5% increase in armor stone weight due to sea level rise through the mid-point of the project life.

C-39 Given the small predicted annual increase in sea level rise in the project area, and the standard construction specification for the armor stone to range from 0.75 W to 1.25 W (W = 12.6 tons) with about 50 percent of the individual stones weighing more than W, increasing the armor stone weight to account for future sea level rise is not considered to be warranted.

C-40 Annualized Maintenance Costs. Annualized revetment maintenance costs for Plans 2A and 2B are based on 0.5% of the direct first cost based on experience with Corps designed coastal structures. This maintenance will be accomplished from the berm. For Plan 2C, annualized maintenance costs include construction of an offshore rubble mound stone cofferdam to accomplish repairs since no berm is available for maintenance operations. The first cost and annualized cost for this cofferdam is shown in Table C-8.

## Table C-8
## Annualized Maintenance Cost (Oct. 04 P.L.)
## for Montauk 15-Year Plan Construction Berm
## (Estimated to be performed every 10 years)

**Cost breakout of construction berm:

600 lf of stone cofferdam

| | | |
|---|---|---|
| consists of: | 7,800 | tons of 6-10 ton armor |
| | 4,000 | tons of bedding |

To install and remove:

| | | | | | |
|---|---|---|---|---|---|
| 7,800 | tons @ | $ | 141.66 | per ton | $ 1,105,000 |
| 4,000 | tons @ | $ | 120.00 | per ton | $ 480,000 |

| | | |
|---|---|---|
| Subtotal | | $ 1,585,000 |
| Contingency | 20% | $ 317,000 |
| | | |
| Subtotal | | $ 1,902,000 |
| S&A | | $ 100,000 |
| | | |
| Subtotal | | $ 2,000,000 |

| | |
|---|---|
| Interest Rate | 0.05375 |
| Life (years) | 50 |
| Capital Recovery Factor | 0.05798 |
| Frequency (years) | 10 |
| Present Worth Factor | 0.5924 |

| Year | Future Worth $ | PW Factor | Present Worth $ |
|---|---|---|---|
| 10 | $ 2,000,000 | 0.5924 | $ 1,184,825 |
| 20 | $ 2,000,000 | 0.3510 | $ 701,905 |
| 30 | $ 2,000,000 | 0.2079 | $ 415,817 |
| 40 | $ 2,000,000 | 0.1232 | $ 246,335 |
| | | Sum | $ 2,548,882 |

| | |
|---|---|
| Interest Rate | 5.375% |
| N Years | 50 |
| Capital Recovery Factor | 0.057980614 |

| | |
|---|---|
| Annualized Cost of Plan 2C Construction Berm | $ 148,000 |

## Annual Costs

C-41 Annual Costs. The annual charges include the annualized first cost with interest during construction, and annualized operations and maintenance costs of the revetment within design storm condition. Annual project costs for the recommended plan (i. e. 73-year level of protection, crest elevation +25' NGVD) are presented in Table C-9. Annual costs for two alternative levels of protection are presented in Tables C10 and C-11.

### TABLE C-9
### TOTAL ANNUAL COST – MONTAUK POINT EROSION CONTROL FEASIBILITY STUDY
### RECOMMENDED PLAN

| | |
|---|---|
| Total First Cost<br>Interest During Construction (a) | $13,722,900<br>$712,700 |
| Total Investment Cost | $14,435,600 |
| Annualized Investment Cost (b) | $837,000 |
| Annual Revetment Maintenance (c) | $52,300 |
| Total Annual Cost | $889,300 |

(a) i = 5.375 % for 24 mo. construction period
(b) I = 5.375 % for 50 yr. period of analysis
(c) i = 0.5% of Direct First Cost (excluding E&D, S&A, and contingency)

## TABLE C-10
## TOTAL ANNUAL COST – MONTAUK POINT EROSION CONTROL FEASIBILITY STUDY
## ALTERNATIVE 2A

| | |
|---|---|
| Total First Cost<br>Interest During Construction (a) | $15,998,900<br>$1,057,000 |
| Total Investment Cost | $17,055,900 |
| Annualized Investment Cost (b)<br>Annual Revetment Maintenance (c,d) | $988,900<br>$61,500 |
| Total Annual Cost | $1,050,400 |

(a) i = 5.375 % for 30 mo. construction period
(b) I = 5.375 % for 50 yr. period of analysis
(c) i = 0.5% of Direct First Cost (excluding E&D, S&A, and contingency)
(d) Increase of annual maintenance with increases in level of protection is due to increase of maintenance of rubblemound structures as total quantity of stone increases, and need for larger equipment and slower production rate associated with increase in armor unit weight.

### TABLE C-11
### TOTAL ANNUAL COST – MONTAUK POINT EROSION CONTROL FEASIBILITY STUDY
### ALTERNATIVE 2C

| | |
|---|---|
| Total First Cost<br>Interest During Construction (a) | $5,804,000<br>$301,400 |
| Total Investment Cost | $6,105,400 |
| Annualized Investment Cost (b)<br>Annual Revetment Maintenance (c) | $354,000<br>$170,700 |
| Total Annual Cost | $524,700 |

(a) i = 5.375 % for 24 mo. construction period
(b) i = 5.375% for 50 yr. period of analysis
(c) Includes normal annualized maintenance @ 0.5% of the direct first cost excluding E&D, S&A, and contingency ($22,700), plus the cost to construct an offshore temporary construction berm from which to perform the repairs ($148,000) (see Table C-8)

## Cost Sharing Responsibilities General

C-42 The basic requirements for the Federal and non-Federal sharing of responsibilities in the construction, operation, and maintenance of Federal water resources projects are set forth in the Water Resources Development Act (WRDA) of 1986 (PL 99-662).

## Cost Apportionment

C-43 The Water Resources Development Act of 1986, Section 103, which sets forth cost sharing for hurricane and storm damage reduction projects, states that non-Federal interests must operate, maintain, and rehabilitate the project; must provide lands, easements, rights-of-way, relocations, and disposal areas (LERRD). The non-Federal -share of the project cost is limited to 50% of the first costs.

C-44 The Federal share of the project's total first cost is $6,845,450. This represents 50 % of the total.

C-45 The non-Federal share of the estimated total first cost of the proposed project is $6,845,450. T non-Federal cost typically consists of a number of components including lands, easements, rights-of-way, relocations, and a cash contribution. Since no land acquisition or relocation is involved, the non-Federal share is all cash contribution. The non-Federal share represents 50% of the total project first costs. A breakdown of the Federal and non-Federal cost share is shown in Table C-12 - Cost Apportionment.

## Table C-12
## Montauk Point

### Cost Apportionment
### Oct 2004 P.L.

| Cost Sharing | Federal Share | Non-Federal Share | TOTAL |
|---|---|---|---|
| Cash Contribution | $ 6,861,450 | $ 6,861,450 | $ 13,722,900 |
| Total First Cost | $ 6,861,450 | $ 6,861,450 | $ 13,722,900 |
| Annual Revetment Maintenance |  | $ 52,300 | $ 52,300 |

# MONTAUK POINT EROSION CONTROL
# FEASIBILITY STUDY
# MONTAUK POINT, NEW YORK

## ATTACHMENT C1

## MCACES Recommended Plan
## (Alternative 2B)

---

# Montauk Point
# Erosion Control Feasibility
# Study - Recommended Plan
# Alternative 2B

Designed By: Andrews, Miller & Assoc., Inc.
Estimated By: Andrews, Miller & Assoc., Inc.

Prepared By: klw
revised by JC

Preparation Date: 02/17/05
Effective Date of Pricing: 10/01/04
Est Construction Time: 730 Days

Sales Tax: 0.00%

Construction Assumptions / Methodologies:

1. A construction access berm will be built over the slope of the existing stone revetment by temporarily relocating the existing stone. This will be done on both the Northerly and Southerly ends of the revetment. Elevation of access roads to be at app. +8.0'.

2. Assume two crews will be performing the work. One crew at each end of revetment. Crews developed for this project incorporate the use of two crews.

3. An additional temporary road is proposed on the Northerly end of the revetment to provide access to the project site.

4. Excavation and stone placement construction to be from access road. No access via water is proposed.

5. Excavation and stone crews are separate because stonework and excavation cannot occur at the same time. However, the established two crews do share equipment and workers. Any equipment that is to be used for one operation and not the other is included within that crew as a standby item.

6. 10 - 38 ton trucks with 16-23.5 cy trailers (max. available from database) will be used for hauling large armor stone from the quarry to the project site.

7. 6 - 12 cy dump trucks will be used for hauling the underlayer and bedding stone from the quarry to the project site.

8. Bottom material from revetment's toe area to be transported directly to a Dredge Material Placement (DMP) site using 6 - 12 cy covered dump trucks. Assumption made that the DMP site will be within the grounds of Montauk State Park. Exact location to be determined.

9. 4 - 25 ton (16-19 cy) off-highway trucks are proposed to deliver stone from the stockpile area to either end of the work area.

10. No filter cloth is proposed under the stone revetment.

11. All existing armor stone (4.5 ton) that is to be rehandled is assumed to be reused within the final revetment. No extra existing stone is anticipated.

12. 3 deep draft offshore barges are proposed to provide wave protection to work area. The equipment database provides an hourly rate for a 500-800 ton barge. The total amount of combined hours for the off-shore barges was estimated by reducing the duration of the project (730 days = 5840 hours) by 25% (= 4380 hours). Price for barges is included within Preparatory Work under Mob/Demob.

13. Mob/Demob (total) PE&D and S&I costs provided by NY Corps.

14. Labor rates referenced from General Decision Number NY020013

15. Prime Contractor's Field Overhead; Equip. Operators (Crane, Medium, Light, Oilers) = 14.0%; Means 2003, pp. 499.

16. Prime Contractor's Profit = 10.0%; Means 2003, pp.499.

17. Prime Contractor's Home Office Expense; Costs are usually calculated as a percentage of annual sales volume. With the Contractor to be determined, 3.0% was used in estimating.

18. 15% contingency is included in the estimate

Feb2005

=======

1. Entire estimate updated to Oct2004 price level (unless noted otherwise) using ENR Index
2. Stone material prices were updated with recent quotes
3. Labor rates were updated using the Davis Bacon at Oct2004 level
4. Construction Management was recalculated using the formula
5. Acct 30 was inflated using EC 11-2-187 dtd Mar 2004

```
hu 06 Oct 2005                 Tri-Service Automated Cost Engineering System (TRACES)                  TIME 09:21:12
ff. Date 10/01/04            PROJECT MNTA04:   Montauk Point - Erosion Control Feasibility
                                    Feasibility Study updated to Oct2004 PL                        SUMMARY PAGE    1
                            ** PROJECT OWNER SUMMARY - CONTRACT (Rounded to 100's) **

-------------------------------------------------------------------------------------------------------------------
                                                            QUANTITY UOM  CONTRACT    CONTINGN TOTAL CST UNIT COST
-------------------------------------------------------------------------------------------------------------------

                                   01  Lands & Damages                          30,000       2,000    32,000
                                   10  Breakwaters and Seawalls               10454400   1,568,200  12022500
                                   30  Planning, Engineering and Design         547,800      82,200   630,000
                                   31  Construction Management (S&I)           902,800     135,400 1,038,200
                                                                              --------- ----------- ---------
                                 TOTAL Montauk Point                           11935000   1,787,700  13722700




LABOR ID: MNTA04   EQUIP ID: MNTA04                Currency IN DOLLARS                   CREW ID: MNTA04   U[illegible] ID: MNTA04
```

| | QUANTITY | UOM | CONTRACT | CONTINGN | TOTAL CST | UNIT COST |
|---|---|---|---|---|---|---|
| 01 Lands & Damages | | | | | | |
| 01_01 Lands & Damages | | | 30,000 | 2,000 | 32,000 | |
| TOTAL Lands & Damages | | | 30,000 | 2,000 | 32,000 | |
| 10 Breakwaters and Seawalls | | | | | | |
| 10_46 Stone Reventment | | | | | | |
| 10_46.01 Mob, Demob and Preparatory Work | | | 522,000 | 78,300 | 600,300 | |
| 10_46.02 Site Work | | | 9,932,400 | 1,489,900 | 11422200 | |
| TOTAL Stone Reventment | | | 10454400 | 1,568,200 | 12022500 | |
| TOTAL Breakwaters and Seawalls | | | 10454400 | 1,568,200 | 12022500 | |
| 30 Planning, Engineering and Design | | | | | | |
| 30_26 Miscellaneous Activities | | | | | | |
| 30_26.01 Lump Sum by Corps | | | 547,800 | 82,200 | 630,000 | |
| TOTAL Miscellaneous Activities | | | 547,800 | 82,200 | 630,000 | |
| TOTAL Planning, Engineering and Design | | | 547,800 | 82,200 | 630,000 | |
| 31 Construction Management (S&I) | | | | | | |
| 31_26 Miscellaneous Activities | | | | | | |
| 31_26.01 Lump Sum by Corps | | | 902,800 | 135,400 | 1,038,200 | |
| TOTAL Miscellaneous Activities | | | 902,800 | 135,400 | 1,038,200 | |
| TOTAL Construction Management (S&I) | | | 902,800 | 135,400 | 1,038,200 | |
| TOTAL Montauk Point | | | 11935000 | 1,787,700 | 13722700 | |

| | QUANTITY | UOM | CONTRACT | CONTINGN | TOTAL CST | UNIT COST |
|---|---|---|---|---|---|---|
| 01 Lands & Damages | | | | | | |
| 01_01 Lands & Damages | | | 30,000 | 2,000 | 32,000 | |
| TOTAL Lands & Damages | | | 30,000 | 2,000 | 32,000 | |
| 10 Breakwaters and Seawalls | | | | | | |
| 10_46 Stone Reventment | | | | | | |
| 10_46.01 Mob, Demob and Preparatory Work | | | | | | |
| 10_46.01.01 Mobilization and Demobilization | | | 290,000 | 43,500 | 333,500 | |
| 10_46.01.02 Preparatory Work | | | 195,800 | 29,400 | 225,100 | |
| 10_46.01.03 Survey | | | 36,200 | 5,400 | 41,700 | |
| TOTAL Mob, Demob and Preparatory Work | | | 522,000 | 78,300 | 600,300 | |
| 10_46.02 Site Work | | | | | | |
| 10_46.02.01 Armor Stone - 12.6 Ton | 46700.00 | TON | 5,168,700 | 775,300 | 5,944,000 | 127.28 |
| 10_46.02.02 Armor Stone Rehandled (4.5 Ton) | 19300.00 | TON | 1,134,500 | 170,200 | 1,304,700 | 67.60 |
| 10_46.02.03 Underlayer Stone - 1.3 Ton | 18600.00 | TON | 2,072,400 | 310,900 | 2,383,200 | 128.13 |
| 10_46.02.04 Bedding Material | 11000.00 | TON | 1,042,400 | 156,400 | 1,198,800 | 108.98 |
| 10_46.02.05 Excavation | 32000.00 | CY | 514,400 | 77,200 | 591,600 | 18.49 |
| TOTAL Site Work | | | 9,932,400 | 1,489,900 | 11422200 | |
| TOTAL Stone Reventment | | | 10454400 | 1,568,200 | 12022500 | |
| TOTAL Breakwaters and Seawalls | | | 10454400 | 1,568,200 | 12022500 | |
| 30 Planning, Engineering and Design | | | | | | |
| 30_26 Miscellaneous Activities | | | | | | |
| 30_26.01 Lump Sum by Corps | | | 547,800 | 82,200 | 630,000 | |
| TOTAL Miscellaneous Activities | | | 547,800 | 82,200 | 630,000 | |
| TOTAL Planning, Engineering and Design | | | 547,800 | 82,200 | 630,000 | |
| 31 Construction Management (S&I) | | | | | | |
| 31_26 Miscellaneous Activities | | | | | | |

```
                                                          QUANTITY UOM  CONTRACT    CONTINGN TOTAL CST UNIT COST

          31_26.01  Lump Sum by Corps                                    902,800     135,400 1,038,200
                                                                       ---------  ---------- ---------
                TOTAL Miscellaneous Activities                           902,800     135,400 1,038,200
                                                                       ---------  ---------- ---------
                TOTAL Construction Management (S&I)                      902,800     135,400 1,038,200
                                                                       ---------  ---------- ---------
                TOTAL Montauk Point                                     11935000   1,787,700  13722700
```

```
                       ** PROJECT INDIRECT SUMMARY - CONTRACT (Rounded to 100's) **

---------------------------------------------------------------------------------------------------------------------------------------
                                                          QUANTITY UOM    DIRECT    FIELD OH   HOME OFC     PROFIT       BOND TOTAL CST UNIT COST
---------------------------------------------------------------------------------------------------------------------------------------

              01  Lands & Damages                                         30,000          0          0          0          0    30,000
              10  Breakwaters and Seawalls                             8,013,800  1,121,900    274,100    941,000    103,500  10454400
              30  Planning, Engineering and Design                       547,800          0          0          0          0   547,800
              31  Construction Management (S&I)                          902,800          0          0          0          0   902,800
                                                                       ---------  ---------  ---------  ---------  ---------  ---------
           TOTAL Montauk Point                                         9,494,400  1,121,900    274,100    941,000    103,500  11935000

                Contingency                              14.98 %                                                            1,787,700
                                                                                                                            ---------
                  TOTAL INCL OWNER COSTS                                                                                     13722700
```

```
                   ** PROJECT INDIRECT SUMMARY - SUB-FEAT (Rounded to 100's) **

----------------------------------------------------------------------------------------------------------------
                                             QUANTITY UOM   DIRECT   FIELD OH   HOME OFC    PROFIT      BOND TOTAL CST UNIT COST
----------------------------------------------------------------------------------------------------------------


 01  Lands & Damages

 01_01  Lands & Damages                                     30,000          0          0          0          0    30,000
                                                         --------- ---------- ---------- ---------- ---------- ---------
     TOTAL Lands & Damages                                  30,000          0          0          0          0    30,000


 10  Breakwaters and Seawalls

 10_46  Stone Reventment

 10_46.01  Mob, Demob and Preparatory Work                 400,100     56,000     13,700     47,000      5,200   522,000
 10_46.02  Site Work                                     7,613,700  1,065,900    260,400    894,000     98,300 9,932,400
                                                         --------- ---------- ---------- ---------- ---------- ---------
     TOTAL Stone Reventment                              8,013,800  1,121,900    274,100    941,000    103,500  10454400
                                                         --------- ---------- ---------- ---------- ---------- ---------
     TOTAL Breakwaters and Seawalls                      8,013,800  1,121,900    274,100    941,000    103,500  10454400


 30  Planning, Engineering and Design

 30_26  Miscellaneous Activities

 30_26.01  Lump Sum by Corps                               547,800          0          0          0          0   547,800
                                                         --------- ---------- ---------- ---------- ---------- ---------
     TOTAL Miscellaneous Activities                        547,800          0          0          0          0   547,800
                                                         --------- ---------- ---------- ---------- ---------- ---------
     TOTAL Planning, Engineering and Design                547,800          0          0          0          0   547,800


 31  Construction Management (S&I)

 31_26  Miscellaneous Activities

 31_26.01  Lump Sum by Corps                               902,800          0          0          0          0   902,800
                                                         --------- ---------- ---------- ---------- ---------- ---------
     TOTAL Miscellaneous Activities                        902,800          0          0          0          0   902,800
                                                         --------- ---------- ---------- ---------- ---------- ---------
     TOTAL Construction Management (S&I)                   902,800          0          0          0          0   902,800
                                                         --------- ---------- ---------- ---------- ---------- ---------
     TOTAL Montauk Point                                 9,494,400  1,121,900    274,100    941,000    103,500  11935000

   Contingency                                 14.98 %                                                        1,787,700
                                                                                                              ---------
     TOTAL INCL OWNER COSTS                                                                                    13722700
```

** PROJECT INDIRECT SUMMARY - ELEMENT (Rounded to 100's) **

| | QUANTITY | UOM | DIRECT | FIELD OH | HOME OFC | PROFIT | BOND | TOTAL CST | UNIT COST |
|---|---|---|---|---|---|---|---|---|---|
| 01 Lands & Damages | | | | | | | | | |
| 01_01 Lands & Damages | | | 30,000 | 0 | 0 | 0 | 0 | 30,000 | |
| TOTAL Lands & Damages | | | 30,000 | 0 | 0 | 0 | 0 | 30,000 | |
| 10 Breakwaters and Seawalls | | | | | | | | | |
| 10_46 Stone Reventment | | | | | | | | | |
| 10_46.01 Mob, Demob and Preparatory Work | | | | | | | | | |
| 10_46.01.01 Mobilization and Demobilization | | | 222,300 | 31,100 | 7,600 | 26,100 | 2,900 | 290,000 | |
| 10_46.01.02 Preparatory Work | | | 150,100 | 21,000 | 5,100 | 17,600 | 1,900 | 195,800 | |
| 10_46.01.03 Survey | | | 27,800 | 3,900 | 1,000 | 3,300 | 400 | 36,200 | |
| TOTAL Mob, Demob and Preparatory Work | | | 400,100 | 56,000 | 13,700 | 47,000 | 5,200 | 522,000 | |
| 10_46.02 Site Work | | | | | | | | | |
| 10_46.02.01 Armor Stone - 12.6 Ton | 46700.00 | TON | 3,962,100 | 554,700 | 135,500 | 465,200 | 51,200 | 5,168,700 | 110.68 |
| 10_46.02.02 Armor Stone Rehandled (4.5 Ton) | 19300.00 | TON | 869,700 | 121,800 | 29,700 | 102,100 | 11,200 | 1,134,500 | 58.78 |
| 10_46.02.03 Underlayer Stone - 1.3 Ton | 18600.00 | TON | 1,588,600 | 222,400 | 54,300 | 186,500 | 20,500 | 2,072,400 | 111.42 |
| 10_46.02.04 Bedding Material | 11000.00 | TON | 799,100 | 111,900 | 27,300 | 93,800 | 10,300 | 1,042,400 | 94.76 |
| 10_46.02.05 Excavation | 32000.00 | CY | 394,300 | 55,200 | 13,500 | 46,300 | 5,100 | 514,400 | 16.07 |
| TOTAL Site Work | | | 7,613,700 | 1,065,900 | 260,400 | 894,000 | 98,300 | 9,932,400 | |
| TOTAL Stone Reventment | | | 8,013,800 | 1,121,900 | 274,100 | 941,000 | 103,500 | 10454400 | |
| TOTAL Breakwaters and Seawalls | | | 8,013,800 | 1,121,900 | 274,100 | 941,000 | 103,500 | 10454400 | |
| 30 Planning, Engineering and Design | | | | | | | | | |
| 30_26 Miscellaneous Activities | | | | | | | | | |
| 30_26.01 Lump Sum by Corps | | | 547,800 | 0 | 0 | 0 | 0 | 547,800 | |
| TOTAL Miscellaneous Activities | | | 547,800 | 0 | 0 | 0 | 0 | 547,800 | |
| TOTAL Planning, Engineering and Design | | | 547,800 | 0 | 0 | 0 | 0 | 547,800 | |
| 31 Construction Management (S&I) | | | | | | | | | |
| 31_26 Miscellaneous Activities | | | | | | | | | |

** PROJECT INDIRECT SUMMARY - ELEMENT (Rounded to 100's) **

```
--------------------------------------------------------------------------------------------------------------------------------------
                                                  QUANTITY UOM    DIRECT    FIELD OH   HOME OFC     PROFIT       BOND TOTAL CST UNIT COST
--------------------------------------------------------------------------------------------------------------------------------------

                     31_26.01  Lump Sum by Corps                 902,800           0          0          0          0   902,800
                                                               ---------  ---------- ---------- ---------- ----------  ---------
                          TOTAL Miscellaneous Activities         902,800           0          0          0          0   902,800
                                                               ---------  ---------- ---------- ---------- ----------  ---------
                          TOTAL Construction Management (S&I)    902,800           0          0          0          0   902,800
                                                               ---------  ---------- ---------- ---------- ----------  ---------
                          TOTAL Montauk Point                  9,494,400   1,121,900    274,100    941,000    103,500  11935000

                       Contingency                     14.98 %                                                        1,787,700
                                                                                                                      ---------
                         TOTAL INCL OWNER COSTS                                                                        13722700
```

```
                                                  QUANTITY UOM   LABOR  EQUIPMNT  MATERIAL     OTHER TOTAL CST UNIT COST

 01  Lands & Damages                                                 0         0         0    30,000    30,000
 10  Breakwaters and Seawalls                                  1222500 2,261,500 2,740,700 1,789,200 8,013,800
 30  Planning, Engineering and Design                                0         0         0   547,800   547,800
 31  Construction Management (S&I)                                   0         0         0   902,800   902,800
                                                               ------- --------- --------- --------- ---------
TOTAL Montauk Point                                            1222500 2,261,500 2,740,700 3,269,800 9,494,400

    Prime Contractor's Field Overhead              11.82 %                                           1,121,900
                                                                                                     ---------
      SUBTOTAL                                                                                        10616400
    Prime's Home Office Expense                     2.58 %                                             274,100
                                                                                                     ---------
      SUBTOTAL                                                                                        10890500
    Prime Contractor's Profit                       8.64 %                                             941,000
                                                                                                     ---------
      SUBTOTAL                                                                                        11831400
    Prime Contractor's Bond                         0.87 %                                             103,500
                                                                                                     ---------
      TOTAL INCL INDIRECTS                                                                            11935000
    Contingency                                    14.98 %                                           1,787,700
                                                                                                     ---------
      TOTAL INCL OWNER COSTS                                                                          13722700
```

** PROJECT DIRECT SUMMARY - SUB-FEAT (Rounded to 100's) **

```
                                                    QUANTITY UOM  LABOR  EQUIPMNT  MATERIAL     OTHER TOTAL CST UNIT COST

01  Lands & Damages

01_01  Lands & Damages                                              0         0         0    30,000    30,000
                                                              ------- --------- --------- --------- ---------
    TOTAL Lands & Damages                                           0         0         0    30,000    30,000

10  Breakwaters and Seawalls

10_46  Stone Reventment

10_46.01  Mob, Demob and Preparatory Work                      32,800   106,100         0   261,200   400,100
10_46.02  Site Work                                           1189700 2,155,300 2,740,700 1,528,000 7,613,700
                                                              ------- --------- --------- --------- ---------
    TOTAL Stone Reventment                                    1222500 2,261,500 2,740,700 1,789,200 8,013,800
                                                              ------- --------- --------- --------- ---------
    TOTAL Breakwaters and Seawalls                            1222500 2,261,500 2,740,700 1,789,200 8,013,800

30  Planning, Engineering and Design

30_26  Miscellaneous Activities

30_26.01  Lump Sum by Corps                                         0         0         0   547,800   547,800
                                                              ------- --------- --------- --------- ---------
    TOTAL Miscellaneous Activities                                  0         0         0   547,800   547,800
                                                              ------- --------- --------- --------- ---------
    TOTAL Planning, Engineering and Design                          0         0         0   547,800   547,800

31  Construction Management (S&I)

31_26  Miscellaneous Activities

31_26.01  Lump Sum by Corps                                         0         0         0   902,800   902,800
                                                              ------- --------- --------- --------- ---------
    TOTAL Miscellaneous Activities                                  0         0         0   902,800   902,800
                                                              ------- --------- --------- --------- ---------
    TOTAL Construction Management (S&I)                             0         0         0   902,800   902,800
                                                              ------- --------- --------- --------- ---------
    TOTAL Montauk Point                                       1222500 2,261,500 2,740,700 3,269,800 9,494,400

  Prime Contractor's Field Overhead               11.82 %                                            1,121,900
                                                                                                     ---------
    SUBTOTAL                                                                                          10616400
  Prime's Home Office Expense                      2.58 %                                              274,100
                                                                                                     ---------
    SUBTOTAL                                                                                          10890500
  Prime Contractor's Profit                        8.64 %                                              941,000
```

```
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------
                                                                                                  QUANTITY UOM   LABOR  EQUIPMNT  MATERIAL     OTHER TOTAL CST UNIT COST
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------

                                                                                                                                                ---------
                                                        SUBTOTAL                                                                                 11831400
                                                      Prime Contractor's Bond                          0.87 %                                     103,500
                                                                                                                                                ---------
                                                        TOTAL INCL INDIRECTS                                                                     11935000
                                                      Contingency                                     14.98 %                                   1,787,700
                                                                                                                                                ---------
                                                        TOTAL INCL OWNER COSTS                                                                   13722700
```

| | QUANTITY | UOM | LABOR | EQUIPMNT | MATERIAL | OTHER | TOTAL CST | UNIT COST |
|---|---|---|---|---|---|---|---|---|
| 01 Lands & Damages | | | | | | | | |
| 01_01 Lands & Damages | | | 0 | 0 | 0 | 30,000 | 30,000 | |
| TOTAL Lands & Damages | | | 0 | 0 | 0 | 30,000 | 30,000 | |
| 10 Breakwaters and Seawalls | | | | | | | | |
| 10_46 Stone Reventment | | | | | | | | |
| 10_46.01 Mob, Demob and Preparatory Work | | | | | | | | |
| 10_46.01.01 Mobilization and Demobilization | | | 0 | 0 | 0 | 222,300 | 222,300 | |
| 10_46.01.02 Preparatory Work | | | 32,800 | 106,100 | 0 | 11,100 | 150,100 | |
| 10_46.01.03 Survey | | | 0 | 0 | 0 | 27,800 | 27,800 | |
| TOTAL Mob, Demob and Preparatory Work | | | 32,800 | 106,100 | 0 | 261,200 | 400,100 | |
| 10_46.02 Site Work | | | | | | | | |
| 10_46.02.01 Armor Stone - 12.6 Ton | 46700.00 | TON | 412,800 | 747,300 | 1,868,000 | 934,000 | 3,962,100 | 84.84 |
| 10_46.02.02 Armor Stone Rehandled (4.5 Ton) | 19300.00 | TON | 309,400 | 560,300 | 0 | 0 | 869,700 | 45.06 |
| 10_46.02.03 Underlayer Stone - 1.3 Ton | 18600.00 | TON | 221,100 | 400,300 | 595,200 | 372,000 | 1,588,600 | 85.41 |
| 10_46.02.04 Bedding Material | 11000.00 | TON | 106,600 | 193,000 | 277,500 | 222,000 | 799,100 | 72.64 |
| 10_46.02.05 Excavation | 32000.00 | CY | 139,800 | 254,500 | 0 | 0 | 394,300 | 12.32 |
| TOTAL Site Work | | | 1189700 | 2,155,300 | 2,740,700 | 1,528,000 | 7,613,700 | |
| TOTAL Stone Reventment | | | 1222500 | 2,261,500 | 2,740,700 | 1,789,200 | 8,013,800 | |
| TOTAL Breakwaters and Seawalls | | | 1222500 | 2,261,500 | 2,740,700 | 1,789,200 | 8,013,800 | |
| 30 Planning, Engineering and Design | | | | | | | | |
| 30_26 Miscellaneous Activities | | | | | | | | |
| 30_26.01 Lump Sum by Corps | | | 0 | 0 | 0 | 547,800 | 547,800 | |
| TOTAL Miscellaneous Activities | | | 0 | 0 | 0 | 547,800 | 547,800 | |
| TOTAL Planning, Engineering and Design | | | 0 | 0 | 0 | 547,800 | 547,800 | |
| 31 Construction Management (S&I) | | | | | | | | |
| 31_26 Miscellaneous Activities | | | | | | | | |

```
--------------------------------------------------------------------------------------------------------------------------------------------
                                                                QUANTITY UOM   LABOR  EQUIPMNT  MATERIAL     OTHER TOTAL CST UNIT COST
--------------------------------------------------------------------------------------------------------------------------------------------

                                   31_26.01  Lump Sum by Corps                     0         0         0   902,800   902,800
                                                                             ------- --------- --------- --------- ---------
                                        TOTAL Miscellaneous Activities             0         0         0   902,800   902,800
                                                                             ------- --------- --------- --------- ---------
                                        TOTAL Construction Management (S&I)        0         0         0   902,800   902,800
                                                                             ------- --------- --------- --------- ---------
                                        TOTAL Montauk Point                  1222500 2,261,500 2,740,700 3,269,800 9,494,400

                                     Prime Contractor's Field Overhead      11.82 %                                1,121,900
                                                                                                                   ---------
                                       SUBTOTAL                                                                     10616400
                                     Prime's Home Office Expense             2.58 %                                  274,100
                                                                                                                   ---------
                                       SUBTOTAL                                                                     10890500
                                     Prime Contractor's Profit               8.64 %                                  941,000
                                                                                                                   ---------
                                       SUBTOTAL                                                                     11831400
                                     Prime Contractor's Bond                 0.87 %                                  103,500
                                                                                                                   ---------
                                       TOTAL INCL INDIRECTS                                                         11935000
                                     Contingency                            14.98 %                                1,787,700
                                                                                                                   ---------
                                       TOTAL INCL OWNER COSTS                                                       13722700
```

# APPENDIX D:  REAL ESTATE PLAN

U.S. Army Corps of Engineers

# REAL ESTATE PLAN

# Montauk Point, New York Storm Damage Reduction Project - Feasibility Study

Prepared by:

Department of the Army
New York District
Corps of Engineers

Real Estate Division

October 2005

# REAL ESTATE PLAN

# Montauk Point, New York Storm Damage Reduction Project - Feasibility Study

## TABLE OF CONTENTS

Exhibits

Maps

# Preamble

A. **Introduction**: Montauk Point is situated on the extreme eastern end of the south fork of Long Island, approximately 125 miles east of New York City. The historic Montauk Point Lighthouse Complex sits on a high bluff approximately 70 feet above Mean Sea Level (MSL). The Montauk Point Light Station was authorized for construction in 1792, and is included in the *National Register of Historic Places*. When the light was completed it was located 300 feet from the edge of the cliff. Presently the lighthouse is less than 120 feet from the edge of the bluff and other major structures are now within 50 feet of the bluff edge. The critical area of study consists of the bluff from the southwest side of the Point to the northwest side of the Point, covering about 900 feet of shoreline. The bluff and beach along this entire area are considered to be critical elements of the stability of the lighthouse. Erosion control structures are required to protect the bluff faces from the forces of oncoming waves. The larger area of concern consists of 2,300 feet of shoreline, extending from the pivotal point of the adjacent bluff to the south to a beach area to the north. The entire area of concern must be considered in order to prevent potential adverse impacts from this Project.

B. **Authorization**: The study is being conducted under the authority of the following resolution, adopted by the Committee on Environment and Public Works of the U.S. Senate on May 15, 1991:

> *"Resolved by the Committee on Environment and Public Works of the United States Senate, that the Secretary of the Army is hereby requested to review the report of the Chief of Engineers on Fire Island to Montauk Point, New York, published as House Document Number 86-425, 86th Congress, 2nd session, and other pertinent reports, to determine whether modifications of the recommendations contained therein are advisable at the present time, with a view to preserving, restoring, and protecting Montauk Point and vicinity, including the historic Montauk Lighthouse and associated facilities, from erosion, environmental degradation, and coastal storm damage."*

C. **Designation**: Montauk Point, New York Storm Damage Reduction Project - Feasibility Study (the "Project")

D. **Location**: The study area is situated in the Village of Montauk in the Town of East Hampton, Suffolk County, New York, between the Atlantic Ocean and Block Island Sound, at the easternmost end of the south fork of Long Island and includes the historic Montauk Point Lighthouse Complex.

E. **Non-Federal Sponsor**: The non-Federal Sponsor is the New York State Department of Environmental Conservation ("NYSDEC," or "the State"). The Project, if approved, will be cost-shared at a ratio of 50% Federal and 50% non-Federal.

1. **Statement of Purpose**: The purpose of this Real Estate Plan is to present the overall plan describing the minimum real estate requirements for the Montauk Point, New York Storm Damage Reduction Project.

This Real Estate Plan is tentative in nature; both the final real property acquisition lines and costs are subject to change after approval of the Decision Document to which this Plan is appended.

2. **Project Purpose and Features**:

A. Purpose: Because existing shore protection measures (somewhat similar to a failed revetment installed in 1946) were not designed to withstand significant storm events over a substantial duration (e.g. lack of a buried toe, inadequate stone size, and insufficient overtopping protection), it is expected that the revetment now in place will fail in the foreseeable future.

Recent efforts, including terracing, vegetation and improved revetment construction, have decreased the erosion rate. Repeated storm effects will continue to cause erosion at the ends of the structure, and the eventual compromise of the revetment and upper bluff areas. This, in turn, is expected to result in the eventual loss of the lighthouse and its adjacent structures if no corrective action is taken.

B. Plan of Improvement: The selected plan for protection of Montauk Point and the lighthouse complex and bluff is the construction of a stone revetment with a crest width of 40-feet at elevation +25 feet NGVD, 1V:2H side slopes, and 12.6-ton quarrystone armor units extending from the crest down to the embedded toe. A heavily embedded toe is incorporated to protect against breaking waves and scour at the toe of the structure.

C. Required Lands, Easements, Rights-of-Way, Relocations and Disposal Areas (LERRD): The construction of the new revetment will require three (3) tracts and two (2) individual affected ownerships, namely the Montauk Historical Society (a Not-for-Profit educational institution which administers the Montauk Lighthouse Museum and which obtained title to same via a quitclaim deed from the United States of America dated 18 September 1998 (one tract), and the State of New York (two tracts). The two State-owned tracts are along the shoreline at the base of the cliff, on the Atlantic Ocean and Block Island Sound, adjacent to either side of the Montauk Historical Society property.

Approximately **1.81 acres** of land is required for the revetment. In addition, approximately **2.33 acres** will be required for two (2) Temporary Work Area adjacent to the revetment (1.43 acres south of the revetment ("Staging Area #1) and 0.90 acre north of the revetment ("Staging Area #2")). Approximately **1.37 acres** will be required for the two Temporary Access Roads, one along Block Island Sound to the north, the other to the south near the Atlantic oceanfront. The total Project requirement is approximately **5.51 acres**. (See ***Map 1*** and ***Figure 1***.) Access to the Project site will be via existing State roads (Montauk Highway) and local interior roads on either Sponsor-owned or Montauk Historical Society lands, including portions of the Temporary Work Areas and Roads discussed above. The Sponsor will be responsible for obtaining the required real estate interests.

Although the location of the temporary access roads for construction is currently fixed and defined, future maintenance or repair work *may* require different locations for temporary access roads, due to environmental or similar considerations, including erosion control, but such temporary access roads would be situated on land owned either by the Non-Federal Sponsor or the Montauk Historical Society.

However, if at some time in the future the Non-Federal Sponsor intends to sell or otherwise convey the lands upon which the existing (or planned) access roads are situated, it would have to include a "reservation" providing for such access in any deed of conveyance or similar instrument.

The Project is not expected to require any facility or utility relocations, nor any relocation of displaced persons, residences, businesses or farms under the provisions of Public Law 91-646 (*See* **Paragraph 11** hereof, "PL 91-646 Uniform Relocation Assistance"). Similarly the Project does not require acquisition of real property interests for borrow areas, nor will disposal areas will be required for any purpose.

A summary of the acreage needed for the Project and the uses thereof is as follows:

| Interest: | Acreage |
|---|---|
| Perpetual non-Standard Revetment Easement | 1.81 |
| Temporary Work Area Easements: | 3.70 |
| **Total:** | **5.51 acres** |

D. Appraisal Information

(i) Highest and Best Use:

The land required for the construction of the revetment is inundated by the Atlantic Ocean at high tide and its highest and best use is "recreational." Insofar as the proposed improvement will protect the Montauk Point Historical Society's upland improvements (i.e., the Lighthouse itself and appurtenant buildings and improvements) as well as the cliff upon which these improvements are sited, the value of the required easement for the revetment and associated temporary work area easement is considered to be subject to an "offsetting benefit" that is greater than the value of the easements themselves.

(ii) Real Estate Costs:

A summary of real estate costs, using a November 2002 valuation (Gross Appraisal) is as follows:

Lands and Damages:

| | Acres | $/Acre (fee) | $/Acre (easement) | Est. Cost |
|---|---|---|---|---|
| Permanent Easements: | 1.81 | (nominal) | (nominal) | $ 0 |
| Temporary Easements: | 3.70 | (nominal) | (nominal) | $ 0 |
| TOTAL: | **5.51** | | | **$ 0** |

Administrative Costs:

| | |
|---|---|
| Planning: | $ 20,000 |
| Incidental Acquisition Costs:<br>(includes mapping & survey, title evidence, tract appraisals, negotiations & closings) | $ 10,000 |
| TOTAL, Administrative Costs: | $ 30,000 |
| Contingencies: (20% of Lands & Damages and Admin costs, *Excluding* Planning costs): | $ 2,000 |
| GRAND TOTAL, Real Estate Costs: | **$ 32,000** |

3. **Non-Federal Sponsor Owned Lands**: The non-Federal Sponsor (the State of New York) owns approximately one-third (1/3) of the 1.81 acres required for the perpetual Revetment Easement, as well as unpaved roads thereon that will provide access to the Revetment work area ("Temporary Work Area Easements"). Further, any construction, operation, maintenance, repair or rehabilitation activities seaward of the Mean High Water Line, will be performed in waters of the State of New York. The Sponsor's interests are available for Project purposes.

The balance of the required easement areas is owned in fee by the Montauk Historical Society, a not-for-profit public educational corporation chartered for this purpose by the State of New York. Montauk Historical Society supports the Project and has agreed to make the required easement areas available for Project purposes.

4. **Estates**: There are two estates, one Standard and one non-Standard, to be obtained by the non-Federal Sponsor: perpetual **Revetment Easement** ("non-Standard estate") and **Temporary Work Area Easement** (4 years' duration) ("Standard Estate" No. 15). The complete text of these estates is included in **Exhibit "A."**

The proposed non-standard perpetual Revetment Easement is similar to a standard Flood Protection Levee Easement (**Standard Estate No. 9**), with the words "flood protection levee" replaced by the words "stone revetment."

5. **Existing Federal Projects**: The following Projects are in the vicinity of the subject Project:

1. Fire Island Inlet to Montauk Point, New York Hurricane Protection and Beach Erosion Control Project
2. Lake Montauk Harbor Navigation Improvement and Environmental Restoration Project.

Neither of these two projects affects the subject Montauk Point Project, nor are any lands required for these two projects required for the subject Project, and vice versa.

6. **Federally-Owned Lands**: There are presently no Federal Government owned lands in the Project area.

7. **Navigational Servitude**: Insofar as this Project is for storm damage reduction purposes, the Government will not invoke its rights of Navigational Servitude. Any construction, operation or maintenance activities seaward of the Mean High Water Line, however, will be performed waters of the State of New York, the Project's Non-Federal Sponsor.

8. **Project Maps**: Project Maps are attached hereto. **Map 1** depicts the Project features (Revetment (Permanent Easement) area, Staging areas and temporary Access Roads. **Figure 1** is an aerial photograph depicting the general Project area, as well as the two Project access roads.

9. **Induced Flooding**: No induced flooding is anticipated as a result of this Project.

10. **Baseline Cost Estimate**: A Baseline Cost Estimate in M/CACES Format is attached hereto as **Exhibit "B."**

Under the doctrine of "offsetting benefits" as applied to the construction of a stone revetment to protect the underlying fee owners' upland and improvements (i.e., the Montauk Point Lighthouse Complex and the adjacent State-owned lands) the value of the easement estates to be obtained and the land to be provided directly by the Sponsor is estimated to be **Zero ($0) dollars.** The administrative cost of acquisition is estimated to be approximately **Ten Thousand ($10,000) dollars.** Insofar as Montauk Historical Society, the landowner of the single easement tract to be acquired, holds title to its land under a Quitclaim Deed from the United States of America and is a "willing seller," *no condemnations* are anticipated.

11. **Compliance with Public Law 91-646**: No residences, businesses or farms will be displaced as a result of the construction, operation or maintenance of the Project. Accordingly, no relocation assistance under the provisions of PL91-646 will be required.

12. **Mineral and Timber Activities**: There are no present or anticipated mineral activities or timber harvesting in the Project area and vicinity.

13. **Assessment of the Non-Federal Sponsor's Land Acquisition Experience and Ability**: An Assessment of the non-Federal Sponsor's Real Estate Acquisition Capability is attached hereto as **Exhibit "C."** The Sponsor is considered to be "fully capable."

14. **Zoning**: Application or enactment of zoning ordinances is **not** anticipated for the Project.

15. **Acquisition Schedules**: A schedule of acquisition by the non-Federal Sponsor is attached hereto as **Exhibit "D."** The schedule assumes a Project Cooperation Agreement will be signed in **January 2007**, and forecasts Certification of Project LERRD in **June 2007**.

16. **Facility/Utility Relocations**: The Project will require no Facility or Utility relocations.

17. **Hazardous, Toxic or Radiological Waste ("HTRW")**: As indicated in Paragraph 3.10 of the Project's Preliminary Draft Environmental Impact Statement ("Preliminary DEIS"), there are no known contaminants or HTRW problems associated with the LER required for construction, operation and maintenance of the Project.

18. **Project Support**: The affected underlying fee owners (Montauk Historical Society, and the non-Federal Sponsor, the State of New York), local County and Town officials, and other residents in the Project area, are supportive of this Project.

19. **Notification to Non-Federal Sponsor**: Based on its past sponsorship of other Corps water resource (Civil Works) projects and ongoing discussions during the Project's Feasibility phase, the non-Federal Sponsor is aware of the risks of acquiring LER required for the Project prior to the signing of the Project Cooperation Agreement ("PCA"), and of the other requirements of PL91-646. In accordance with Paragraph 12-31 of Chapter 5 of the Corps of Engineers Real Estate Handbook, ER 405-1-12, formal written notification of the risks of such acquisition, and of the requirement to document expenses associated with acquiring and providing Project LERRD, and of the requirements of PL91-646, will be forwarded to the non-Federal Sponsor during the Project's Preliminary Engineering and Design ("PED") phase.

20. **Historical Sites**: The Montauk Light Station (comprising the Montauk Point Lighthouse and its outbuildings, all of which will be protected by the Project) is listed on the *National Register of Historic Places*.

21. **Other Issues**:

A. Aside from the Montauk Point Lighthouse, a *National Register of Historic Places*-listed structure, and the surrounding support structures (all eligible for the *National Register*), at this time no known historically-significant artifacts have been uncovered in the area of the proposed revetment construction and access areas.

B. There are no known existing encumbrances (i.e. easements, rights-of-way, etc.).

## 22. **Recommendations**:

A. It is recommended that the "Non-Standard" Perpetual Revetment Easement proposed for use for this Project be approved by HQ, USACE.

B. This report has been prepared in accordance with the Corps of Engineers Regulation ER 405-1-12. It is recommended that this report be approved.

for Noreen D. Dresser
Chief, Real Estate Division

# REAL ESTATE PLAN

## Montauk Point, New York Storm Damage Reduction Project - Feasibility Study

## EXHIBIT "A" - ESTATES

## Estates

**Revetment Easement (non-Standard Estate)**: a perpetual and assignable right and easement in (the land described in Schedule A) (Tracts Nos. ________, _______ and _______) to construct, maintain, repair, operate, replace and patrol a stone revetment, including all appurtenances thereto; reserving, however, to the owners, their heirs and assigns, all such rights and privileges in the land as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

**STANDARD ESTATE #15**
**TEMPORARY WORK AREA EASEMENT**: a temporary easement and right-of-way in, over and across the land described in Schedule A (Tract No. ___) for a period not to exceed forty-eight (48) months, beginning with the date of possession of the land is granted to the United States, for use by the United States, its representatives, agents and contractors as a work area including the right to move, store, and remove equipment and supplies and also to erect and remove temporary structures.

Exhibit “A”

# REAL ESTATE PLAN

# Montauk Point, New York Storm Damage Reduction Project - Feasibility Study

## EXHIBIT "B" – BASELINE COST ESTIMATES in M/CACES Format

## Exhibit B - Chart of Accounts
## for
## Montauk Point, New York Storm Damage Reduction Project

(Prepared by CENAN-RE-M March 2003)

| | **TOTAL PROJECT COSTS** | non-Federal | Federal | Project Cost |
|---|---|---|---|---|
| 01 | LANDS AND DAMAGES | $15,000 | $15,000 | 30,000 |
| | Contingencies (20%) (Excludes Planning) | | | 2,000 |
| | **TOTAL, Lands and Damages** | | | 32,000 |
| | (Rounded to): | | | **32,000** |
| 01A | **PROJECT PLANNING** | **9,000** | **11,000** | |
| 01A10 | REAL ESTATE SUPPLEMENT/PLAN | 9,000 | 9,000 | |
| 01A20 | PRELIMINARY RE ACQUISITION MAPS | | 2,000 | |
| 01A30 | PHYSICAL TAKINGS ANALYSIS | | | |
| 01A40 | PRELIMINARY ATTORNEY'S OPINION OF COMPENSABILITY | | | |
| 01A50 | ALL OTHER RE ANALYSES/DOCUMENTS | | | |
| 01B | **ACQUISITIONS** | **3,000** | **1,000** | |
| 01B10 | BY GOVERNMENT | | | |
| 01B20 | BY LOCAL SPONSOR (LS) | 3,000 | | |
| 01B30 | BY GOVT ON BEHALF OF LS | | | |
| 01B40 | REVIEW OF LS | | 1,000 | |
| 01C | **CONDEMNATIONS** | **0** | **0** | |
| 01C10 | BY GOVERNMENT | | | |
| 01C20 | BY LS | 0 | | |
| 01C30 | BY GOVT ON BEHALF OF LS | | | |
| 01C40 | REVIEW OF LS | | 0 | |
| 01D | **INLEASING** | **0** | **0** | |
| 01D10 | BY GOVERNMENT | | | |
| 01D20 | BY LS | | | |
| 01D30 | BY GOVT ON BEHALF OF LS | | | |
| 01D40 | REVIEW OF LS | | | |
| 01E | **APPRAISAL** | **3,000** | **1,000** | |
| 01E10 | BY GOVT (IN HOUSE) | | | |
| 01E20 | BY GOVT (CONTRACT) | | | |
| 01E30 | BY LS | 3,000 | | |
| 01E40 | BY GOVT ON BEHALF OF LS | | | |
| 01E50 | REVIEW OF LS | | 1,000 | |
| 01F | **PL 91-646 ASSISTANCE** | **0** | **0** | |
| 01F10 | BY GOVERNMENT | | | |
| 01F20 | BY LS | 0 | | |
| 01F30 | BY GOVT ON BEHALF OF LS | | | |
| 01F40 | REVIEW OF LS | | 0 | |

Exhibit B - Chart of Accounts
for
Montauk Point, New York Storm Damage Reduction Project
(Prepared by CENAN-RE-M March 2003)

| | | | | |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| 01G | **TEMPORARY PERMITS/LICENSES/RIGHTS-OF-ENTRY** | **0** | **0** | |
| 01G10 | BY GOVERNMENT | | | |
| 01G20 | BY LS | 0 | | |
| 01G30 | BY GOVT ON BEHALF OF LS | | | |
| 01G40 | REVIEW OF LS | | 0 | |
| 01G50 | OTHER | | | |
| 01G60 | DAMAGE CLAIMS | | | |
| | | | | |
| 01H | **AUDITS** | **0** | **0** | |
| 01H10 | BY GOVERNMENT | | | |
| 01H20 | BY LS | | | |
| 01H30 | BY GOVT ON BEHALF OF LS | | | |
| 01H40 | REVIEW OF LS | | | |
| | | | | |
| 01J | **ENCROACHMENTS AND TRESPASS** | **0** | **0** | |
| 01J10 | BY GOVERNMENT | | | |
| 01J20 | BY LS | | | |
| 01J30 | BY GOVT ON BEHALF OF LS | | | |
| 01J40 | REVIEW OF LS | | | |
| | | | | |
| 01K | **DISPOSALS** | **0** | **0** | |
| 01K10 | BY GOVERNMENT | | | |
| 01K20 | BY LS | | | |
| 01K30 | BY GOVT ON BEHALF OF LS | | | |
| 01K40 | REVIEW OF LS | | | |
| | | | | |
| 01N00 | **FACILITY/UTILITY RELOCATIONS** | **0** | **0** | |
| | | | | |
| 01Q00 | **RESERVED FOR FUTURE HQUSACE USE** | **0** | **0** | |
| | | | | |
| 01R | **REAL ESTATE PAYMENTS** | **0** | **1,000** | |
| 01R1 | **LAND PAYMENTS** | 0 | 0 | |
| 01R1A | BY GOVERNMENT | | | |
| 01R1B | BY LS | 0 | | |
| 01R1C | BY GOVT ON BEHALF OF LS | | | |
| 01R1D | REVIEW OF LS | | 0 | |
| | | | | |
| 01R2 | **PL 91-646 ASSISTANCE PAYMENTS** | 0 | 0 | |
| 01R2A | BY GOVERNMENT | | | |
| 01R2B | BY LS | 0 | | |
| 01R2C | BY GOVT ON BEHALF OF LS | | | |
| 01R2D | REVIEW OF LS | | 0 | |
| | | | | |

## Exhibit B - Chart of Accounts
## for
## Montauk Point, New York Storm Damage Reduction Project

(Prepared by CENAN-RE-M March 2003)

| | | | | |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| 01R3 | **DAMAGE PAYMENTS** | 0 | 0 | |
| 01R3A | BY GOVERNMENT | | | |
| 01R3B | BY LS | | | |
| 01R3C | BY GOVT ON BEHALF OF LS | | | |
| 01R3D | REVIEW OF LS | | 0 | |
| 01R9 | **OTHER** | | | |
| | | | | |
| 01T | **LERRD CREDITING** | **0** | **1,000** | |
| 01T10 | LAND PAYMENTS | | 0 | |
| 01T20 | ADMINISTRATIVE COSTS | | 1,000 | |
| 01T30 | PL 91-646 ASSISTANCE | | 0 | |
| 01T40 | ALL OTHER | | | |

# REAL ESTATE PLAN

# Montauk Point, New York Storm Damage Reduction Project - Feasibility Study

# EXHIBIT "C" – Assessment of Non-Federal Sponsor's Real Estate Acquisition Capability

## Montauk Point, New York Storm Damage Reduction Project

Assessment of Non-Federal Sponsor's Real Estate Acquisition Capability

I. Legal Authority:

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? *YES*
b. Does the sponsor have the power of eminent domain for this project? *YES*
c. Does the sponsor have "quick-take" authority for this project? *YES*
d. Are any of the lands/interests in the land required for the project located outside the sponsor's political boundary? *NO*
e. Are any of the lands/interests in the land required for the project owned by an entity whose property the sponsor cannot condemn? *NO*

II. Human Resources Requirements:

a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including P.L. 91-646, as amended? *NO*
b. If the answer to IIa is YES, has a reasonable plan been developed to provide such training? *N/A*
c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? *YES*
d. Is the sponsor's projected in-house staffing level sufficient considering its other work load, if any, and the project schedule? *YES*
e. Can the sponsor obtain contractor support, if required, in a timely fashion? *YES*
f. Will the sponsor likely request USACE assistance in acquiring real estate? *NO*

III. Other Project Variables:

a. Will the sponsor's staff be located within reasonable proximity to the project site? *YES*
b. Has the sponsor approved the project/real estate schedule / milestones? *YES*

Exhibit "C"

## IV. Overall Assessment:

a. Has the sponsor performed satisfactorily on other USACE projects? *YES*
b. With regard to this project, the sponsor is anticipated to be: Fully Capable.

## V. Coordination:

a. Has this assessment been coordinated with the sponsor? *YES*
b. Does the sponsor concur with this assessment? *YES*

Prepared by:

Stanley H. Nuremburg,
Realty Specialist

Reviewed and Approved by:

Noreen Dean Dresser
Chief, Real Estate Division

Exhibit "C"

# REAL ESTATE PLAN

# Montauk Point, New York Storm Damage Reduction Project - Feasibility Study

## EXHIBIT "D" – Real Estate Acquisition Milestones and Schedules

# Montauk Point, New York Storm Damage Reduction Project - Feasibility Study

## Exhibit D – Schedule of Real Estate Acquisition

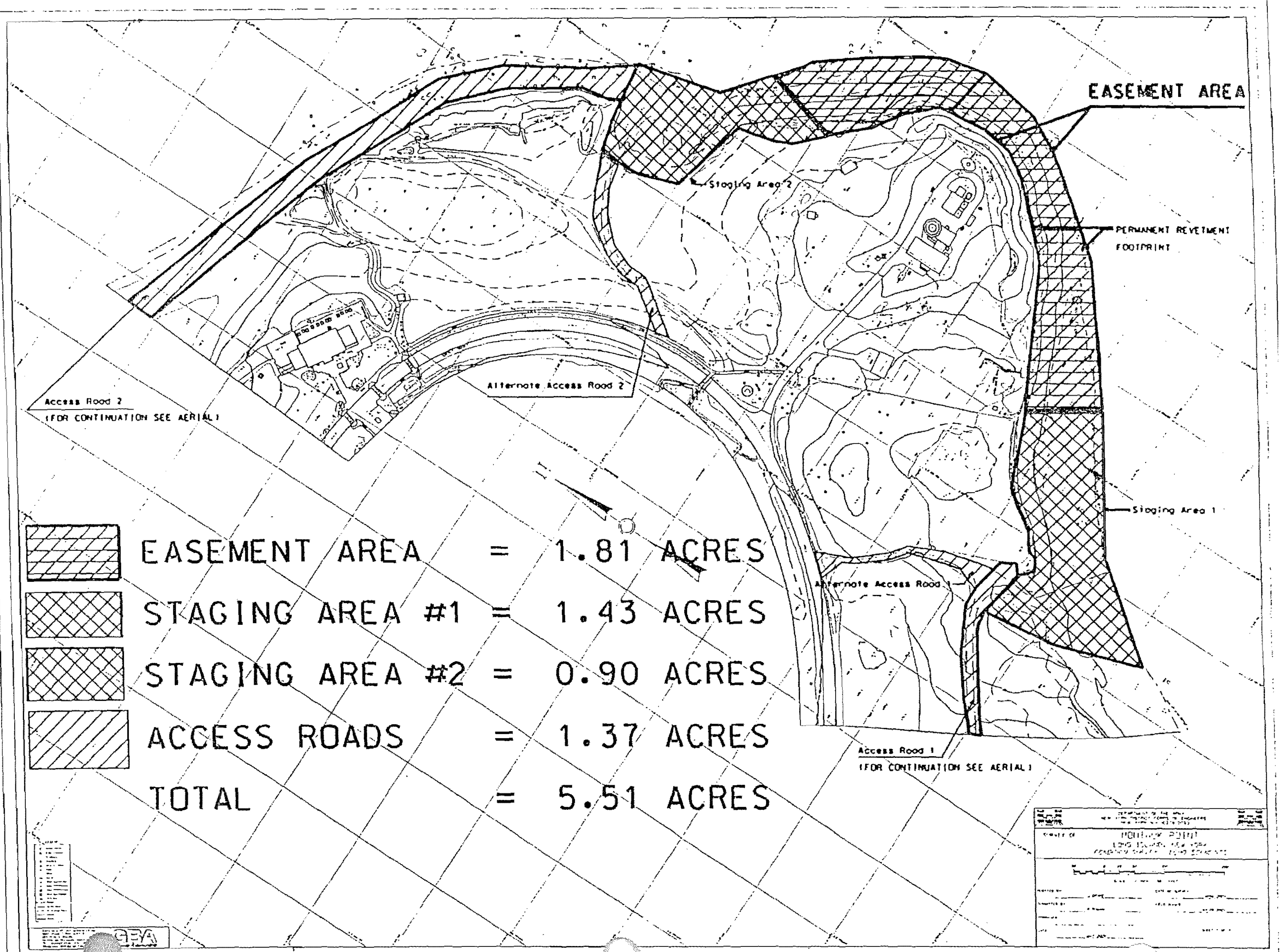
| ID | Task Name | Start | Finish |
|---|---|---|---|
| 1 | Start RE Acquisition | 31 Jan 07 | 15 June 07 |
| 2 | PCA Signed | 31 Jan 07 | 31 Jan 07 |
| 3 | Obtain LER (Sponsor) | 7 Feb 07 | 30 April 07 |
| 4 | Receive Authorization for Entry for Construction from Sponsor | 10 May 07 | 31 May 07 |
| 5 | Certify RE for Construction | 7 June 07 | 15 June 07 |

# REAL ESTATE PLAN

# Montauk Point, New York Storm Damage Reduction Project - Feasibility Study

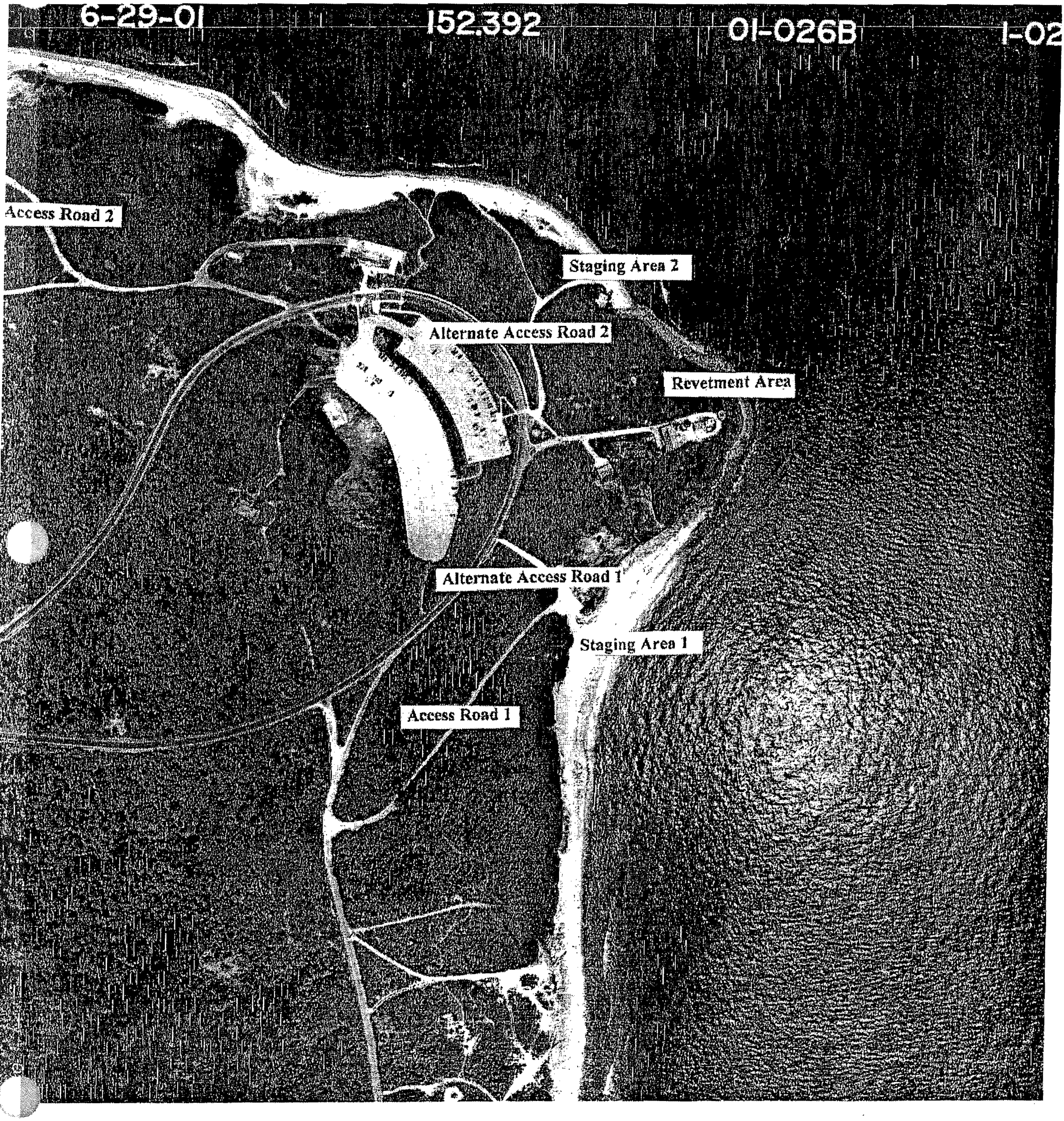
## MAPS

## Map 1 & Figure 1



▨ EASEMENT AREA = 1.81 ACRES
▨ STAGING AREA #1 = 1.43 ACRES
▨ STAGING AREA #2 = 0.90 ACRES
▨ ACCESS ROADS = 1.37 ACRES
TOTAL = 5.51 ACRES

Montauk easement 2.dgn 05/27/2003 11:42:50 AM


6-29-01
152,392
01-026B
1-02
Access Road 2
Staging Area 2
Alternate Access Road 2
Revetment Area
Alternate Access Road 1
Staging Area 1
Access Road 1

# APPENDIX E: PERTINENT CORRESPONDENCE

**New York State Department of Environmental Conservation**
**Division of Water**
**Bureau of Program Resources and Flood Protection, 4th Floor**
625 Broadway, Albany, New York 12233-3507
**Phone:** (518) 402-8151 • **FAX:** (518) 402-9029
**Website:** www.dec.state.ny.us

Denise M. Sheehan
Acting
Commissioner

October 5, 2005

Mr. Frank Santomauro, P.E.
Chief, Planning Division
U. S. Army Corps of Engineers
New York District
26 Federal Plaza
New York, NY 10278-0090

Re: Montauk Point, NY
Storm Damage Reduction

Dear Mr. Santomauro:

The New York State Department of Environmental Conservation (Department) has reviewed the *Draft Feasibility Report* and the *Draft Environmental Impact Statement*, and supports the project recommended therein. The Department will request that funds for design of the project be included in the 2006-2007 State Budget. However, we continue to pursue our previously-stated position that project construction funding should be 65% federal - 35% non-federal.

A copy of the letter from the Montauk Historical Society expressing support for the project is enclosed. Department efforts to identify a local cost-sharing partner for the project continue. We understand that the non-federal partners will be responsible to provide all lands, easements, and rights-of-way necessary for the construction of the project prior to federal advertisement for bids for construction.

Please direct inquiries to Project Engineer Rick Tuers, at 518-402-8148, if more information is needed.

Yours Truly,

for Michael Stankiewicz

Michael Stankiewicz, Chief
Flood Protection Structural Programs Section
Bureau of Program Resources and Flood Protection

Enclosure

c: w/o enc. - D. White/G. Donahue - Montauk Historical Society
w/enc. - F. Verga/T. Pfiefer - US Army Corps of Engineers
- R. Tuers/R. Rakoczy- BPR&FP
- E. Star - Region 1- Stony Brook, NY

MONTAUK LIGHTHOUSE
Montauk Historical Society
Post Office Box 943 • Montauk, New York 11954

AUG 2005
RESOURCE MANAGEMENT

August 1, 2005

Mr. Richard Tuers
NY State Department of Environmental Conservation
Coastal Erosion Management Section
Bureau of Flood Protection
625 Broadway, 4th Floor
Albany, NY 12233-3507

Dear Rick,

Please accept this letter in support of the Army Corps of Engineers "Storm Damage Reduction - Feasibility Study: Feasibility Report & Environmental Impact Statement Draft July 2005."

We are grateful that the report stresses the need to protect the Montauk Point Lighthouse Museum Complex. You well know that our mission as a non-profit organization (the protection, preservation and educational development of this nationally significant historic site) is dependent on the continued life of this complex of structures. In fact, Richard F. (Dick) White, Jr. Chairman of the Lighthouse Committee stresses the importance of the timeliness of this project.

We appreciate all of the work that has gone into this study and all of your efforts on behalf of saving this important Cultural Resource.

Sincerely,

Ann Shengold
Museum Director

(631) 668-2544 http://www.montauklighthouse.com Fax: (631) 668-2546

Bernadette Castro
*Commissioner*

**New York State Office of Parks, Recreation and Historic Preservation**
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

September 8, 2005

Dr. Christopher Ricciardi, EIS Coordinator
US Army Corps of Engineers-NY District
Planning Division-Environmental Branch
26 Federal Plaza, Room 2151
New York, NY 10278-0090

RE: Archeology Survey at the Montauk Point Light Station
Lake Montauk
Montauk, Suffolk County, NY
04PR04116 (formerly 02PR04111)

Dear Dr. Ricciardi,

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We received the Draft Environmental Impact Statement on August 22, 2005 and are reviewing the project in accordance with Section 106 of the National Historic Preservation Act of 1966 and relevant implementing regulations.

L01a Douglas Mackey of our archeology unit has reviewed the DEIS and concurs with the recommendations regarding archeology issues.

L01b We understand that moving the lighthouse was explored, but will not take place. We feel strongly that it should not be moved and are pleased that it is not being considered.

Please use the PR number of top of this letter when you refer to this project in future. If you or anyone involved with the project has any questions, please contact me at 518-237-8643, ext. 3252.

Sincerely,

Sloane Bullough

Sloane Bullough
Historic Sites Restoration Coordinator

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON DC 20310-0108

29 JUN 2005

MEMORANDUM FOR DIRECTOR OF CIVIL WORKS

SUBJECT: Montauk Point, New York, Storm Damage Reduction Feasibility Study – Policy Exemption for Private Non-Profit Non-Federal Sponsor

I have completed my review of CEMP-NAD memorandum dated June 7, 2005, regarding the request that I grant an exception to existing policy which prohibits the Army Corps of Engineers from cost-sharing water resources projects involving a single, private landowner. Although the Montauk Historical Society (Society) is clearly a single, private, land-owner the Society must, by deed restriction and State charter, act as a public entity akin to agencies of State and local governments. The Society must accomplish its public education mission to stay in operation, must follow Federal National Historic Preservation requirements for maintenance work, and membership and enjoyment of the benefits of the facility and educational programs are open to all, with no restriction, for a $5.00 fee. Under the deed and charter the Society can not structure and constrain uses of the property as envisioned in existing policy guidance nor can anyone who cares to join the Society and enjoy the benefits of the facility (and water resources project) be excluded.

Based upon this analysis I grant the exception to the single landowner policy for this project. However, please note that this project remains a low budget priority. If you have any questions please do not hesitate to contact me. Your staff may contact Mr. Chip Smith at (703) 693-3655.

Geo. P. Dunlop
for John Paul Woodley, Jr.
Assistant Secretary of the Army
(Civil Works)

# APPENDIX F: ENVIRONMENTAL IMPACT STATEMENT

Montauk Point, New York
Storm Damage Reduction Project

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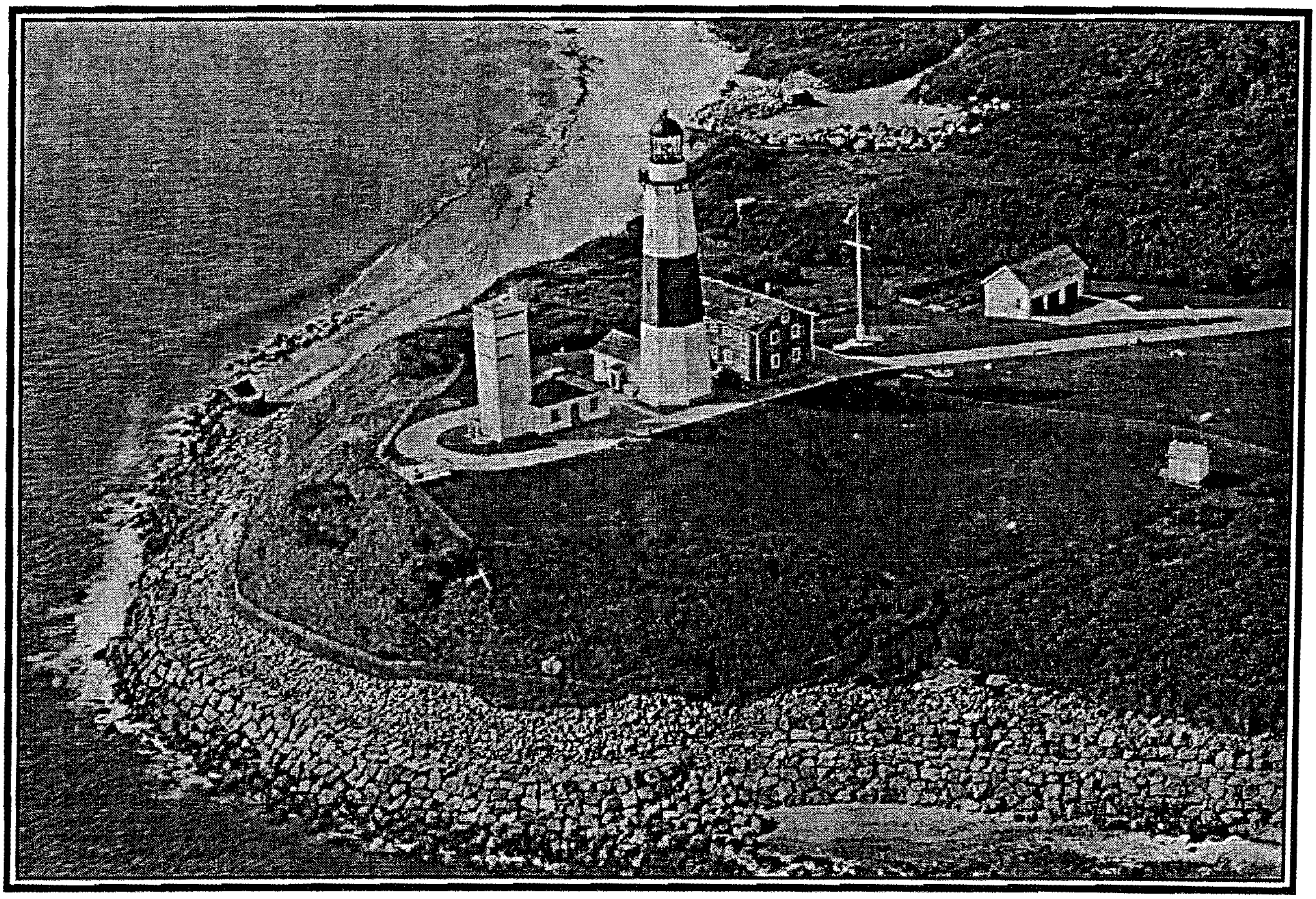
# FINAL
# ENVIRONMENTAL IMPACT STATEMENT



## OCTOBER 2005

Prepared by: U.S. Army Corps of Engineers
New York District - Planning Division
26 Federal Plaza – Room 2151
New York, New York 10278-0090

# FINAL
# ENVIRONMENTAL IMPACT STATEMENT

## Montauk Point, New York
## Storm Damage Reduction Project

Prepared by:

U.S. Army Corps of Engineers
New York District (CENAN-PL-EA)
26 Federal Plaza – Room 2151
New York, New York 10278-0090

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# EXECUTIVE SUMMARY

The United States Army Corps of Engineers (USACE), New York District (District), is the lead Federal agency for the Montauk Point Storm Damage Reduction Project (Project). The Project area is located in Suffolk County, New York, between the Atlantic Ocean and Block Island Sound at the easternmost end of the south fork of Long Island. Montauk is in the Town of East Hampton and is approximately 125 miles east of the City of New York. The Project area includes the historic Montauk Point Lighthouse Complex that sits on a high bluff underlain with glacial till, approximately 70 feet above Mean Sea Level (MSL). The Montauk Point Historical Society (MHS) owns the land immediately surrounding the Lighthouse and related structures. The New York State Office of Parks, Recreation, and Historic Preservation (NYSOPRHP) owns portions of the project area in which the existing stone revetment is located.

The Montauk Point Lighthouse (Lighthouse), which is listed on the United States Department of the Interior's National Register of Historic Places (NRHP), was commissioned by President Washington in 1796 and completed in 1797. Since its construction, the Lighthouse has served as an important navigation aid for the first land encountered by ships headed for New York Harbor and Long Island Sound, as well as other eastern seaboard ports. Despite numerous previous protection projects implemented at Montauk Point, the existing shoreline and bluff in the Project area continue to erode. This erosion will lead to the continued loss of the Turtle Hill plateau, the eventual loss of the Lighthouse and its adjacent structures, as well as other historically important resources (*e.g.,* archaeological features and artifacts).

As a result of the need for protection of the Turtle Hill plateau and the historic Lighthouse, the USACE was authorized by two resolutions of the United States Senate Committee on Environment and Public Works, adopted May 15, 1991, to provide long term storm damage protection at Montauk Point, New York. The first of these resolutions authorizes the study of interim emergency protection works. In the Reconnaissance Report (USACE 1993) it was determined that in view of the limited protection afforded by the recently constructed emergency erosion control project by the U.S. Coast Guard and the MHS in 1990, 1992 and 1993, no additional interim measures were warranted at that time. The second resolution authorized a study to investigate the feasibility of a comprehensive project and various alternatives. The District is the lead Federal agency for the Project, and the New York State Department of Environmental Conservation (NYSDEC) is the non-Federal cooperating agency.

The District performed an analysis of six different Project alternatives as part of the formulation of long-term storm damage protection at Montauk Point. These alternatives were developed to provide the most appropriate form of shoreline stabilization for the Turtle Hill plateau that would eliminate the threat of erosion and provide acceptable levels of protection to historic structures from the impacts of wave attack and storm recession. Alternatives included the no-action alternative, one non-structural protection alternative, and four structural protection alternatives. To accomplish this analysis, the District identified the causes and rate of shoreline erosion and storm damage, developed general evaluation criteria (*i.e.*, appropriateness to site conditions, compliance with New York State Coastal Zone Management criteria, effectiveness of protection, environmental and cultural impacts, and annual erosion cost and benefits), analyzed specific evaluation criteria (*i.e.*, technical, economic, environmental, regional and local interests, and institutional), formulated planning objectives, and considered planning constraints.

The District's selected alternative is the stone revetment alternative, which consists of the construction of 840 feet of stone revetment that incorporates material from the existing revetment, and has a heavily embedded toe to protect against breaking waves and scour at the base of the revetment. The estimated construction costs for the stone revetment alternative is $13,722,000 or $889,300 annualized for the 50-year evaluation period.

Two public scoping meetings were held to provide the general public with an opportunity to comment on the Project. The two meetings were held at the Montauk Fire House, Montauk, New York, at 1:00–3:00 pm and 7:00–9:00 pm on November 14, 2001. The regulatory agencies and public were invited to comment during the scoping meetings and during the 60 days following the meetings. In addition, the District coordinated and met with interested parties, including the Surfrider Foundation, Montauk Surfcasters Association, and the New York Sport Fishing Federation, to assist with the evaluation of short- and long-term impacts on recreational activities and to discuss mitigating solutions. The District also coordinated closely and met with the NYSOPRHP regarding short- and long-term impacts to cultural, recreation, visual, aesthetic, and natural resources. In addition, the United States Fish and Wildlife Service (USFWS) prepared a Fish and Wildlife Coordination Act Section 2(b) Report (FWCAR) which evaluated Project impacts on the natural environment and provided recommendations for avoidance and minimization of impacts. These contacts and consultations are summarized in this final Environmental Impact Statement (FEIS).

The USACE prepared this FEIS to fulfill the requirements of the National Environmental Policy Act (NEPA) process. The purpose of the FEIS is to summarize information in relevant background documents, public and agency comments, consultations, and recommendations, and evaluate changes in environmental and social conditions (i.e., the human environment) in the Project area as a result of the construction, operation, and maintenance of the District's selected alternative. Based on the FEIS evaluations, the District has concluded that the changes in the conditions of the resources in and around the Project area as a result of implementation of the District's selected alternative will not cause adverse effects on the human environment.

This FEIS was filed with the United States Environmental Protection Agency (USEPA) and in accordance with the Council on Environmental Quality (CEQ) regulations for implementing NEPA, the public has 30 days from the date of issuance to comment on this DEIS in the form of written comments. The USACE would review and take the comments into consideration in preparing a Final Environmental Impact Statement (FEIS) for the Project.

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# LIST OF ABBREVIATIONS AND ACRONYMS

| ACRONYM/ ABBREVIATION | FULL NAME |
|---|---|
| ACHP | Advisory Council on Historic Preservation |
| ANEP | Association of National Estuary Program |
| BA | Biological Assessment |
| CAA | Clean Air Act |
| CEQ | Council on Environmental Quality |
| CFR | Code of Federal Regulations |
| CMP | Coastal Management Program |
| CWA | Clean Water Act |
| CZM | Coastal Zone Management |
| dB-A | Decibel, A-weighted |
| District | U.S. Army Corps of Engineers, New York District |
| FEIS | Final Environmental Impact Statement |
| EFH | Essential Fish Habitat |
| EIS | Environmental Impact Statement |
| EM | Engineering Manual |
| ER | Engineering Resolution |
| ESA | Endangered Species Act |
| FEIS | Final Environmental Impact Statement |
| FWCA | Fish and Wildlife Coordination Act |
| FWCAR | Fish and Wildlife Coordination Act Report |
| FY | Fiscal Year |
| HABS/HAER | Historic American Building Survey/Historic American Engineering Record |
| HTRW | Hazardous, Toxic, and Radioactive Waste |
| IBA | Important Bird Area |
| IPCNYS | Invasive Plant Council of New York State |
| $L_{dn}$ | day-night noise level |
| Lighthouse | Montauk Point Lighthouse |
| MHS | Montauk (Point) Historical Society |
| MHWL | Mean High Water Level |
| MLLW | Mean Lower Low Water |
| MSL | Mean Sea Level |
| MSFCMA | Magnuson-Stevens Fishery Conservation and Management Act |
| M2AB1N | Marine intertidal wetlands with algal aquatic beds and tidal water regime, irregularly flooded |
| M2US1P | Marine intertidal wetlands with unconsolidated cobble/gravel shores and tidal water regime, irregularly flooded |
| M2US2P | Marine intertidal wetlands with unconsolidated sand shores and tidal water regime, irregularly flooded. |
| NED | National Economic Development |
| NEPA | National Environmental Policy Act |
| NGVD | National Geodetic Vertical Datum |
| NHL | National Historic Landmark |
| NHPA | National Historic Preservation Act |

# LIST OF ABBREVIATIONS AND ACRONYMS (Continued)

| ACRONYM/ ABBREVIATION | FULL NAME |
|---|---|
| NMFS | National Marine Fisheries Services |
| NOAA | National Oceanic and Atmospheric Administration |
| NOI | Notice of Intent |
| NRCS | Natural Resources Conservation Service |
| NRHP | National Register of Historic Places |
| NYSCRR | New York State Codes, Rules, and Regulations |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOS | New York State Department of State |
| NYSECL | New York State Environmental Conservation Law |
| NYSOGS | New York State Office of General Services |
| NYSOPRHP | New York State Office of Parks, Recreation and Historic Preservation |
| O&CT | Offshore & Coastal Technologies, Inc. |
| PEP | Peconic Estuary Program |
| Project | Montauk Point Storm Damage Reduction Project |
| PUBV | Palustrine, unconsolidated bottom, permanently tidally influenced freshwater wetlands |
| PEMV5 | Palustrine emergent, tidally influenced freshwater wetlands, mesohaline coastal halinity |
| SCPD | Suffolk County Planning Department |
| SHPA | State Historic Preservation Act |
| SHPO | State Historic Preservation Office |
| SPDES | State Pollutant Discharge Elimination System |
| USACE | United States Army Corps of Engineers |
| USC | United States Code |
| USCB | United States Census Bureau |
| USCG | United States Coast Guard |
| USDA-USFS | United States Department of Agriculture, United States Forest Service |
| USDI-NPS | United States Department of the Interior, National Park Service |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |

# 1.0 PURPOSE AND NEED OF ACTION

## 1.1 INTRODUCTION

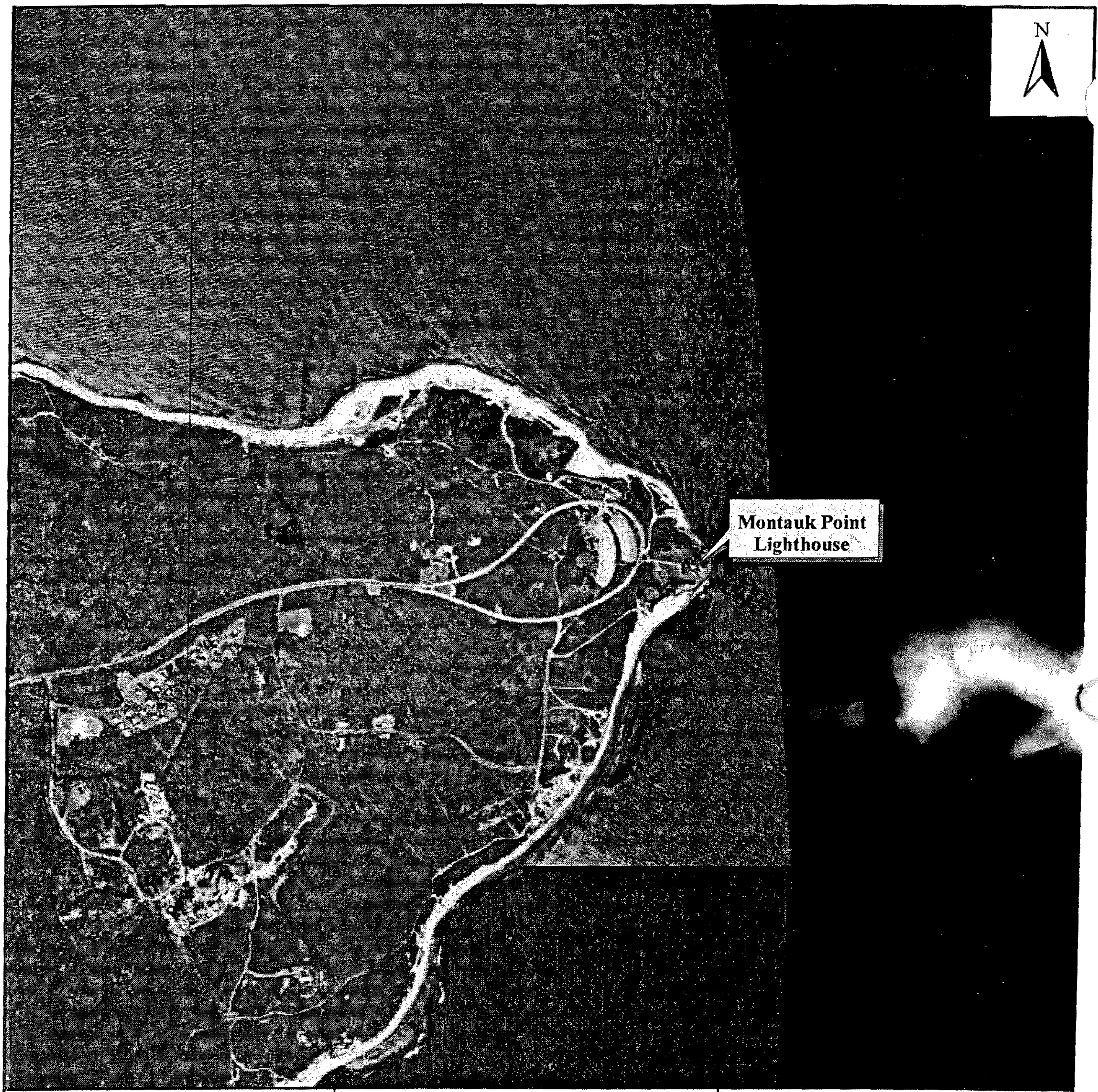
The United States Army Corps of Engineers (USACE), New York District (District), is the lead Federal agency for the Montauk Point Storm Damage Reduction Project (Project). The Project area is located at Montauk Point in the Township of East Hampton, Suffolk County, New York. Montauk Point is located on the extreme eastern tip of Long Island and separates the Atlantic Ocean to the south and Block Island Sound to the north (Figure 1).

Montauk Point is located approximately 125 miles east of New York City. The Montauk Point Lighthouse (Lighthouse), which is listed on the United States Department of the Interior's National Register of Historic Places (NRHP), was commissioned by President Washington in 1796 and completed in 1797. Since its construction, the Lighthouse has served as an important navigation aid for the first land encountered by ships headed for New York Harbor and Long Island Sound, as well as other eastern seaboard ports. Despite numerous previous protection projects implemented at Montauk Point (discussed further in Section 1.3 and are outlined in Table 1), the existing shoreline and bluff in the Project area are still eroding (USACE 2005). This erosion will lead to the continued loss of the Turtle Hill plateau, the eventual loss of the Lighthouse and its adjacent structures, as well as other important historical resources (e.g., archaeological features and artifacts).

A primary mission of the USACE is to provide solutions to reduce damages caused by erosion and storm events. The USACE is proposing storm damage protection measures to reduce the rate of erosion presently occurring at Montauk Point. Aside from the primary mission and benefits of storm damage reduction, this Project will produce several secondary benefits. The Project will provide protection for the various cultural resources associated with the Lighthouse complex and stability to the natural environment. Finally, human beings will be able to use and enjoy the existing natural and cultural landscapes for years to come because of the protection that the recommended plan provides.

This Final Environmental Impact Statement (FEIS) presents the results of the District's evaluation of various alternatives that comprise a comprehensive study for the preservation and protection of Montauk Point and its associated facilities from coastal erosion and storm damage. The District evaluated an array of structural and non-structural alternatives. Structural alternatives included structures such as revetments, breakwaters, T-groins, and beach nourishment, either individually or in various combinations. Non-structural measures included relocation and/or reconstruction of affected historic structures.

This FEIS for this Project has been prepared by the staff of the USACE to fulfill the requirements of the National Environmental Policy Act of 1969 (NEPA) and in accordance with the President's Council on Environmental Quality (CEQ) Rules and Regulations for implementing NEPA (Title 40, Code of Federal Regulations [CFR], Sections 1500-1508), USACE's principals and guidelines (Engineering Resolution [ER] 1105-2-100), and other applicable federal and state environmental laws. A Notice of Intent was filed on May 24, 2002 for this Project.



**Project Location**

Source: New York State Department of State
1 meter orthimagery 1994-1999.
www.nysgis.state.ny.us/gateway/mg/interactive main.html

US Army Corp of Engineers
New York District
26 Federal Plaza
New York NY 12078-0090

Figure 1. Site Location Map. Montauk Point Storm Damage Reduction Project.

Date: 07/26/02

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## 1.2 PROJECT AUTHORIZATION

This Project Feasibility Study and Report was authorized by two resolutions of the United States Senate Committee on Environment and Public Works, adopted beginning in May 1991, to provide storm damage protection at Montauk Point, New York. The first of these resolutions authorizes the study of interim emergency protection works. In the Reconnaissance Report (USACE 1993) it was determined that in view of the limited protection afforded by the recently constructed emergency erosion control project by the U.S. Coast Guard and the MHS in 1990, 1992 and 1993, no additional interim measures were warranted at that time. The second resolution authorized a study to investigate the feasibility of a comprehensive project and various alternatives. The District is the lead Federal agency for the Project, and the New York State Department of Environmental Conservation (NYSDEC) is the non-Federal cooperating agency.

This FEIS was prepared pursuant to recommendations from:

a) An investigation of erosion processes in the vicinity of the Lighthouse on Long Island, New York, conducted by the USACE, New York District, with results of this investigation published in July 1944 (USACE 1944 and USACE 1993).

b) A study of improvements for the dual-purpose of beach erosion control and hurricane protection project for five reaches of the Atlantic Coast of Long Island from Fire Island Inlet to Montauk Point, conducted by the District, with results of this study published in July 1958 (USACE 1958).

c) Authorization of a review of the report to the Chief of Engineers on the beach erosion control and hurricane protection for five reaches of the Atlantic Coast of Long Island, from Fire Island Inlet to Montauk Point, subsequently published as House Document Number 86-425 of the 86th Congress, 2nd Session, dated June 21, 1960.

d) Authorization of the existing Federal project for beach erosion control and hurricane protection for five reaches of the Atlantic Coast of Long Island, from Fire Island Inlet to Montauk Point, under the Rivers and Harbors Act of July 14, 1960.

e) Modification of the beach erosion control and hurricane protection project for five reaches of the Atlantic Coast of Long Island, from Fire Island Inlet to Montauk Point, consisting of an increase in the extent of Federal participation in the first cost of the project, as authorized by modifications to Section 31 of the Water Resources Development Act of March 6, 1974.

f) A presentation of plans and specifications for emergency repairs at the Lighthouse, prepared by the United States Coast Guard (USCG) in 1992 (USCG 1992). This included a review of the existing revetment wall project.

## 1.3 DESCRIPTION OF THE PROBLEM

Hurricanes, northeasters, and extratropical storms have historically threatened the Lighthouse since its construction in 1797. Three of the most recent severe storms in the Project area include Hurricane Bob in August 1991, the Northeaster of October 1991 (also known as the Perfect Storm), and the Northeaster of December 1992 (USACE 2005). These types of storms generate surges and waves that are characterized by excessive wave height and concurrent strength of wave impact, which contribute to acute episodes of shoreline erosion and storm damage. These and other storms also have permanently eroded large portions of the steep coastal bluffs that surround Montauk Point on three sides. Such erosion and damage have significantly altered the appearance and composition of the Montauk Point shoreline, such that significant erosion has removed much of the natural beachfront and all of the dune complexes that would normally provide a degree of natural coastal protection to Montauk Point. In addition, unlike most beach habitats, erosion of bluffs represents a permanent loss of shoreline because bluffs will never rebuild as a result of accretion.

Erosion has been particularly significant at Montauk Point, where the historical long-term average rate of erosion of the shoreline within the Project area has been estimated at 2 feet per year, and the historical long-term average rate of erosion of the bluff face has been estimated at 1 foot per year (USACE 1993). These average rates mask the effect of episodic rates of erosion, which are much greater as a result of storm events (USACE 1993). A historical review of records for the Project area has indicated that approximately 200 feet of bluff face has eroded since the construction of the Lighthouse, such that the Lighthouse's location is currently less than 100 feet from the bluff face. In addition, the eroding bluff face threatens two structures that are even closer to the bluff's edge than the Lighthouse. The World War Two ear constructed Fire Control Tower, built seaward of the Lighthouse, is less than 50 feet from the edge of the bluff, and the concrete walkway for visitor access is less than 20 feet from the edge of the bluff (USACE 1993).

Since construction of the Lighthouse, numerous projects have been implemented to control the erosion problems at Montauk Point (Table 1). Of these activities, two are currently providing protection, terracing of the 1970s and 1980s and the 1990 and 1992 revetments. The remainder of these erosion control projects have been rendered ineffective in providing storm damage protection, which has led to the recession of the bluff toe and shoreline. Details of these projects are outlined within the Montauk Point, New York – Reconnaissance Report (USACE 1993) and the Feasibility Report (USACE 2005). Despite these numerous protection projects, the existing shoreline and bluff in the Project area will continue to erode. Further progression of erosion is expected as repeated storm damage and storms that exceed the current level of protection cause failure of the present revetment. As a result, the revetment would no longer hold the base of the bluff and bluff erosion would accelerate. This accelerated erosion would lead to the continued loss of the Turtle Hill plateau, and the irrecoverable loss of the Lighthouse, its adjacent structures, and other historically important resources (e.g., archaeological features and artifacts).

## 1.4 PROJECT AREA DESCRIPTION

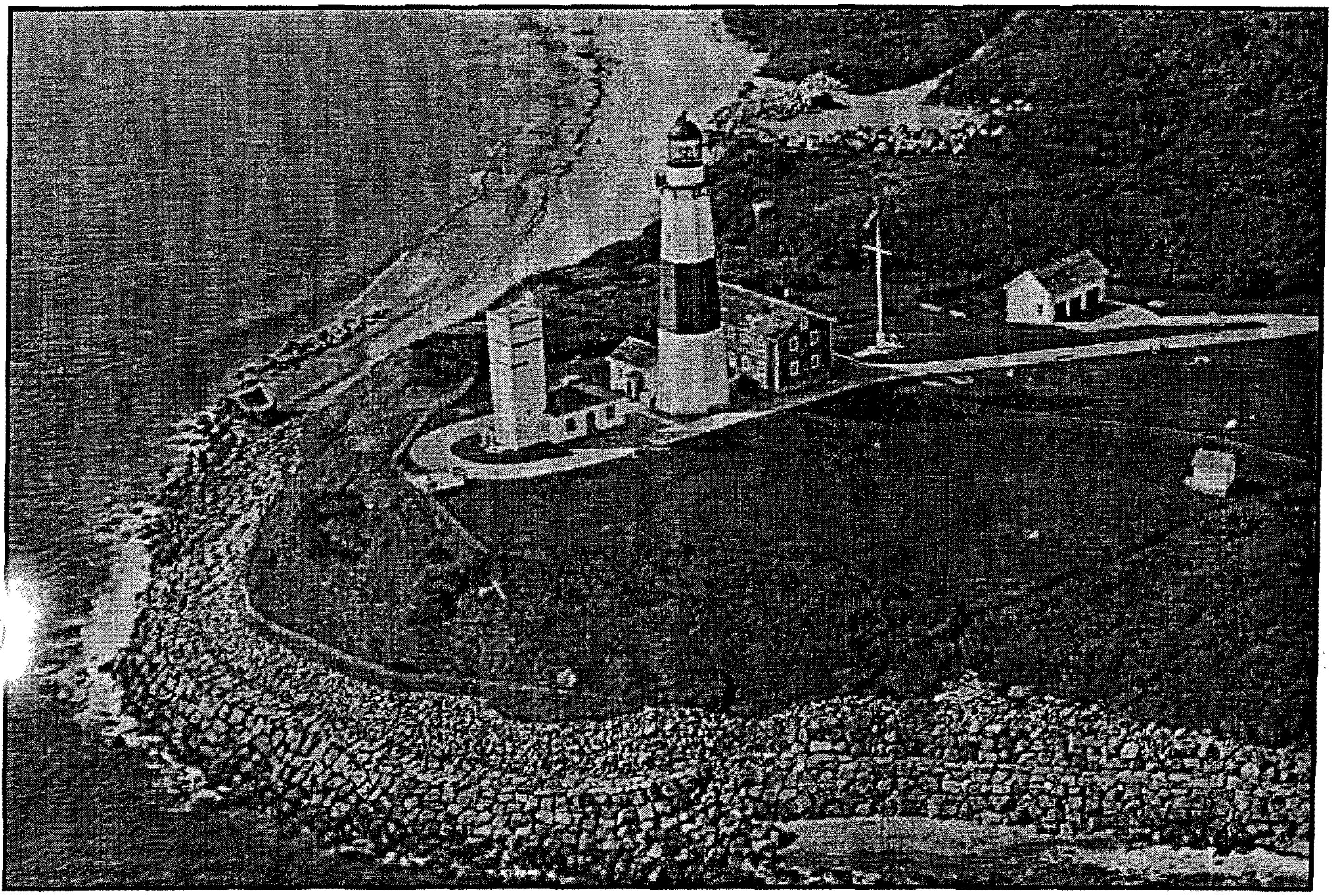
The study area is located in Suffolk County, New York, between the Atlantic Ocean and Block Island Sound at the easternmost end of the south fork of Long Island (Figure 1). Montauk is in the Town of East Hampton and is approximately 125 miles east of the City of New York. The study area includes the historic Montauk Point Lighthouse complex that sits on a high bluff underlain with glacial till, approximately 70 feet above Mean Sea Level (MSL). The Montauk Point Historical Society (MHS) owns the land immediately surrounding the Lighthouse and related structures. The New York State Office of Parks, Recreation, and Historic Preservation (NYSOPRHP) owns portions of the project area in which the existing stone revetment is located.

**Table 1. History of Erosion Control Activities at Montauk Point.**

| Year | Project |
|---|---|
| 1796 | Lighthouse construction begins; Lighthouse was built more than 300 feet from the edge of the bluff, presumably due to an awareness that the bluff would erode. |
| 1946 | USACE builds 700-foot-long stone seawall along the toe of the bluff. |
| 1960s | United States Department of Transportation placed concrete rubble over the edge of the bluff just south of the Lighthouse. |
| 1971 | Ms. Georgina Reid constructed the first terracing project along the bluff slope; construction was on the USCG's property just north of the Lighthouse. |
| 1972 | The USCG placed a series of gabions above the 1946 seawall project along the toe of the bluff. |
| 1970s and 1980s | Terracing projects continued in various locations around the Lighthouse. Repairs were made to existing terraces, due to slippage. |
| 1987 | Mr. Greg Donohue of the Montauk Historical Society initiated the planting of American beach grass (*Ammophila breviligulata*) on the terraces to help maintain slope stability. Beach grass plantings were also initiated in areas to the north and south of the Lighthouse in places which had not been previously terraced. |
| 1990 | The Montauk Historical Society and the NYSOPRHP constructed a 225-foot-long revetment along Turtle Cove, south of the Lighthouse. |
| 1992 | The USCG and Montauk Historical Society constructed a revetment on their property. The USCG built approximately 300 linear feet of revetment using a range of 5- to 10-ton stone. The Montauk Historical Society constructed the approximately 150-foot-long structure to the south of the USCG property. |

Source: USACE 2005.

The Project area (Figure 1) encompasses the area of anticipated potential direct and indirect environmental impacts from the proposed Project and alternatives. Direct impacts to land, water, and benthic communities could occur from the potential alterations such as the replacement of sand substrate with rock revetment or breakwaters structures. Indirect impacts could occur from potential alternatives such as the influence of breakwater structures on the movement of sand. Specifically, the Project area includes the historic Lighthouse and associated facilities, Turtle Hill plateau, 2,300 linear feet of shoreline, and a 200-foot-wide buffer zone of subtidal waters surrounding Montauk Point (Figure 2).



**Project Location**

US Army Corp of Engineers
New York District
26 Federal Plaza
New York NY 12078-0090

Figure 2 . Aerial Close-Up of the Project Area. Montauk Point Storm Damage Reduction Project.

Date:08/02/02

z:/projects/montauk/aprs/figure1.apr

Topographically, the Project area is characterized by a high bluff composed of glacial till, which is approximately 70 feet above MSL, with steep slopes and abbreviated rocky shorelines surrounding the bluff. Ecologically, the Project area consists of a complex of valuable interdunal fresh and brackish water pond plant communities located within the Atlantic Coastal Plain Province of New York (USACE 2005). The Project area is relatively undeveloped, and primarily supports recreational and tourism-related activities (i.e., sightseers, hikers, fishermen and surfers) provided by the resources of Montauk Point State Park.

The Lighthouse, which is listed on the United States Department of the Interior's NRHP, was commissioned by President Washington in 1796 and was completed in 1797. Since its construction, the Lighthouse has served as an important navigation aid for the first land encountered by ships headed for New York Harbor and Long Island Sound, as well as other eastern seaboard ports.

By the mid twentieth century, ownership and control of the Lighthouse complex was under the authority of the USCG. When the function of the Lighthouse shifted from navigation to a living museum, ownership was transferred to the MHS. Under the agreement, the Montauk Historical Society (MHS) would adhere to all Federal regulations with regard to current and future potential National Register issues (USACE 2005). Continued ownership of the property is subject to the condition that the Montauk Historical Society maintains the Montauk Light Station in accordance with the provisions of the National Historic Preservation Act (NHPA) of 1966, amended (16 United States Code [USC] 470 et seq.) and other applicable laws. All rights, title, and interest would revert to the United States if the Montauk Light station ceases to be maintained in accordance with the NHPA as a nonprofit center for public benefit for interpretation and preservation of the material culture of the USCG, maritime history of Montauk, and Native American and colonial history.

The bluff and beach along this entire area are considered to be critical elements of the stability of the Lighthouse. Erosion control structures are required to protect the bluff faces from the forces of oncoming waves and for shoreline protection. The area of concern consists of 2,300 linear feet of shoreline, extending from the pivotal point of the adjacent bluff to the south to a beach area to the north.

## 1.5 PLANNING OBJECTIVES

Planning objectives are identified based on the needs and opportunities, as well as the existing physical and environmental conditions present in the Project area. In general, the prime Federal objective is to contribute to the National Economic Development (NED) account consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders and other Federal planning requirements, such as environmental sustainability.

## 1.6 PUBLIC REVIEW AND COMMENT

On May 24, 2002, the District issued a Notice to Intent (NOI) to prepare an Environmental Impact Statement (EIS) for the Montauk Point Damage Reduction Project. The NOI was sent to individuals, organizations, and interested parties, including Federal, state, county, and local agencies, and elected officials. The NOI was also published in the Federal Register.

Two public scoping meetings were held to provide the general public with an opportunity to comment on environmental issues to be addressed in this FEIS. The two meetings were held at the Montauk Fire House, Montauk, New York, at 1:00–3:00 pm and 7:00–9:00 pm on November 14, 2001. The regulatory agencies and public were invited to comment during the scoping meetings and during the 60 days following the meetings. The public scoping document (USACE 2002a) and the response to comments document (USACE 2002b) prepared as a result of these sessions are part of the public record, and the NOI lists the locations of their availability for review. Table 2 summarizes the issues and concerns of commentors and identifies the FEIS section in which these issues are addressed.

**Table 2. Issues Identified During Public Scoping and Public Review.**

| Topic | Issue | FEIS Section Addressing Issue |
|---|---|---|
| Alternatives | No-action, opposition against offshore breakwaters | 2.0 |
| Ecological Communities | Habitat loss, indirect impacts, erosion | 4.3 |
| Fish and Wildlife | Habitat loss, recreational fishing | 4.4 |
| Endangered and Threatened Species | Impacts to endangered and threatened species | 4.5 |
| Socioeconomics | Impacts related to reduced visitation as a result of potential negative impacts to surfing and fishing resources | 4.6 |
| Cultural Resources | Protection of the Lighthouse, relocation of the Lighthouse | 4.7 |
| Aesthetic and Visual Resources | Loss of land use, aesthetic and visual impacts | 4.12 |
| Recreation | Negative impact to recreational users, including surfing and fishing resources | 4.13 |

This FEIS was filed with the United States Environmental Protection Agency (USEPA). A formal notice indicating that the FEIS is available was published in the Federal Register, and the document has been mailed to individuals and organizations on the mailing list prepared during the scoping process (Appendix A). The public has 30 days from the date of issuance to comment on this FEIS in the form of written comments. The District would review and take the comments into consideration in preparing a Final EIS (FEIS) for the Project.

## 1.7 PERMITS, APPROVALS, AND REGULATORY REQUIREMENTS

As the lead Federal agency for the Project, the District has certain obligations under Section 7 of the Endangered Species Act (ESA); Section 106 of the NHPA; Sections 401, 402, and 404 of the

Clean Water Act (CWA); and the Clean Air Act (CAA). The requirements of these regulations are described below.

Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by any Federal agency (i.e., the USACE) should not "...jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined... to be critical..." (16 USC 1536[a] [2] 1988). The USACE is required to consult with the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) to determine whether any species that is Federally-listed or proposed for listing as threatened or endangered, or its designated critical habitat, occurs in the vicinity of the proposed Project. See Section 4.5 for further discussion.

Section 106 of the NHPA requires the USACE to consider the effects of its undertakings on properties listed in, or eligible for listing in, the NRHP, including prehistoric and historic sites, districts, buildings, structures, objects, and properties of traditional religious or cultural importance. The USACE must afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the undertaking. See Section 4.7 for further discussion.

Several meetings were held between the District and NYSOPRHP and representatives have been in contact through letters and electronic mail since 1992. NYSOPRHP was given the opportunity to review preliminary versions of this FEIS and other documentation (including internal District documents such as the P-7 Report). Many of their comments regarding impacts and mitigation measures were incorporated into this current draft. NYSOPRHP raised concerns regarding Project communication, access, timing, and short and long term impacts. Most of these concerns have been addressed in Section 4.0. Communication with NYSOPRHP will continue throughout all phases of the Project.

At the Federal level, required permits and approval authority outside the USACE's jurisdiction include compliance with the CWA, the Rivers and Harbors Act, and the CAA. All permits, approvals, and consultations required for the Project will be met (see listing in Table 3). Pertinent correspondence with Federal, state, and local agencies are provided in Appendix B of this report.

**Table 3. Federal and State Agency Permits, Approvals, and Consultation Requirements.**

| Permits and Approvals | Status | Agency[1] | Action |
|---|---|---|---|
| *Federal* | | | |
| Clean Water Act of 1977, as amended | Completed | USACE,<br>NYSDEC,<br>USEPA | Conforms to Section 404 |
| Coastal Zone Management Act of 1972, as amended | Completed | NOAA,<br>NYSDOS | Provide a Coastal Consistency Certification for the Project. |
| Endangered Species Act of 1973, as amended | Completed | USFWS,<br>NMFS | Consult on Federal listed threatened and endangered species. |

## Table 3. Federal and State Agency Permits, Approvals, and Consultation Requirements.

| Permits and Approvals | Status | Agency[1] | Action |
|---|---|---|---|
| Marine Mammal Protection Act of 1972, as amended | Completed | USFWS, NMFS | Review of, and comments on, the Project to determine impacts to marine mammals. |
| Fish and Wildlife Coordination Act, as amended | Completed | USFWS, NMFS, USACE | Consult on wildlife resources and conservation practices. |
| National Historic Preservation Act of 1966, as amended | Completed | ACHP, NYSOPRHP | Per Section 106, review of, and comment on, the Project to determine effects on cultural resources that are listed on, or eligible for listing on, the NRHP. |
| Executive Order 11988, Floodplain Management | Completed | USACE | Evaluate the potential effects of the Project with regard to floodplains. |
| Executive Order 11990, Protection of Wetlands | Completed | USACE | Evaluate the potential effects of the Project with regard to wetlands. |
| Farmland Protection Policy Act of 1981, as amended | N/A | NRCS | Analysis of impacts of the Project on prime and unique farmland. |
| Water Resources Planning Act of 1965, as amended | Completed | USACE | Assessment of impacts by the Project on water resources, and related land resources. |
| Wild and Scenic Rivers Act, as amended | N/A | USDI-NPS, USDA-USFS | Analysis to determine impacts by the Project on specific river reaches or areas that are classified as "wild, scenic, or recreational." |
| National Environmental Policy Act of 1969, as amended | Completed | USACE (Lead Agency) | Evaluation of the impacts of the Project on a broad range of environmental resources. |
| Archeological and Historic Preservation Act of 1974, as amended | Completed | ACHP, NYSOPRHP | Evaluation of the impacts of the Project on archaeological and historical resources. |
| Estuary Protection Act, as amended | Completed | USEPA, NMFS | Evaluate the impacts of the Project on estuarine areas. |
| Rivers and Harbors Appropriation Act of 1899, as amended | Completed | USACE | Evaluate the impacts of the Project on navigable waters. |
| Hazardous, Toxic and Radioactive Waste Guidance | Completed | USACE | Guidelines for managing hazardous wastes associated with the Project. |
| Magnuson-Stevens Fishery Conservation and Management Act of 1990 | Completed | NMFS | Evaluate the impacts of the Project on anadromous fish species or fishery resources. |
| Safe Drinking Water Act | Completed | USEPA | Evaluate compliance of the Project on public drinking water supplies, including surface waters and groundwater. |
| ***State and Local*** | | | |

**Table 3. Federal and State Agency Permits, Approvals, and Consultation Requirements.**

| Permits and Approvals | Status | Agency[1] | Action |
|---|---|---|---|
| New York State Department of Environmental Conservation Rules and Regulations, Title 6 part 182 of the New York State Environmental Conservation Law (NYSECL) | Completed | NYSDEC | Consult on state and Federal listed threatened and endangered species. |
| New York State Office of Parks, Recreation and Historic Preservation | Completed | NYSOPRHP | Temporary work easement for actions affecting state parkland |
| Review under State Historic Preservation Act (SHPA) | Completed | NYSOPRHP | Review to determine effects on properties listed on, or eligible for listing on, the NRHP. |
| Review of State Protected Species | Completed | NYSDEC | Evaluation of the effects of the Project on state-protected species. |
| Permit under the State Pollutant Discharge Elimination System (SPDES) | Completed | NYSDEC | Evaluation of the effects of the Project on discharges to water bodies. |
| Permit for Coastal Erosion Hazard Areas, under Article 34 of the NYSECL | Completed | NYSDEC | Evaluation of the effects of the Project on coastal erosion hazard areas. |
| Permit under Freshwater Wetlands Act, Article 24 of the NYSECL | Completed | NYSDEC | Evaluation of the effects of the Project on freshwater wetlands. |
| New York State Department of Environmental Conservation | Pending[2] | NYS DEC | Evaluation of the effects of the Project on Air Conformity Emissions. |
| Water Quality Certification | Pending[2] | NYSDEC | Evaluation of the effects of the Project on water quality. |
| New York State Office of General Services (NYSOGS) | Pending[2] | NYSOGS | Application for permission to use New York State lands underwater. |

[1] See list of abbreviations and acronyms on page viii.

[2] Review of the Project's DEIS and FEIS is required before the issuance of permits.

# 2.0 ALTERNATIVES

The Project Delivery Team performed an analysis of six different Project alternatives as part of the formulation of long-term storm damage protection at Montauk Point. These alternatives were developed to provide the most appropriate form of shoreline stabilization for the Turtle Hill plateau that would eliminate the threat of erosion and provide acceptable levels of protection to historic structures from the impacts of wave attack and storm recession. Alternatives included the no-action alternative (discussed in Section 2.1), one non-structural protection alternative (discussed in Section 2.2), and four structural protection alternatives (discussed in Section 2.3). To accomplish this analysis, the Project Delivery Team identified the causes and rate of shoreline erosion and storm damage, developed general evaluation criteria (i.e., appropriateness to site conditions, compliance with New York State Coastal Zone Management criteria, effectiveness of protection, environmental and cultural impacts, and annual cost), analyzed specific evaluation criteria (i.e., technical, economic, environmental, regional and local interests, and institutional), formulated planning objectives, and considered planning constraints (USACE 2005). Table 4 provides a preliminary evaluation of the impacts and costs associated with the alternatives discussed in more detail in the following sections.

**Table 4. Alternative Impact Evaluation Summary and Costs.**

| **Selected Evaluation Criteria** | **No-Action*** | **Lighthouse Relocation** | **Stone Revetment** | **Offshore Segmented Breakwater with Beach Nourishment** | **T-Groins with Beach Nourishment** | **Beach Nourishment**** |
|---|---|---|---|---|---|---|
| Fish and Wildlife | No-effect | Negative | Negligible | Negative | Negative | Negative |
| Socioeconomics | Negative | Negative | Beneficial | Negative | Negative | Negative |
| Cultural Resources | Negative | Negative | Beneficial | Beneficial | Beneficial | Beneficial |
| Aesthetic and Visual Resources | Negative | Negative | Beneficial | Negative | Negative | Negative |
| Recreation | Negative | Negative | No-effect | Negative | Negative | Negative |
| Total Initial Investment Cost | n/a | $27 million | $13,690.000 | $14,481,000 | $12,094.000 | Not Feasible |

Notes:

* = Does not achieve project objectives.

** = Does not achieve project objectives. Significant adverse effects to the environment, surfing and fishing experiences.

Beneficial = Effects of the given alternative on the evaluation criterion are considered to be positive or beneficial overall.

Negative = Effects of the given alternative on the evaluation criterion are considered to be negative or adverse overall.

Negligible = Effects of the given alternative on the evaluation criterion are considered to be minor and temporary.

No-effect = The given alternative would not affect, either negatively or beneficially, the evaluation criterion.

This table is presented as a summary of points discussed in the text, and is not intended to quantify impacts or otherwise delineate the overall decision making criteria.

## 2.1 NO-ACTION ALTERNATIVE

The no-action alternative consists of a continuation of the without-Project condition. It is estimated that the present revetment structure is susceptible to damage from a 10-year or greater storm event (USACE 2005), but that periodic damage would also occur during lesser events. As a result of the no-action alternative, progressive erosion of the bluff and bluff toe area would result in the irrecoverable loss of the Turtle Hill plateau, the Lighthouse and its associated structures, along with historic and cultural resources.

The no-action alternative assumes that the MHS would continue to conduct routine repairs to the bluff, bluff toe, and the Lighthouse, as they would be needed to keep the structure intact. Although efforts by the MHS to control the erosion are expected to continue, in the absence of a comprehensive shore protection project, their efforts would not solve the problem of significant damage to the Lighthouse associated with threats from large storm events over an extended period of time (e.g., 50 years). It is estimated that repair costs would continue to be required. However, the repair costs over an extended period of time are not anticipated to provide adequate protection to the Lighthouse and adjacent structures. Eventually, additional bluff failure would occur with the slope slumping thereby covering the existing revetment wall rendering its functionality as useless. In addition, there would be costs to investigate and curate historical and culturally significant resources in threatened bluff areas as mandated by the NHPA of 1966, as amended, and the Archeological and Historic Preservation Act of 1974, as amended. Pursuant to these acts, the no-action alternative would involve the obligatory performance of studies of a structures at Montauk Point, including Historic American Building Survey/Historic American Engineering Record (HABS/HAER) drawings and photo-documentation, and performance of archaeological investigations at the Lighthouse and other structures. Also, if the Lighthouse is lost as a result of the no-action alternative, a replacement navigational aid would need to be constructed resulting in additional costs. The loss of the Lighthouse would have a negative impact on the socioeconomic, cultural, aesthetic and visual, and recreational resources in the Project area.

The no-action alternative fails to provide a protection to the Turtle Hill plateau, the Lighthouse and its adjacent structures, and other historically important resources.

## 2.2 NON-STRUCTURAL ALTERNATIVE

The non-structural alternative of relocating the Lighthouse and its associated structures is the only non-structural storm protection measure/alternative identified by the Project Delivery Team. The following subsection provides a brief description of this non-structural protection alternative.

### 2.2.1 Relocation of the Lighthouse

Relocation of the Lighthouse, a NRHP-listed property, and its associated structures inland from their current location was given consideration as a non-structural alternative. The purpose of the relocation of the Lighthouse and its associated structures, features, and archaeological deposits, would be to preserve the existing structures, while simultaneously allowing the natural forces of erosion to continue to reshape the Point.

The relocation alternative would first consist of performing studies of all structures at Montauk Point, including HABS/HAER drawings and photo-documentation, and performing archaeological investigations, removal of any buried archaeological artifacts and ecofacts, at both the present Lighthouse site and at the new location for the Lighthouse and other structures. This alternative also would involve constructing a new land surface, and moving the Lighthouse and its associated structures to this new location.

The preliminary estimated cost for the relocation alternative for the Lighthouse would be approximately $20,000,000. The estimated cost for creation of new land surface and completion of HABS/HAER and archaeological investigation associated with this alternative is $7,000.000, for a total cost of $27,000,000 (USACE 2005).

The relocation alternative would not be feasible for a number of reasons, in addition to the high cost. Relocating the Lighthouse would be difficult because of the unique configuration of Montauk Point, which is located on an elevated plateau that is at about 70 feet above the ocean and approximately 20 to 30 feet higher than land to the immediate west. A new land surface approximately 20 to 30 feet high would have to be constructed inland to the west, as well as immediately east of the current Lighthouse location. This would elevate the adjacent land up to the level of the bluff on which the Lighthouse is presently located, to ensure a stable move across a level surface. A source of fill for this new land surface would have to be identified, and would potentially be subject to a separate environmental review. Relocating the Lighthouse would exclude one of its uses as a navigational aid at Montauk Point and the construction of a tower with a replacement beacon would be required. This would be a permanent effect, as the repositioning of the Lighthouse west of its current position would result in reduced visibility from ocean vessels. Since relocating the Lighthouse would involve the construction of a new platform onto which the Lighthouse would stand and a large track or bridge that the Lighthouse would move upon, impacts to vegetation and terrestrial wildlife habitat would be higher than the other proposed alternatives. Finally, the New York State Office of Parks, Recreation and Historic Preservation (see Letter Number 01), the Regulatory Agency that would have to approve any move of a National Register structure has already stated, and has done so throughout the entire process, that they would not approve the moving of the Lighthouse, which would lead to the destruction of the Lighthouse complex area.

## 2.3 STRUCTURAL ALTERNATIVES

The Project Delivery Team analyzed a total of four different structural storm protection alternatives. This analysis focused on the evaluation and selection of the alternative that best maximized economic benefits and avoided and/or minimized potential impacts to the existing environment. These four approaches included improvements to the existing revetment, two types of offshore breakwaters, and beach nourishment without structures.

### 2.3.1 Stone Revetment

The stone revetment alternative is a structural alternative that was developed for long-term erosion control (Figure 3). This alternative would consist of 840 linear feet of stone revetment protection and would primarily involve reinforcement of the existing revetment structure. The reinforced stone revetment would protect the most vulnerable portion of the bluff area from failure, offering comprehensive protection to the plateau, the Lighthouse and its adjacent structures, and other historically important resources.

The reinforced stone revetment followed Engineering Manual (EM) 1110-2-1614 "Design of Coastal Revetments, Seawalls and Bulkheads." A heavily embedded toe would be employed to stand against breaking waves at the base of the revetment structure. The stone revetment features a 40-foot-wide crest at +25 feet National Geodetic Vertical Datum (NGVD), a 1V:2H side slope, and 12.6-ton quarrystone armor units extending from the crest of the revetment down to the embedded toe (Figure 3). Three layers of 4- to 5-ton armor units would be used to construct the splash apron. Filter cloth and sublayers would be specified in accordance with standard USACE design procedures. The estimated construction cost, including interest, for the this alternative is $13,690,000 (Table 4).

This stone revetment alternative will utilize much of the stone already on site as part of the existing revetment structure, thus making good use of existing resources. The proposed revetment would extend in length 200 feet to the south and would be 7 feet higher than the existing revetment. The proposed revetment would also extent 20-feet seaward from the existing revetment. It is not expected that the reinforced revetment would change present surfing conditions in any way (USACE 2005) and access for fishing would be only temporarily restricted. See Section 4.13 for further discussion of the impacts of the revetment on recreational fishing and surfing. The revetment plan would have the least impact on intertidal, subtidal waters, and benthic substrate, therefore impacts to fish and other aquatic wildlife would be the least of the alternatives considered. Because the bluff face and Lighthouse are offered protection without having a negative effect on surfing, fishing, and tourism, this alternative is expected to have a beneficial effect on cultural resources and socioeconomics of the Project area.

The construction of the revetment might impact potential cultural resources that could be located within the bluff and below the ocean floor where the toe would be excavated. However, survey of the areas impacted by the stone revetment alternative would be easier to implement compared to the other structural alternatives because a smaller total area would be impacted and the impacted area would be closer to the shoreline. Although no further cultural resource studies are planned at Montauk Point, cultural resource monitoring will occur during construction.

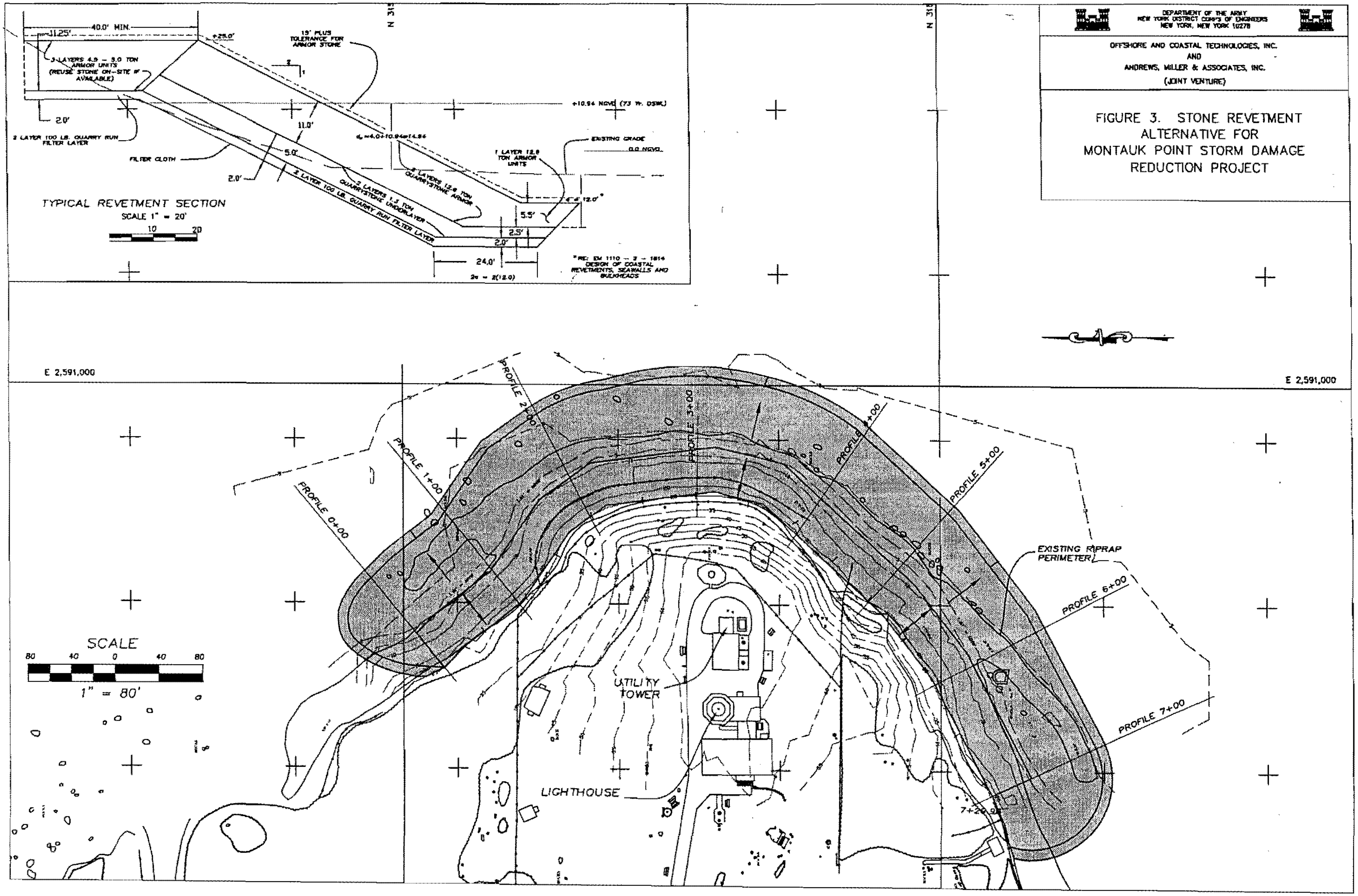


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FIGURE 3. STONE REVETMENT ALTERNATIVE FOR MONTAUK POINT STORM DAMAGE REDUCTION PROJECT

### 2.3.2 Offshore Segmented Breakwater with Beach Nourishment

The offshore segmented breakwater with beach nourishment alternative is a structural alternative that was developed for long-term erosion control (Figure 4). This alternative would consist of approximately 1,100 feet of breakwater protection, constructed parallel to, and approximately 200 feet offshore of, the existing shoreline. The purpose of this alternative would be to reduce the storm wave height offshore of the existing revetment toe, thus reducing the wave impact force and runup elevation on the bluff. Shoreline recession would be reduced with the construction of the offshore segmented breakwater. The existing revetment and the terracing of the upper bluff would provide a reasonable additional level of protection with the offshore segmented breakwater in place.

The offshore segmented breakwater design is based on present USACE guidelines, and would consist of three separate segments, two being 300 feet in length and one 500 feet in length, with the longest facing the southeasterly direction, from which the more severe wave effects are experienced. The breakwater would be a rubble mound structure located about 200 feet offshore at about the –8 feet NGVD contour (Figure 4). The crest would be placed at +7.75 feet NGVD, which is the 73-year water level without wave setup. The armor size would be 17.5 tons, placed in two layers on a single layer of 1.75-ton quarrystone underlayer and 2 layers of 100-pound filter stone. The entire structure would be built on filter cloth.

Following construction of the offshore segmented breakwater, approximately 200,000 cubic yards of beach fill would be placed from about the mean high water level (MHWL) out to the breakwaters to provide additional toe scour protection to the existing revetment. The sand for the beach fill would be placed using a 4,000 cubic yard hopper dredge. The sand would be obtained from Borrow Area IV, seaward of Shinnecock Inlet, a site identified during the Fire Island to Montauk Point Reformulation Study. The estimated construction cost for the offshore segmented breakwater with beach nourishment alternative is $14,481.000 (Table 4).

Offshore breakwaters would be difficult to construct due to difficult site access and in-water construction. Tidal currents in this area are significant and breaking waves arrive from almost all onshore directions. The offshore breakwater would require very large stone and a substantial width and elevation to be effective. The offshore segmented breakwater would not prevent damage to the existing revetment during tidal or storm surges with waves that submerge the +11-foot NGVD berm of the existing revetment. The gaps between the segments of the offshore breakwater could induce significant currents that would continue to scour the bottom, potentially compromising the foundation of the breakwaters sometime in the future (USACE 2005). These strong currents could cause a safety hazard to surfers, fishermen, and other park users. The protective beach fill for the breakwater system would require renourishment at a rate that is difficult to predict until it is constructed and monitored. The rate of renourishment would be further affected by embayments in the beach fill that are expected to form quickly as waves and tides re mold the fill material.

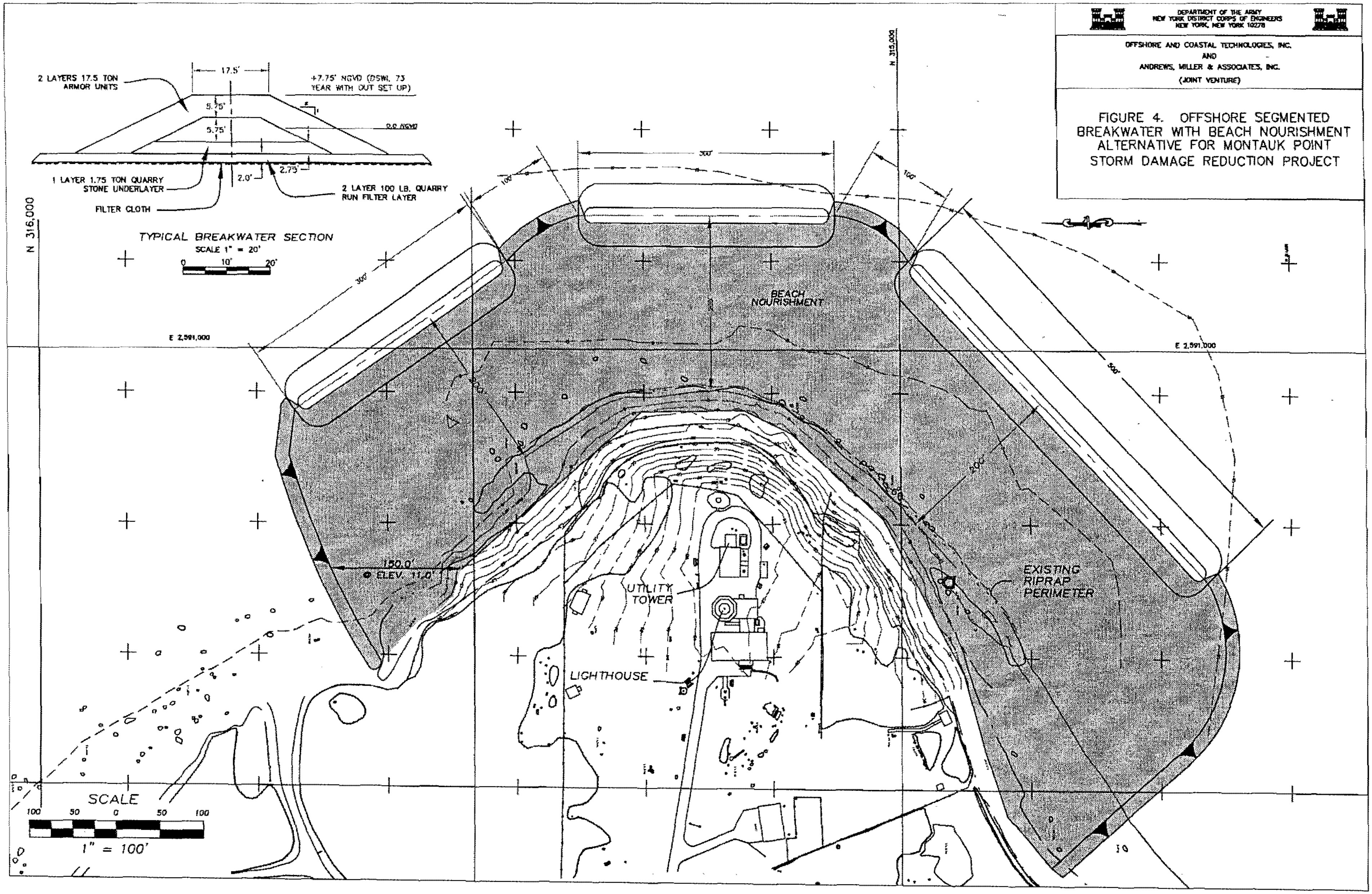

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FIGURE 4. OFFSHORE SEGMENTED BREAKWATER WITH BEACH NOURISHMENT ALTERNATIVE FOR MONTAUK POINT STORM DAMAGE REDUCTION PROJECT

The surfing activity in the area may be affected by changed wave characteristics as a result of the offshore segmented breakwater (USACE 2005). Breakwaters by design are structures intended to reduce wave energy. Although submerged breakwaters may enhance surfing, the existing reefs and their influence on the waves off of Montauk Point are currently providing high quality surfing conditions. A reduction in wave energy off of Montauk Point would have a negative impact on the quality of surfing. As waves propagate shoreward, their breaking shape and geometry are related to the shallow water bathymetry (Galvin 1972, Nelsen 1996), thus beach nourishment would alter the current shallow water bathymetry and affect the current wave conditions off of Montauk Point. It is expected that the surfing conditions in the area would be negatively influenced by implementation of the segmented offshore breakwater with beach nourishment alternative.

Recreational fisherman often use the existing revetment to access deeper subtidal waters. Placement of sand around Montauk Point would create an artificial beach that would hinder fishermen access to deeper waters. In addition, the visual and aesthetic appeal of the area would be negatively influenced by the placement of sand around Montauk Point. The abrupt transition of the bluffs face into the ocean is unique to the area and would be replaced with a transition from bluff face to sloping beachfront.

The construction of the segmented breakwater with beach renourishment may impact potential cultural resources that are located within the bluff, and the intertidal, subtidal, and deep waters where construction of the breakwaters and beach nourishment would occur. Additional cultural resource studies would be necessary to locate and evaluate potential resources in the area.

### 2.3.3 T-Groins with Beach Nourishment

The T-groins with beach nourishment alternative is a structural alternative that was developed for long-term erosion control (Figure 5). T-groins, similar to a nearer-to-shore segmented breakwater system with shore-attached groins, were considered as a second breakwater alternative. Similar to the breakwater alternative presented in Section 2.3.2, the purpose of T-groins is to reduce the storm wave height, thus reducing the wave impact force and runup elevation on the bluff. The consistent beach and shoreline recession would be reduced with the construction of T-groins and beach nourishment. The existing revetment and terracing of the upper bluff would provide a reasonable level of protection with the T-groins in place.

The T-groin system design is based on present USACE guidelines, and would consist of five separate shore-parallel structures, each being 150 feet in length. A groin would be extended from the center of each shore-parallel breakwater segment back to shore, creating individual littoral cells. The T-groin system would be a rubble mound structure located about 100 feet offshore at about the –5-feet NGVD contour (Figure 5). The shore-parallel structure crest would be placed at +11 feet NGVD and the groin section crest would be placed at +8 feet NGVD. The armor size would be 17.5 tons in the shore-parallel structures, placed in two layers on a single layer of 1.75-ton quarrystone underlayer and two layers of 100-pound filter stone. The armor size would be 4.5 tons in the groins, placed in two layers on 900-pound quarrystone underlayer. The entire structure would be built on filter cloth.

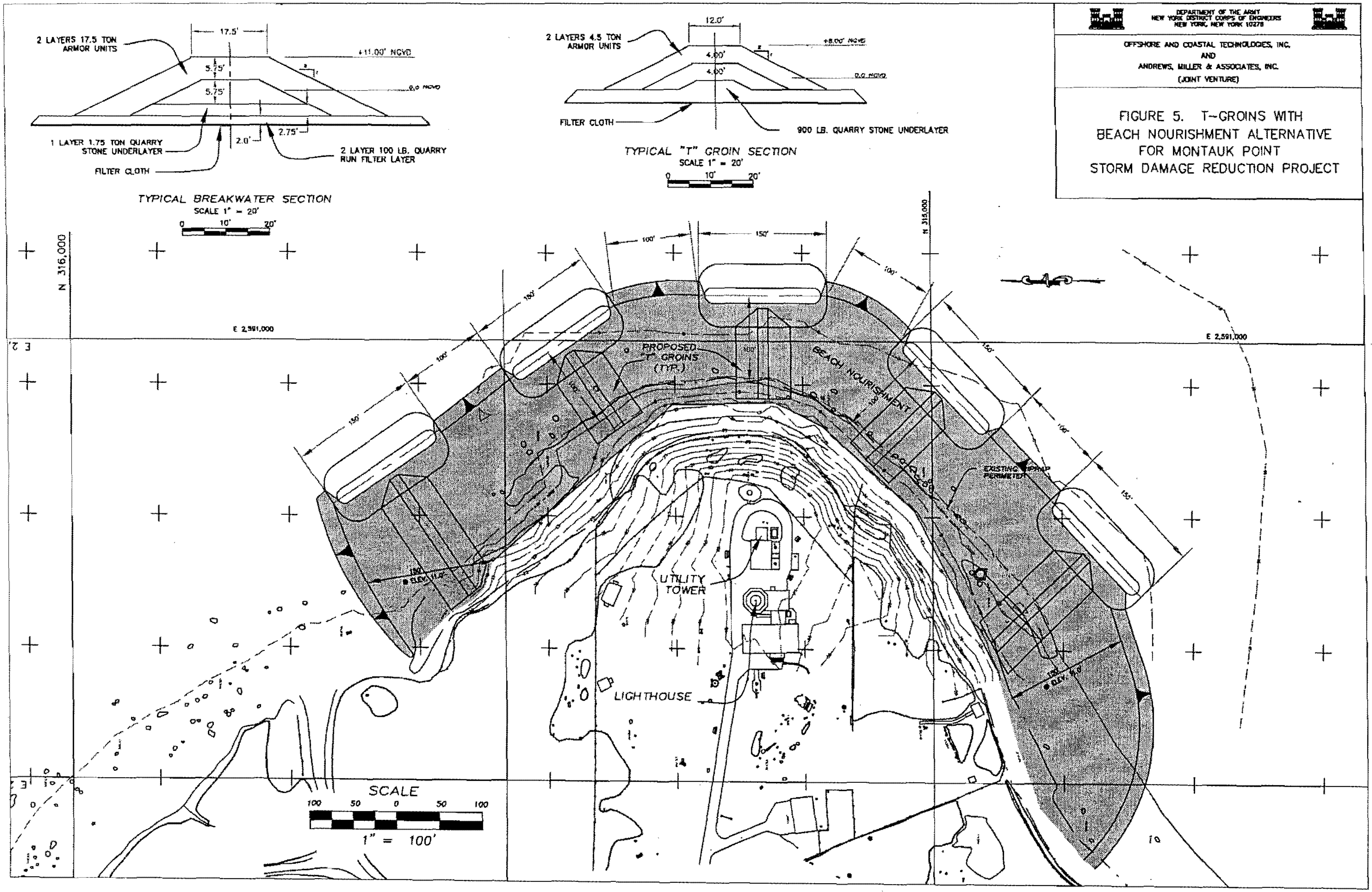

FIGURE 5. T-GROINS WITH BEACH NOURISHMENT ALTERNATIVE FOR MONTAUK POINT STORM DAMAGE REDUCTION PROJECT

Following construction of the T-groin system, a total of approximately 125,000 cubic yards of beach fill would be placed from shore out to the centerline of the shore-parallel breakwaters to provide erosion protection to the bluff toe. The sand would be trucked in from an upland borrow source, which is the more economical borrow source for required quantities of less then 200,000 cubic yards, due to the high mobilization and demobilization costs for offshore borrow implementation. The estimated construction cost for the T-groins with beach nourishment alternative is $12,094,000 (Table 4).

As discussed for the offshore-segmented breakwater with beach nourishment alternative in Section 2.3.2, T-groins would be difficult to construct due to difficult site access and in-water construction. Tidal currents are significant and breaking waves arrive from almost all onshore directions. The shore-parallel structures would require very large stone and a substantial width and elevation to be effective. The T-groin system would not prevent damage to the existing revetment during tidal or storm surges with waves that submerge the +11-foot berm of the shore-parallel structures. The gaps between the shore-parallel structures would allow some tidal circulation but may also induce significant currents that would be concentrated in the gaps between the shore-parallel structures, and that would scour the bottom behind these structures, potentially compromising the foundation of the T-groin system sometime in the future (USACE 2005). The high currents could also cause a safety hazard to surfers, fishermen, and other park users.

The protective beach fill for the T-groin system would require renourishment at a rate that is difficult to predict until it is constructed and monitored. The rate of renourishment would be further affected by embayments in the beach fill that are expected to form quickly as waves and tides remold the fill material. The surfing activity in the area might be affected by the reflected wave characteristics (USACE 2005). Sand accumulated at the end of a groin can sometimes create sandbars that may produce quality surfing waves (Nelson 1996). However, in the case of the El Segundo groin in California, a negative effect on surfing was observed as a result of construction of a 900-foot semi-permeable groin supplemented with a sand renourishment program (Nelson 1996). As waves propagate shoreward their breaking shape and geometry are related to the shallow water bathymetry (Galvin 1972, Nelsen 1996), thus beach nourishment would alter the current shallow water bathymetry and affect the current wave conditions off of Montauk Point. It is expected that the surfing conditions in the area would be negatively influenced by implementation of the T-groins with beach nourishment alternative.

Recreational fisherman often use the existing revetment to access deeper subtidal waters. Placement of sand around Montauk Point would create an artificial beach that would hinder fishermen access to deeper waters. In addition, the visual and aesthetic appeal of the area would be negatively influenced by the placement of sand around Montauk Point. The abrupt transition of the bluffs face into the ocean is unique to the area and would be replaced with a transition from bluff face to sloping beachfront.

The construction of the T-groins with beach nourishment may impact potential cultural resources that may be located within the bluff, and the intertidal, subtidal, and deep waters where construction of the T-groins and beach nourishment would occur. Additional cultural resource studies would be necessary to identify and evaluate potential resources in the area.

### 2.3.4 Beach Nourishment

The beach nourishment alternative, without additional containment structures, is considered a structural alternative that was developed for ongoing erosion control (Figure 6). The purpose of this alternative would be to provide additional shoreline runup area for incoming waves and tidal surges without the expense of construction of more robust or permanent shore protection structures. The existing revetment and terracing of the upper bluff would continue to provide existing levels of protection with the beach nourishment alternative in place.

The beach nourishment design is based on present USACE guidelines and would consist of the construction of a 150-foot-wide sand berm along the existing shoreline, with an elevation of +11 feet NGVD, and a steep slope down to the existing bottom. Beach nourishment, including the sand berm, would require approximately 200,000 cubic yards of beach fill. The sand for this alternative would be placed using a 4,000 cubic yard hopper dredge. The sand would be obtained from Borrow Area IV, seaward of Shinnecock Inlet, a site identified during the Fire Island to Montauk Point Reformulation Study.

The beach nourishment alternative is considered to be not feasible for a number of reasons. High longshore transport rates are expected to remove the beach fill rapidly and at an unpredictable rate, and thus would require constant renourishment. To address renourishment issues, seasonal (or even monthly) beach surveys would be necessary during the first two to three years after construction to refine the design of the beach fill cross section and to estimate the renourishment requirements. As currently designed, the +11-foot sand berm would provide some short-term reduction in the recession of the toe of the bluff, but would not prevent impacts to the bluff face during tidal or storm surges with waves that submerge the +11-foot sand berm, and therefore would not provide adequate storm damage protection.

As waves propagate shoreward their breaking shape and geometry are related to the shallow water bathymetry (Galvin 1972, Nelsen 1996), thus beach nourishment would alter the current shallow water bathymetry and affect the current wave conditions off of Montauk Point. It is expected that the surfing conditions in the area would be negatively influenced by implementation of the beach nourishment alternative.

Recreational fisherman often use the existing revetment to access deeper subtidal waters. Placement of sand around Montauk Point would create an artificial beach that would hinder fishermen access to deeper waters. In addition, the visual and aesthetic appeal of the area would be negatively influenced by the placement of sand around Montauk Point. The abrupt transition of the bluffs face into the ocean is unique to the area and would be replaced with a transition from bluff face to sloping beachfront.

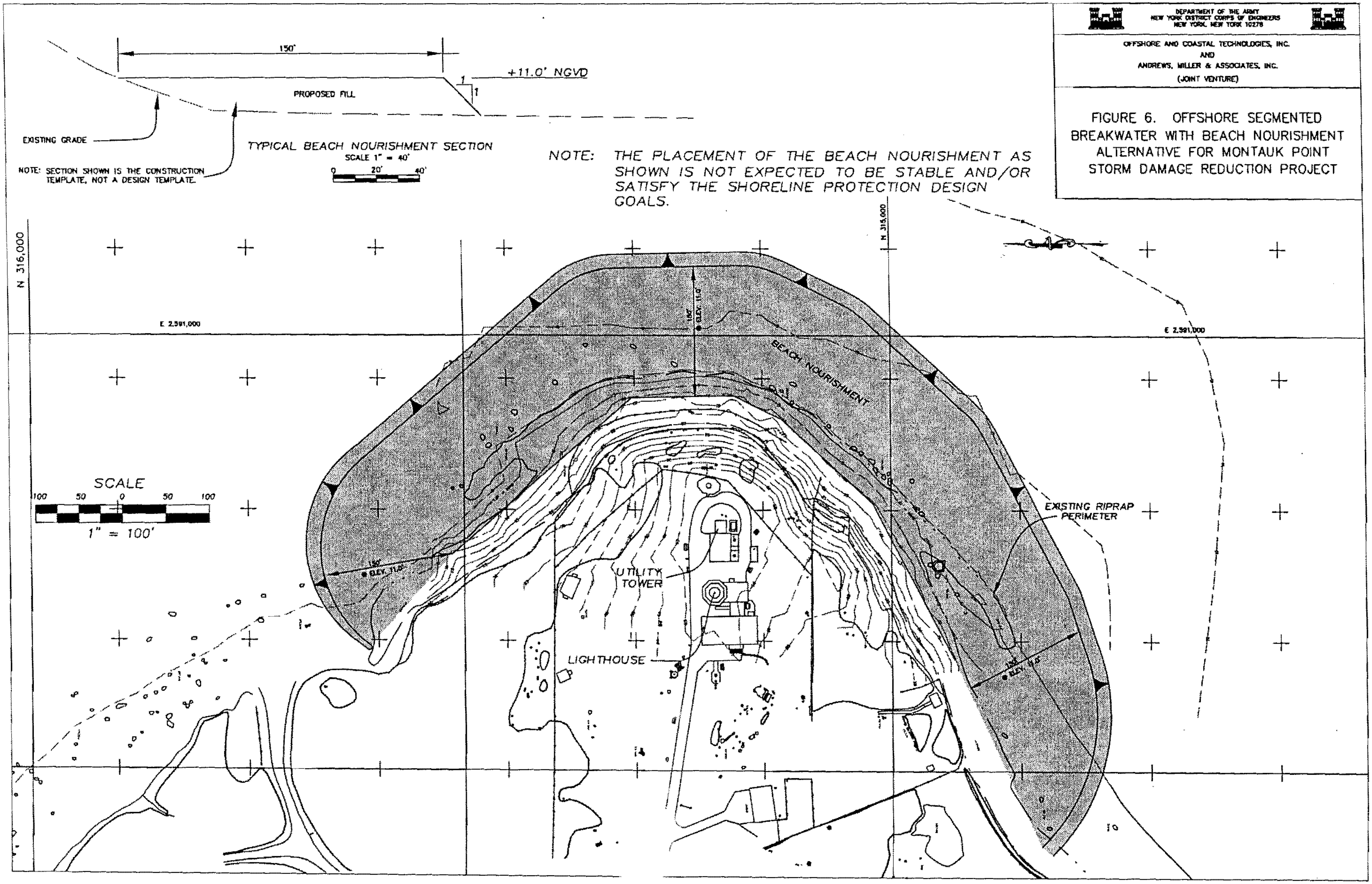

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FIGURE 6. OFFSHORE SEGMENTED BREAKWATER WITH BEACH NOURISHMENT ALTERNATIVE FOR MONTAUK POINT STORM DAMAGE REDUCTION PROJECT

NOTE: THE PLACEMENT OF THE BEACH NOURISHMENT AS SHOWN IS NOT EXPECTED TO BE STABLE AND/OR SATISFY THE SHORELINE PROTECTION DESIGN GOALS.

NOTE: SECTION SHOWN IS THE CONSTRUCTION TEMPLATE, NOT A DESIGN TEMPLATE.

The construction of the beach nourishment alternative could impact potential cultural resources that may be located within the bluff, and the intertidal, subtidal, and deep waters where placement of the sand would occur. Additional cultural resource studies would be necessary to locate and evaluate potential resources in the area.

## 2.4 SELECTED PROJECT ALTERNATIVE

As summarized in Sections 2.2 and 2.3, the Project Delivery Team performed an evaluation of each of the six non-structural and structural alternatives by examining each alternative plan's method of shore protection, acceptance by state and local sponsors, estimated first cost, and estimated annualized cost. In addition, the Project Delivery Team selected the most practicable overall alternative plan that maximized socio-cultural benefits, and avoided or minimized environmental impacts (Table 4). The stone revetment alternative was selected as the plan that best met these planning objectives.

The stone revetment alternative is described in detail in Section 2.3.1 and the location and design of the storm protection structure is depicted in Figure 3. Access roads and staging areas that will be used for construction of the selected Project alternative are depicted in Figure 7. However, as recommended by the USFWS, Access Road 2 (Figure 7) would not be used to minimize impacts to wildlife resources and adjacent coastal habitats (i.e., beach and dune habitat) (USFWS 2003; Appendix B). Access Road 1 and Alternate Access Road 2 would be used for access under the selected alternative.

### 2.4.1 Impact Avoidance and Minimization

Throughout the Project planning process, the Project Delivery Team formulated alternative design plans to meet Project planning objectives, including avoidance and minimization of environmental impacts, while considering the preferences of various interested parties with regard to Project design. The Project Delivery Team has consulted and coordinated its Project planning efforts with the non-Federal cooperating agency (the NYSDEC), NYSOPRHP, USFWS, and the NMFS to solicit recommendations for further avoidance and minimization of potential impacts caused by the selected alternative.

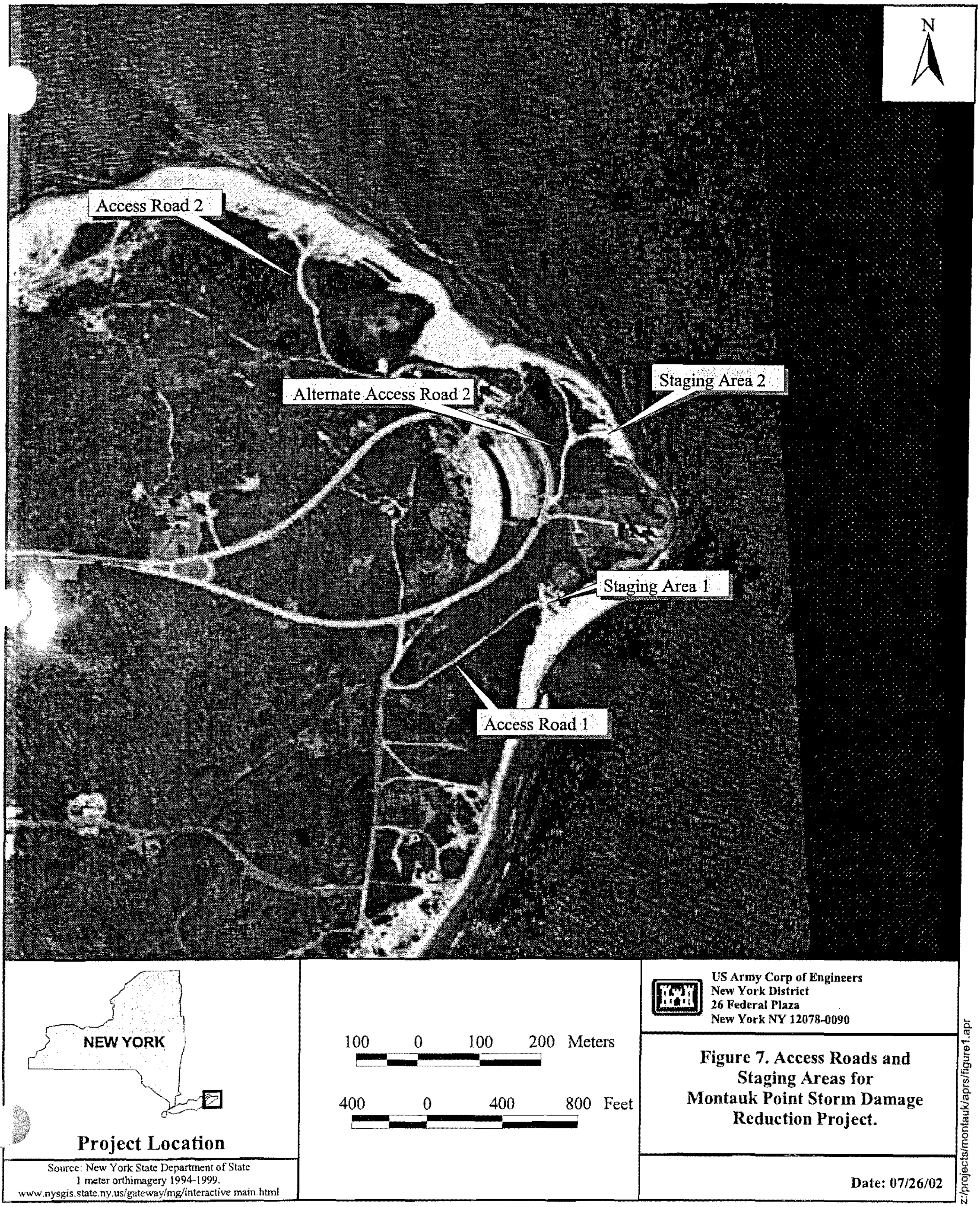
During the initial stages of the Project feasibility phase in February 2002, the Project Delivery Team identified two of four alternatives that would provide long-term shore protection measures for the bluff and Turtle Hill plateau at Montauk Point. The revetment and the offshore segmented breakwater with beach nourishment alternatives were found to reduce the rate of erosion in the Project area due to storm events and continual wave action. However, the revetment was the most cost effective long-term storm protection structure, based on lower annual cost over the project evaluation period (50 years) (USACE 2005). The revetment project scale was economically optimized and the revetment that would protect against the effects of a 73 years design storm maximized the net economic benefits and was designated as the National Economic Development (NED) Plan and selected as the tentatively recommended project. In addition, it was determined that the segmented offshore breakwater with beach nourishment alternative would have an unacceptable level of negative impact on surfing, recreational fishing, and aesthetic and visual resources.

On May 8, 2003, the District held a meeting with local representatives of various agencies and interested parties including the Surfrider Foundation, Montauk Surfcasters Association, and New York Sport Fishing Federation. The selected Project alternative was presented to the attendees of this meeting. Representatives from the Surfrider Foundation were pleased to see that no offshore hard structures such as breakwaters or groins were part of the District's preferred alternative. Additionally, they stated that the proposed alternative should have little to no effect on surfing areas in the vicinity of Montauk Point. The Montauk Surfcasters Association and the New York Sport Fishing Federation were primarily concerned about the final height and slope of the revetment and access during construction. The District informed these parties that the new revetment would be built to be as similar to the existing revetment as possible considering Project goals and engineering constraints. The District also informed these parties that concessions would be considered to allow limited access by fisherman to Project area during construction, however access would need to be determined at the time of construction and would depend primarily on safety.

Following selection of the most practicable alternative plan for the Project, the Project Delivery Team continued its systematic and iterative engineering design approach to further maximize socio-cultural benefits, and to avoid and minimize environmental impacts. Measures and plans to avoid and minimize short-term negative impacts to the environment caused by implementation of the selected alternative are presented in Section 4.0 where applicable.

### 2.4.2 Project Mitigation

The selected alternative was designed and further refined to avoid and minimize potential direct, indirect, and cumulative impacts to various environmental resources. The environmental analysis presented in Section 4.0, Environmental Consequences, indicates that implementation of the selected alternative would not lead to substantial negative direct or indirect, short-term or long-term impacts on the environment. Therefore, mitigation measures to off-set significant losses would not be necessary under implementation of the selected alterative.



**Project Location**

Source: New York State Department of State
1 meter orthimagery 1994-1999.
www.nysgis.state.ny.us/gateway/mg/interactive main.html

**US Army Corp of Engineers**
**New York District**
**26 Federal Plaza**
**New York NY 12078-0090**

**Figure 7. Access Roads and Staging Areas for Montauk Point Storm Damage Reduction Project.**

**Date: 07/26/02**

z:/projects/montauk/aprs/figure1.apr

# 3.0 AFFECTED ENVIRONMENT

## 3.1 TOPOGRAPHY, GEOLOGY, AND SOILS

Topographically, the Project area is characterized by a high bluff composed of glacial till, which is approximately 70 feet above MSL, with steep slopes and abbreviated rocky shorelines surrounding the bluff. The Project area is located in the Atlantic coastal plain province, which extends along the eastern United States and consists of loose, unconsolidated Cretaceous to recent sediments resting on a deeply buried crystalline rock floor.

The South Fork of Long Island, including the Montauk Peninsula, was formed by the deposition of the Ronkonkoma terminal moraine of the most recent (Wisconsin) glaciations. Montauk Point is mostly composed of glacial till with a wide range of particle sizes. The underlayer, also known as Montauk till, contains boulders of considerable size. On top of this layer is a stratified layer called the Hempstead Gravel, which is made of distinct sublayers of sands, silts, and clays (USACE 2005).

The soil series present at Montauk Point are part of the Montauk Series Sandy Variants. These soils are composed of well-drained, coarse-textured soils with a fragipan or compact layer over glacial till. The surface layer is usually very dark grayish-brown loamy sand. The subsoil is primarily a yellowish-brown to dark yellowish-brown loamy sand and the till substratum is a compact, dark yellowish-brown loamy sand.

The topography of the Project area has undergone significant change over the last century. In the past 125 years of record, the seaward bluff at Montauk Point has retreated approximately [illegible] feet and the beach area has seen approximately 305 feet of erosion (USACE 2005). This erosion of the bluff is a result of the combined effect of storm waves, ground water flow and seepage, wind, and rain. Despite numerous protection projects, the existing shoreline and bluff in the Project area continue to erode (USACE 2005).

## 3.2 WATER RESOURCES

### 3.2.1 Regional Hydrology and Groundwater Resources

Long Island's groundwater reservoir consists of a sequence of unconsolidated glacial, lacustrine, deltaic, and marine deposits of clay, silt, sand, and gravel that range in age from Upper Cretaceous to Pleistocene (United States Geological Survey [USGS] 2002). Three principal aquifers underlie Long Island. They are unconsolidated deposits of Pleistocene age, referred to as the upper glacial aquifer, and unconsolidated deposits of Cretaceous age, that include the Magothy aquifer above and the Lloyd aquifer below (USGS 1995). The three aquifers are bounded above by the water table and below by the crystalline bedrock surface. Laterally, usable freshwater in the aquifers is bounded by a freshwater-saltwater transition zone that surrounds the island (USGS 1995).

### 3.2.2 Surface Water

The principal waterbodies in the Project area are the Atlantic Ocean to the south and the Block Island Sound to the north. In general, water quality improves eastward along the southern coast of Long Island away from New York City. The NYSDEC has assigned a "Class SA" water quality classification to the waters surrounding the Project area. Class SA surface waters are defined within the New York State Codes, Rules, and Regulations (NYSCRR), Title 6, Chapter X Parts 700-705, Section 701.10, as saline surface waters best used for shellfishing for market purposes, and primary and secondary contact recreation and fishing, and are considered suitable for fish propagation and survival. The waters around the Project area are part of the extreme eastern extent of the Peconic Bay Estuary, which is part of the USEPA's national environmental estuary program. Overall the estuary generally has "excellent" water quality with respect to nutrients and dissolved oxygen, with less than three percent of the estuary exceeding the recommended total nitrogen guideline for dissolved oxygen attainment (Association of National Estuary Program [ANEP] 2002).

### 3.2.3 Tidal Influences

Tides in the Project area are semi-diurnal with MSL of 1.2 feet above mean lower low water (MLLW) and the mean spring high tide of 2.4 feet above MLLW (USACE 2005). Tidal currents off of Montauk Point are generally strong and can reach nearly 3 knots (USACE 2005). These currents are strong enough to affect littoral processes. Normal waves reaching the Project area include both the locally generated short period wind waves, and the long period sea swells generated in the deep ocean.

Storm surge is the rise above normal water level on the open coast due to the action of wind stress, and in the case of hurricanes, due to atmospheric pressure reduction as well as wind stress. Hurricanes or large storms can result in a combined storm surge and wave crest level approximately 30 feet above MSL (USACE 2005).

## 3.3 ECOLOGICAL COMMUNITIES

The Lighthouse is located on a glacial till plateau surrounded by marine intertidal rocky habitat, beaches, dunes, vegetated uplands, steep coastal bluffs, and wetlands. State and Federally-listed endangered, threatened, and rare plant species and communities of special concern are discussed in Section 3.5.

### 3.3.1 Marine Rocky Intertidal Habitat

Much of following information is taken directly from the USFWS's Fish and Wildlife Coordination Act Section 2(b) Report (FWCAR) (Appendix E) where marine rocky intertidal habitat is discussed in detail.

Marine rocky intertidal habitat at Montauk Point is primarily located within the intertidal zone on the northern and southern ends of the revetment (USFWS 2003). Presently only 18 acres of marine rocky intertidal habitat exists at Montauk Point. Its Natural Heritage rank is "high" with its occurrence rate not specifically known, ranging from 5 or fewer (S1) to 6–20 (S2) occurrences. It is described as the only natural rocky intertidal area of Long Island (USFWS 2003). It is a unique habitat type because it is exposed to colder waters and higher wave action than other Long Island habitats.

This marine rocky intertidal habitat at Montauk Point is specifically classified as boulder beach (USFWS 2003). Boulder beaches are partially exposed beaches primarily composed of round boulders between 10 inches and 10 feet in diameter (USFWS 2003). Underneath each boulder lies a thick layer of coarse and fine sediments that typically support infaunal communities. Boulder fields function as a stable environment for the attachment of algae and organisms (Ward 1999). Larsen and Doggett (1981) describe boulder beaches as one of the most diverse of the intertidal habitats. A complete discussion of the organisms occupying this habitat type is presented in Section 3.4.1.

Mr. Larry B. Liddle, a professor of Biology and Marine Science at Southampton College of Long Island University, described the geologic and biological importance of marine rocky intertidal habitat as "The Montauk Lighthouse sits on a bluff that overlooks the only natural rocky intertidal area in Long Island. Directly in front of the lighthouse and north of it is the richest part of that zone, a small stretch of approximately 200 feet of rocky intertidal. It is a unique area because of the particular geographical location of Long Island with respect to the impact of the glacier, latitude and the impact of the Gulf Stream. This rocky intertidal is exposed to colder waters, more active currents and higher wave action than other habitats on Long Island. unique topography of boulder-sized rocks which create tide pools, supports a marine flora and fauna characteristic of a more northern habitat such as seen on the north side of Cape Cod, Massachusetts, on up to Maine. To the south there is little natural rocky intertidal anywhere all the way to Florida. The biota at Montauk, however, is unique because it includes both northern species, such as the rock weed *Ascophyllum nodosum* with lesser abundance, and southern species such as *Sargassum filidipendula,* not seen above Southern Connecticut. All the organisms in this dynamic habitat are maintained by active recruitment of stages that are capable of attaching to the rocks under high wave conditions. It is well known that the spawn of many intertidal organisms is released at low tide with a lunar periodicity in order to effectively establish populations during periods when wave action doesn't wash the new individuals out to sea away from their preferred substrate" (USFWS 2003).

### 3.3.2 Beach and Dunes

The beaches to the north and south of the Lighthouse are narrow and sparsely vegetated communities on substrates of unstable sand, gravel, or cobble. These communities occur above mean high tide and are often modified as a result of storm waves and wind erosion. The maritime dunes associated with these beaches are covered by American beachgrass (*Ammophila breviliqulata*) and wooly beachheather (*Hudsonia tomentosa*). Farther landward where there is a decrease in the amount of salt spray and sand burial, less specialized species such as seaside goldenrod (*Solidago sempervirens*) and beach pea (*Lathyrus japonicus*) accompany the

American beachgrass. The composition and structure of the vegetation on the dunes is often variable depending on dune stability (Edinger et al. 2002).

### 3.3.3 Vegetated Uplands and Bluffs

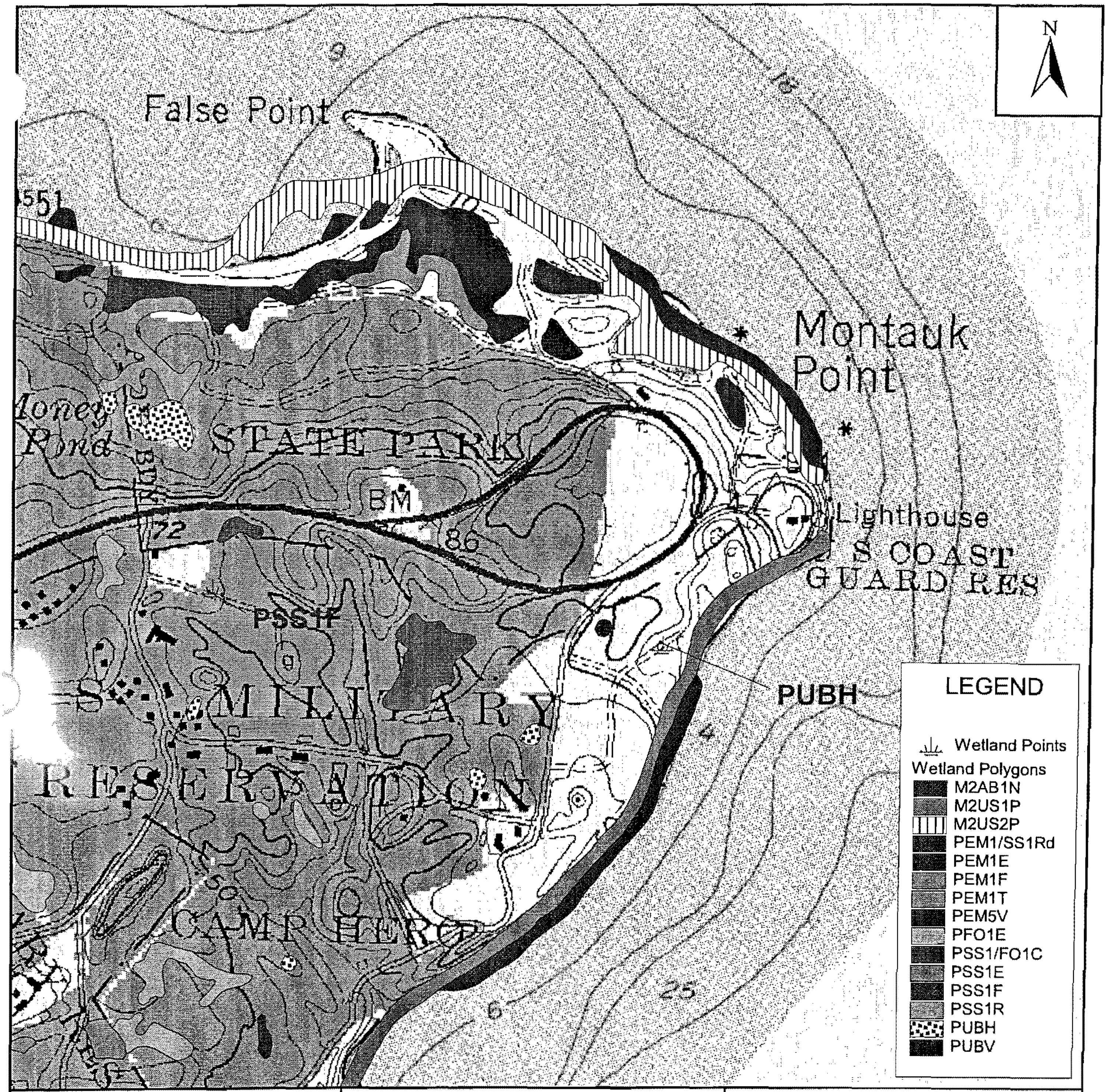
A mosaic of open canopy maritime plant communities occurs on much of the Montauk Peninsula, particularly grassland, heathland, and shrubland communities. These communities comprise what is collectively referred to as moorlands (USFWS 1997, Edinger et al. 2002). These maritime communities occur on sandy, glacially derived soils of the Atlantic Coastal Plain and are under the influence of a maritime climate characterized by moderate temperatures, a long frost-free season, ocean winds, and salt spray. The grasslands are generally dominated by bunch-forming grasses such as little bluestem (*Schizachyrium scoparium*), common hairgrass (*Deschampsia flexuosa*), and poverty-grass (*Danthonia spicata*). Maritime heathlands on the Montauk Peninsula are dominated by bearberry (*Arctostaphylos uva-ursi*), beach heather (*Hudsonia tomentosa*), blueberry (*Vaccinium* spp.), black huckleberry (*Gaylussacia baccata*), bayberry (*Myrica pensylvanica*), and beach plum (*Prunus maritima*). Maritime shrublands include black cherry (*Prunus serotina*), pin cherry (*Prunus pensylvanica*), American holly (*Ilex opaca*), sumac (*Rhus glabra* and *R. copallinum*), bayberry, arrow-wood (*Viburnum dentatum* var. *lucidum*), hawthorn (*Crataegus* spp.), beach plum, wild rose (*Rosa* spp.), catbrier (*Smilax rotundifolia*), and blackberry (*Rubus* spp.) (USFWS 1997, Edinger et al. 2002). Shrubs such as scrub oak (*Quercus ilicifolia*), beach plum, salt-spray rose, bayberry, blueberry, and catbriar are also present adjacent to the maintained herbaceous lawn that surrounds the Lighthouse. The revetment surrounding Montauk Point is generally unvegetated (Figure 2).

Steep coastal bluffs surround Montauk Point to the north, east, and south. Bluffs are an important part of the beach system and bluff erosion can act as a sand supply for the beach. Unlike most beach habitats, bluffs will never rebuild as a result of accretion. Processes influencing bluff erosion include storm wave action, surface water runoff, groundwater seepage, and anthropogenic intervention in natural erosion and sediment supply processes (Bortman and Niedowski 1998). In addition to the natural vegetation species that may be found on the steep bluffs of Montauk Point, vegetative erosion control measures were implemented by the Montauk Historical Society to stabilize the face of the bluff in front of the Lighthouse. These measures involved terracing of the bluff face with filter boxes, and planting species such as beach grass and salt-spray rose (*Rosa rugosa*) (Montauk Lighthouse Erosion Control Project 2002).

### 3.3.4 Wetlands

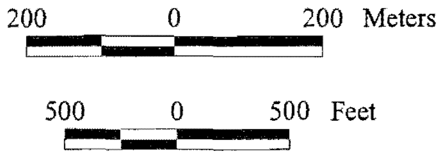
The National Wetland Inventory map indicates that the Project area contains 16 different wetland types (USFWS 1981-2002). However, only five of these wetlands are in the immediate area of the proposed Project (Figure 8).

The five coastal wetland types present in the immediate area of proposed construction activities are further divided into palustrine and marine coastal wetlands. The two coastal palustrine wetlands are PUBV and PEMV5 (Figure 8). Unconsolidated bottoms with permanent tidally influenced conditions characterize PUBV wetlands. PEMV5 wetlands are tidally influenced freshwater system wetlands with a water chemistry characterized as having a mesohaline coastal halinity (i.e., chloride in the water ranges from 0.3% to 1.0%). These two wetland types are associated with the coastal pond communities that have formed along the north shore of the Montauk Peninsula from False Point to Montauk Point (Figure 8).



**Project Location**

Source: USGS 7.5' Series Topographic Quadrangle, Montauk Point, NY 1956; U.S. Fish & Wildlife Service, National Wetlands Inventory 1995; Date of Photography: 1984.



**US Army Corp of Engineers**
**New York District**
**26 Federal Plaza**
**New York NY 12078-0090**

**Figure 8. National Wetland Inventory Map. Montauk Point Storm Damage Reduction Project.**

**Date: 08/26/02**

z:/projects/montauk/aprs/figure1.apr

Coastal pond communities generally are viewed as exceptionally valuable because of their unusually high species diversity (Keddy and Reznicek 1982), as well as their rare occurrence in coastal areas that are relatively developed. These ponds are fed primarily by freshwater seepage and extensive drainage from the adjacent high ground, and are also subjected to intermittent brackish contributions caused by dune breaching during storm events. Many of the coastal ponds in the Project area are heavily degraded from siltation caused by several environmental pressures including wind disturbance (and accompanying sand movement), salt spray, water level fluctuations, and human activities, and are dominated by common reed (*Phragmites australis*). Two larger ponds, dominated by cattail (*Typha latifolia*), are located slightly further inland and retain greater vegetative diversity.

The three coastal marine wetland types present in the immediate area of proposed construction activities are M2US2P, M2AB1N, and M2US1P (Figure 8). M2US2P wetlands are characterized as marine intertidal wetlands with unconsolidated sand shores and a tidal water regime that is irregularly flooded. M2AB1N wetlands are characterized as marine intertidal wetlands with algal aquatic beds and a tidal water regime that is regularly flooded. Marine intertidal wetlands with unconsolidated cobble or gravel shores and a tidal water regime that is irregularly flooded characterize M2US1P wetlands. These three marine wetlands types comprise the sand and cobble shores to the north and south of the existing revetment and are generally devoid of any vegetation.

### 3.3.5 Invasive Species

Under Executive Order 13112, Federal agencies whose actions may affect the status of invasive species shall not authorize, fund, or carry out actions that are likely to cause or prom introduction or spread of invasive species in the United States or elsewhere unless the agency had determined and made public its determination that benefits of such action clearly outweigh the potential harm caused by invasive species. The Invasive Plant Council of New York State (IPCNYS) created a list of the 20 most invasive species in New York (IPCNYS 2001). Although this list does not have legal status, it is generally considered the best reference for invasive plants in the state. Of the species on the list, common reed (*Phragmites australis*) occurs in the vicinity of the Project area and therefore has the potential to be spread as a result of implementation of the proposed Project. The majority of the vegetated community types at Montauk Point are relatively free of invasive species.

## 3.4 WILDLIFE

The types and quality of habitats in the Project area are suitable for a diverse group of migratory and resident wildlife species. These habitats include deepwater habitats, marine and maritime beaches, intertidal swales, coastal pond communities, natural dunes, and maritime shrublands that provide habitat for many species of fish and wildlife in and near Montauk Point.

State and Federally-listed endangered and threatened wildlife species and communities of special concern are discussed in Section 3.5.

### 3.4.1 Benthic Communities

Much of following information is taken directly from the USFWS's FWCAR (Appendix E) where the benthic community of marine rocky intertidal habitats is discussed in detail.

Site-specific studies and/or surveys describing the diversity and abundance of benthic organisms within the Project area are not available. Benthos can be described as the complex community of plants and animals that live on or in the bottom sediments of oceans, streams, and wetlands. The bottom composition of the Project area is composed of mostly rock along the existing revetment, surrounded by intertidal gravel/sand beaches to the north and south of Montauk Point. Both intertidal rocky habitat and beach habitat at the Project area are exposed to rough, high-energy waves. Distribution and composition of benthic fauna within the Project area is dependent on the organism's ability to withstand heavy wave action and current motion, duration of exposure to the air, wide fluctuations in temperature and salinity, and the ability to exhibit diverse adaptations to harsh environments (Duxbury 1971, Lalli and Parsons 1993).

Marine rocky intertidal habitat at Montauk Point is classified into three different zones, low intertidal, mid-intertidal, and high intertidal zone (USFWS 2003). Physical factors such as the duration of air exposure, wave force, salinity, and biological factors such as competition for space and predation, play a key role in species survival in each zone (Raffaelli and Hawkins 1996). Generally, physical factors dominate survival in the upper tidal zone and biological factors are more important in the lower zone (Chiba and Noda 2000).

The low intertidal zone is an area only exposed during the lowest tides and is underwater most of the time. Seaweeds and several species of benthic organisms are found here and relative to the upper parts of the rocky shore, there is tremendous species diversity in this zone (Lerman 1986). Southern kelp (*Laminaria saccharina*) and purple sea urchin (*Urbica pustulate*) are two species typically found in a northeastern rocky shore, low intertidal zone. Hydroids, bryozoans, sea slugs, worms, crabs, and tunicates are among the invertebrates that live on the seaweeds in the low intertidal zone (Lerman 1986).

The mid-intertidal zone is briefly exposed to air once or twice a day at low tide. Sessile invertebrates such as barnacles (*Balanus* spp.), mussels (*Mytilus* spp.), and chitons (*Tonically* spp.), can be found throughout this zone, as well as mobile species such as green crab (*Cacicus menus*) and common sister starfish (*Asterias forbesi*), which feed upon sessile invertebrates. Rockweed (*Fucus* spp.) is the dominant submerged aquatic vegetation and provides cover and substrate for many plants and animals (Lerman 1986).

The high or upper intertidal zone is exposed to air for long periods twice a day (DeVogelaere 1996). Because this zone extends above the highest point wetted by the tide, some of the permanently attached organisms are only moistened by salt spray and splash from breaking waves (Lerman 1986). The animals and plants living here are able to withstand long periods exposed to the air. Snails of the genus *Littorina*, commonly called periwinkles, are the dominant animals. They are mobile and will graze on the algal film that covers the substrate. During exposure to air, they retreat into their shells and seal the opening with mucous secretions. This allows them to retain moisture and avoid desiccation. Limpets (*Notoacmaea* spp.) are also found among the periwinkles, grazing on microscopic blue-green algae (*Calothrix* spp.) and lichen (*Verrucaria* spp.) (Lerman 1986).

Other common rocky habitat benthic species found within the Project area consist of American lobster (*Homarus americanus*), bee chitons (*Chaetopleura apiculata*), Atlantic rock crab (*Cancer irroratus*), blue mussel (*Mytilus edulis*), bryozoans (*Crytosula* spp. and *Microporella ciliata*), common oyster (*Crassostrea virginica*), frilled anemone (*Metridium senile*), isopods (*Idotea* spp.), northern rock barnacle (*Balanus balanoides*), northern horse mussel (*Modiolus modiolus*) periwinkles (*Littorina* spp.), scuds (*Gammarus* spp.), and sea stars (*Asterias* spp. and *Leptasterias* spp.) (USACE 1993, USFWS 2003). Infaunal clams including soft shell clam (*Mya arenaria*) and jingle shell clam (*Anomia simples*) may also be found in this area (USFWS 2003).

Intertidal zones of sandy beaches exposed to severe wave action often seem entirely devoid of life and appear barren when compared with rocky shores or mud communities (Lalli and Parsons 1993). Common sandy habitat benthic species found within the Project area consists of air-breathing amphipods (beach hoppers or beach fleas), Atlantic horseshoe crab (*Limulus polyphemus*), fast burrowing wedge-shaped clams (*Donax* spp. and *Tellina* spp.), ghost crab (*Ocypode quadrata*), isopods, and burrowing polychaete (segmented) worms such as the bamboo worm (*Clymenella torquata*) and trumpet worm (*Pectinaria gouldi*) (Lalli and Parsons 1993, USACE 1993).

### 3.4.2 Finfish and Shellfish

The nearshore zones of Long Island and New Jersey share a number of characteristics and are part of a larger ecosystem called the Mid-Atlantic Bight. More than 60 species of marine and anadromous fish use this ecologically productive ecosystem as a feeding area (USFWS 1997). Table 5 provides a list of the commonly identified finfish and shellfish species near the Project area.

Finfish

Important commercial and recreational finfish species found near the Project area include the American sand lance (*Ammodytes americanus*), American shad (*Alosa sapidissima*), *Atlantic croaker (Micropogonias undulates*), Atlantic mackerel (*Scomber scombrus*), Atlantic menhaden (*Brevoortia tyrannus*), black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), northern kingfish (*Menticirrhus saxatilis*), scup (*Stenotomus chrysops*), spot (*Leiostomas xanthurus*), striped bass (*Morone saxatillis*), summer flounder (*Paralichthys dentatus*), weakfish (*Cynosion regalis*), and winter flounder (*Pseudopleuronectes americanus*) (USFWS 1997, Bortman and Niedowski 1998, USFWS 2003). The Great Peconic Bay to Montauk Point appears to be much more productive than other estuaries and embayments around Long Island for finfish species such as weakfish, winter flounder, and scup (Peconic Estuary Program [PEP] 2001). Migratory finfish species such as bluefish, summer flounder, striped bass occur in seasonal abundance at Montauk Point (PEP 2001).

Common migrant anadromous species found near the Project area include the alewife (*alosa pseudoharengus*), American shad, Atlantic menhaden, Atlantic silverside (*Menidia menidia*), blueback herring (*Alosa aestivalis*), and striped bass (USFWS 1997, Bortman and Niedowski 1998, PEP 2001).

**Table 5. Finfish and Shellfish Species Likely to Occur in the Vicinity of the Project Area.**

| Common Name | Scientific Name |
|---|---|
| **Finfish** | |
| Alewife | *Alosa pseudoharengus* |
| American sandlance | *Ammodytes americanus* |
| American shad | *Alosa sapidissima* |
| Atlantic croaker | *Micropogonias undulates* |
| Atlantic mackerel | *Scomber scombrus* |
| Atlantic menhaden | *Brevoortia tyrannus* |
| Atlantic silverside | *Menidia menidia* |
| Bay anchovy | *Anchoa mitchilli* |
| Black sea bass | *Centropristis striata* |
| Blueback herring | *Alosa aestivalis* |
| Bluefish | *Pomatomus saltatrix* |
| Northern kingfish | *Menticirrhus saxatilis* |
| Scup | *Stenotomus chrysops* |
| Spot | *Leiostomas xanthurus* |
| Striped bass | *Morone saxatilis* |
| Summer flounder | *Paralichthys dentatus* |
| Weakfish | *Cynoscion regalis* |
| Winter flounder | *Pseudopleuronectes americanus* |
| **Shellfish** | |
| American lobster | *Homarus americanus* |
| Blue crab | *Callinectes sapidus* |
| Blue mussel | *Mytilus edulis* |
| Common oyster | *Crassostrea virginica* |
| Purple sea urchin | *Arbacia puncyulata* |
| Rock crab | *Cancer irroratus* |

Source: USACE 1993, USFWS 1997, Bortman and Niedowski 1998.

### Shellfish

Site-specific studies and/or surveys describing the diversity and abundance of shellfish within the Project area are not available. Shellfish species with important commercial or recreational value near the Project area are American lobster, blue mussel, common oyster, purple sea urchin, Atlantic rock crab, and Atlantic surf clam (*Spisula solidissima*) (USFWS 2003).

Unlike the finfish species that have the capabilities of swimming freely in the water column to escape desiccation, temperature and salinity extremes, and high energy wave actions, shellfish species in the intertidal and subtidal zones of the Project area possess diverse adaptations for living on rocky shores (Lalli and Parsons 1993). Common oyster are known to secrete cementing substances for firm attachment, whereas blue mussel secrete tough elastic byssal threads from a gland in the foot to secure their position. In addition, certain animals (e.g., some sea urchins and rock-boring clams) are equipped to bore into hard surfaces by mechanical abrasion and/or chemical secretion (Lalli and Parsons 1993).

### 3.4.3 Essential Fish Habitat

Pursuant to Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), Federal agencies are required to consult with the NMFS regarding any action they authorize, fund, or undertake that may adversely affect Essential Fish Habitat (EFH). For assessment purposes, an adverse effect has been defined in the Act as follows: "Any impact which reduces the quality and/or quantity of EFH. Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species' fecundity), site specific or habitat wide impacts, including individual, cumulative, or synergistic consequences of actions." EFH has been designated for species for which Federal management plans have been developed. The District has prepared a detailed EFH Assessment for the Project, provided as Appendix C.

### 3.4.4 Reptiles and Amphibians

Site-specific studies and/or surveys describing the diversity and abundance of amphibians and reptiles within the Project area are not available. However, the New York State Amphibian and Reptile Atlas Project sponsored by the NYSDEC has recorded several reptile and amphibian species as occurring in or in the vicinity of the Project area. Species of frog and toad such as the green frog (*Rana clamitans melanota*), northern spring peeper (*Pseudacris crucifer*) and Fowler's toad (*Bufo fowleri*) are common to the area and can be found inhabiting fr [illegible] brackish water wetlands and ponds (NYSDEC 2001b). Diamondback terrapins (*Malaclemys terrapin*) are also common to Long Island waters (Morreale 1992), although their preference for more estuarine waters associated with bays and marshes make their presence in the Project area unlikely. Common snakes such as the eastern ribbon snake (*Thamnophis sauritus*), eastern garter snake (*Thamnophis sirtalis*), and northern black racer (*Coluber constrictor*) can be found inhabiting vegetated upland and wetland areas in the Project area (NYSDEC 2001b). Several species of sea turtle seasonally migrate through the deeper waters off Montauk Point. However, their presence in the shallow nearshore waters associated with the Project area is not likely.

### 3.4.5 Birds

The annual Christmas "bird count" on Montauk Point consistently tallies from 125 to 135 species, one of the highest totals in the Northeast United States among participating localities (USFWS 1997). The following is a brief summary of the species likely to be found utilizing the marine and terrestrial habitats at Montauk Point.

The nearshore open waters surrounding Montauk Point provide regionally significant and critical wintering waterfowl habitat and concentration areas (USFWS 1997). Common species of waterfowl likely to occur in the nearshore waters off Montauk Point are the American black duck (*Anas rubripes*), mallard (*Anas platyrhynchos*), lesser scaup (*Aythya marila*), greater scaup (*Aythya affinis*), and Canada goose (*Branta canadensis*). Species more common to bays and deeper water habitats of the Montauk Peninsula are the common loon (*Gavia immer*), common eider (*Somateria mollissima*), white-winged scoter (*Melanitta fusca*), surf scoter (*Melanitta perspicillata*), black scoter (*Melanitta nigra*), oldsquaw (*Clangula hyemalis*), bufflehead (*Glaucionetta albeola*), common goldeneye (*Bucephala clangula*), great cormorant (*Phalacrocorax carbo*), and red-breasted merganser (*Mergus serrator*) (Turner 2001). Harlequin duck (*Histrionicus histrionicus*) and king eider (*Somateria spectabilis*) occur regularly during the winter, and this area is the southernmost regular wintering population of harlequin ducks on the East Coast (USFWS 1997). The majority of these species do not breed in the Project area and tend to concentrate during the mid-winter months using the shallow waters to feed on benthic invertebrates, hard clams, blue mussels, fish, and submerged aquatic vegetation (Andrle and Carroll 1988, USFWS 1997). The sea duck concentrations around Montauk Point are the largest nearshore winter concentrations in New York State (USFWS 1997).

The nearshore waters of the Montauk Peninsula provide forage for several species of shorebirds such as the spotted sandpiper (*Actitis macularia*), sanderling (*Crocethia alba*), semipalmated plover (*Charadruis semipalmatus*), lesser yellowlegs (*Totanus melanoleucas*), greater yellowlegs (*Tringa flavipes*), and herring gull (*Larus argentatus*). Several species of wading birds may occur in the area including the snowy egret (*Egretta thula*), green heron (*Butorides virescens*), and black-crowned night heron (*Nycticorax nycticorax*) (Andrle and Carroll 1988, Pleuthner 1995).

The yellow warbler (*Dendroica petechia*), American robin (*Turdus migratorius*), gray catbird (*Dumetella carolinensis*), common yellowthroat (*Geothlypis trichas*), and song sparrow (*Melospiza melodia*) are common breeders within the scrub-shrub and wetland habitats surrounding the Lighthouse (Andrle and Carroll 1988). Other common bird species known to utilize the habitats within the Project area include the American crow (*Corvus brachyrhynchos*), red-winged blackbird (*Agelaius phoeniceus*), mourning dove (*Zenaida macroura*), killdeer (*Charadrius vociferous*), Northern flicker (*Colaptes auratus*), willow flycatcher (*Empidonax traillii*), American goldfinch (*Carduelis tristis*), Eastern phoebe (*Sayornis phoebe*), bank swallow (*Riparia riparia*), and blue jay (*Cyanocitta cristata*) (Bull 1974, Andrle and Carroll 1988). The American kestrel (*Falco sparverius*) may breed at Montauk Point (Andrle and Carroll 1988). Ring-necked pheasant (*Phasianus colchicus*), American woodcock (*Scolopax minor*), and Northern bobwhite (*Colinus virginianus*) are known to occur at Montauk Point (Andrle and Carroll 1988).

### 3.4.6 Mammals

Site-specific studies and/or surveys describing the diversity and abundance of mammals within the Project area are not available. Terrestrial species most likely to occur in the Project area are habitat generalists tolerant of development, including the white-tailed deer (*Odocoileus virginianus*), eastern gray squirrel (*Sciurus carolinensis*), eastern cottontail (*Sylvilagus floridanus*), eastern chipmunk (*Tamias striatus*), raccoon (*Procyon lotor*), muskrat (*Ondatra zibethica*), little brown bat (*Myotis lucifugus*), house mouse (*Mus musculus*), and white-footed mouse (*Peromyscus leucopus*) (Connor 1971, USFWS 2003).

In the past, gray seals (*Halichoerus grypus*) and harbor seals (*Phoca vitulina*) often used the rocks that make up the revetment around Montauk Point as haulout areas during the winter (USFWS 1997, PEP 2001). However, the Riverhead Foundation and the NMFS Stranding Network representative for Montuak Point, report that seals no longer appear to utilize the revetment or the beach proximal area at Montauk Point (USFWS 2003; Appendix B). It appears that the human presence, local topography, hydrodynamics, and food availability conspire to limit the desirability of the area to seals. The Riverhead Foundation reports that a seal haul out area is located approximately one mile north, northeast of the Project area and is utilized by three species of seals, the harp seal (*Phoca groenlandica*), harbor seal, and hooded seal (*Cystophora cristata*) (Appendix B). All of these seal species are protected under the Marine Mammal Protection Act of 1972, as amended in 1994.

## 3.5 THREATENED AND ENDANGERED SPECIES AND COMMUNITIES OF SPECIAL CONCERN

Section 7 of the ESA requires a Federal agency to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of Federally-listed endangered and threatened species, or result in the destruction or adverse modification of the designated critical habitat of Federally-listed species. The USACE is required to consult with the USFWS and/or the NMFS to determine whether any Federally-listed or proposed species, or critical proposed critical habitat may occur in the proposed Project area, and to determine the proposed action's potential effects on these species or critical habitats. If the proposed Project would affect a listed species or critical habitat, the District must report its findings to the USFWS and NMFS in a Biological Assessment (BA).

To comply with the requirements of Section 7 of the ESA, the District has conducted in consultations with the USFWS and NMFS regarding the presence of Federally-listed or proposed listed endangered and threatened species and their critical habitat in the vicinity of the proposed Project (Appendix B). In addition, the USFWS has contacted the NYSDEC's Natural Heritage Program to review their database regarding Federally-listed and state-listed endangered and threatened species potentially occurring in the Project area (USFWS 2003). The following sections discuss the Federal and state species of concern identified by these agencies and other sources (Table 6). Areas or communities of special concern, or that require special management, are also discussed below.

### 3.5.1 Federal Species of Concern

The Federally-listed endangered Atlantic ridley (*Lepidochelys kempii*) and leatherback (*Dermochelys coriacea*) sea turtles and threatened loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) sea turtles have been identified as transient species through the Project area (Beach 1992). Recent studies indicate that the nearshore waters within Peconic Bay, Gardiners Bay, Block Island Sound, and Long Island Sound are critical developmental habitat for juveniles of the Atlantic ridley sea turtle and a major feeding area for the loggerhead sea turtle (USFWS 1997, Bortman and Niedowski 1998, PEP 2001). Juvenile Atlantic ridley sea turtles recorded in Long Island waters represent the largest concentrations ever documented outside the Gulf of Mexico (Morreale et al. 1992). In the Northeast, during the summer months, juveniles (approximately 2 to 5 years of age) of the Atlantic ridley, loggerhead, leatherback, and green sea turtles migrate from the open ocean to inshore waters including areas along the coast of Long Island (Bortman and Niedowski 1998).

Federally-listed endangered northern right whales (*Eubalaena glacialis*) (usually individuals) are regularly sighted migrating through the nearshore waters off Montauk Point, usually from March through June (USFWS 1997) and have been identified as a transient species by the NMFS (Beach 1992). Small aggregations of Federally-listed endangered finback whales (*Balaenoptera physalus*) feed close to shore from Shinnecock Inlet to Montauk Point from January to March, and Federally-listed endangered humpback whales (*Megaptera novaengliae*) feed all around Montauk Point, primarily between June and September (USFWS 1997).

One Federally-listed endangered plant, the sandplain gerardia (*Agalinis acuta*), has been historically known to have occurred at several locations within the Project area (USACE 1993), and there are two extant areas containing this plant within two miles of the Project area (USFWS 1992). According to the NYSDEC Wildlife Resources Center, this plant has not been identified in the Project area since 1927 (USACE 1993). Several site visits by District personnel along with local naturalists and town biologists have concluded that the sandplain gerardia is not present in the Project area (USACE 1993).

**Table 6. Federal and State Listed Endangered and Threatened Species that May Occur in the Vicinity of the Project Area.**

| Common Name | Scientific Name | Federal Status | State Status |
|---|---|---|---|
| **Reptiles** | | | |
| Atlantic ridley sea turtle | *Lepidochelys kempii* | E | E |
| Green sea turtle | *Chelonia mydas* | T | T |
| Leatherback sea turtle | *Dermochelys coriacea* | E | E |
| Loggerhead sea turtle | *Caretta caretta* | T | T |
| **Birds** | | | |
| Red-shouldered hawk | *Buteo lineatus* | Not listed | SC |
| Least bittern | *Ixobrychus exilis* | Not listed | T |
| Whip-poor-will | *Caprimulgus vociferous* | Not listed | SC |
| Northern harrier | *Circus cyaneus* | Not listed | T |
| Osprey | *Pandion haliaetus* | Not listed | SC |
| **Mammals** | | | |
| Finback whale | *Balaenoptera physalus* | E | E |
| Humpback whale | *Megaptera novaeangliae* | E | E |
| Northern right whale | *Eubalaena glacialis* | E | E |
| **Vascular Plants** | | | |
| Salt-marsh spikerush | *Eleocharis halophila* | Not listed | T |
| Sandplain gerardia | *Agalinis acuta* | E | E |
| Seabeach knotweed | *Polygonum glaucum* | Not listed | R |
| Small's knotweed | *Polygonum buxiforme* | Not listed | E |
| Southern arrowwood | *Viburnum dentatum var. venosum* | Not listed | T |

Key: E=endangered, T=threatened, R=rare, and SC=species of concern.
Source: Andrle and Carroll 1988, Beach 1992, USFWS 1992, USFWS 1997, NYSDEC 2001a, NYSDEC 2002, USFWS 2002, USFWS 2003, NYSOPRHP 2003.

### 3.5.2 State Species of Concern

Several of the Federally-listed threatened and/or endangered species identified within the vicinity of the Project area are also listed within New York State as rare, threatened, or endangered species. In addition, several species that may occur in the vicinity of the Project area are listed only by New York State as species of concern, rare, threatened, or endangered. All state-listed endangered and threatened species are protected under the NYSECL §11-0535.

The threatened least bittern (*Ixobychus exilis*) and northern harrier (*Circus cyanus*), and three species of concern, the red-shouldered hawk (*Buteo lineatus*), whip-poor-will (*Caprimulgus vociferous*), and osprey (*Pandion haliatus*), may potentially nest in the vicinity of the Project area (USFWS 2003). The state-listed endangered sandplain gerardia was historically identified as occurring in the Project area (see Section 3.5.1), and the rare seabeach knotweed (*Polygonum glaucum*), threatened saltmarsh spike rush (*Eleocharis halophile*), and endangered small's knotweed (*Polygonum buxiforme*) may be present in the Project area (USACE 1993, USFWS 2003). In addition, Southern arrowwood (*Viburnum dentatum* var. *venosum*), a state-listed threatened species, is known to occur along the entrance loop road (NYSOPHP 2003)

### 3.5.3 Areas or Communities of Special Concern and/or Management

The USFWS lists the Montauk Peninsula Complex as a Significant Habitat Complex of the New York Bight Watershed (USFWS 1997). Significant Habitat Complexes are identified by the USFWS to aid in the identification, description, distribution, and population status of key marine, coastal, and terrestrial species occurring within the near-coastal waters, coastal lands, and uplands of the New York Bight watershed. The complex consists of undeveloped ma communities that support an unusual diversity of rare plants and animals, and the nearshore waters support important concentrations of marine species.

In 1993, the Peconic Estuary, which encompasses Montauk Point, was designated as an estuary of national significance and included in the USEPA's National Estuary Program. The National Estuary Program has identified the Peconic Estuary as embracing diverse resources and habitats, which, in turn, provide values and uses important to all the citizens of New York, as well as to residents of the region.

The National Audubon Society of New York State recognizes Montauk Point (the area east of Montauk Lake to Montauk Point including offshore waters) as an Important Bird Area (IBA). IBAs are designated for sites that represent the most important habitats for the survival of birds and the conservation of bird species. Specifically, Montauk Point was recognized due to its importance to wintering waterfowl, and for supporting the largest winter concentration of sea ducks in the state. In addition, the site's importance to pelagic seabirds, migrant songbirds, and state threatened and special concern species is noted.

## 3.6 SOCIOECONOMICS

Socioeconomic conditions in the Project area in the Township of East Hampton, Suffolk County, New York, are affected by the area's development and zoning regulations. Much of the eastern portion of Long Island has been preserved primarily as recreational and open space according to land use planning and zoning ordinances. This area is relatively sparsely developed for residential, commercial or industrial purposes, and is considered to have no land available for significant development of these land uses (Suffolk County Planning Department [SCPD] 2001). In particular, development in the Project area is dominated by Montauk Point State Park, which includes the Lighthouse and its associated historic structures. These two recreational areas (the state park and the Lighthouse) influence the specific socioeconomic conditions of the Project area, which are associated with use of the area for tourism or recreational purposes by both seasonal and year-round residents and visitors.

### 3.6.1 Demographic Characterization

Demographic information for the Project area suggests that although population in Suffolk County has increased by 7.4% between 1990 and 2000 (from 1,321,864 people to 1,419,369 people), population density remains concentrated in the western part of Suffolk County. Although the average population density of Suffolk County is 1,558 people per square mile, the five western towns in Suffolk County have a population density of 2,292 people per square mile, and contain 91% of the county's population. Conversely, the population density of eastern Suffolk County is 362 people per square mile, and contains only 9% of the county's population (SCPD 2002).

### 3.6.2 Economy and Income

Economic information for the Project area indicates that, in general, Suffolk County's local economy is characterized by healthy employment figures and low unemployment. The unemployment rate for Suffolk County is 3.8%, which is below the definition of full employment of 4%, set by the U.S. Bureau of the Census. Employment opportunities are provided by an increasingly diverse base. The defense industry remains a strong employer in Suffolk County, with additional employment opportunities in medical care, banking, educational institutions, department stores, and manufacturers (SCPD 2002). Suffolk County's local economy is also closely associated with the hotel and motel industry (including bed-and-breakfast lodging), particularly in eastern Suffolk County, where occupancy is primarily seasonal and associated with the tourism in this area.

Tourism is a particularly important part of the Suffolk County economy, and is focused on the eastern part of Suffolk County. This half of Suffolk County contains 986 miles of shoreline, and over 70,000 acres of parkland. In addition to the hotel and motel industry (including bed-and-breakfasts), Suffolk County has more than 38,000 seasonal homes designed specifically to accommodate the influx of seasonal visitors during prime vacation times of the year (SCPD 2002).

Montauk Point State Park is used by an average of 904,185 visitors annually; the Lighthouse is used by an average of 106,723 visitors annually (USACE 2005). These two areas contribute significantly to the local economy of Suffolk County, by attracting vacationers as well as local residents to enjoy the recreational opportunities at Montauk Point including sightseeing, surfing, and fishing (Levine 2002). These temporary and regular users of the Project area contribute to the local economy by using ancillary facilities such as local restaurants, hostelries, and various businesses (Ahearn 2002). The value of Montauk Point State Park and the Lighthouse are such that a loss of property associated with the park or with the Lighthouse would be expected to cost the region almost $3 million per year due to a loss of visitation (USACE 2005).

Suffolk County considers the local farming industry to be related to the tourism industry, with the open agricultural landscapes contributing to the rural, undeveloped nature of eastern Suffolk County. A farmland protection program is in place in Suffolk County, through which more than 7,000 acres of farmland has been protected from development to preserve the rural and undeveloped character of eastern Suffolk County (SCPD 2002).

Income information indicates that the per capita personal income for Suffolk County residents is $33,803, which is 18% higher than the national average per capita personal income of $28,546. The median household income in Suffolk County is $63,312, and this relatively high median household income contributes to Long Island's (comprised of Nassau and Suffolk counties) ranking as the metropolitan area with the highest household income of the largest 20 metropolitan areas in the country. Suffolk County has one of the lowest poverty rates in New York State, with only 6.3% of the county population below the national poverty rate of $17,463 (SCPD 2002).

### 3.6.3 Housing

Housing information for the Project area indicates that housing availability in Suffolk County is both year-round and seasonal. Suffolk County is also considered to have a tight housing market, with correspondingly high prices for housing. In general, Long Island has a very high percentage of owner-occupied housing, with an owner occupancy rate of 80%. Homeowner vacancy rates for Suffolk County are very low, with a 0.9% vacancy rate. Currently the median price for a previously-owned home in Suffolk County is $215,200. Rental housing is also high, with a fair market rental fee of between $1,000 and $1,500 per month for a one-bedroom apartment (SCPD 2002).

## 3.7 CULTURAL RESOURCES

The Lighthouse is of national significance and is on the National Register of Historic Places and the State Register of Historic Places. As an agency of the Federal Government, the District has certain responsibilities for ensuring that the plans of the proposed Project are in compliance with all relevant cultural resources protection laws. The federal statutes regarding these responsibilities include Section 106 of the NHPA of 1966, as amended, Executive Order 11593, and the Advisory Council on Historic Preservation Procedures for the Protection of Historic and Cultural Properties (36 CFR Part 800). State regulations include the State Historic Preservation Act, which is modeled after the NHPA and administered through the New York State Office of

Parks, Recreation and Historic Preservation. SHPA requires that Federal projects follow the framework or procedures of Section 106 of the NHPA. In accordance with NHPA, the State Historic Preservation Office (SHPO) advises and assists Federal agencies in carrying out their historic preservation responsibilities. In New York State, the SHPO is the Commissioner of NYSOPRHP. It is these preservation laws and directives that guide the District in the implementation of the study authority to protect this site and its associated features.

Congressional authorization for this Project requires protection of the Lighthouse, its associated facilities, and the vicinity of the Lighthouse Complex.

> Committee on Environment and Public Works, U.S. Senate, May 15, 1991.
>
> *"Resolved by the Committee on Environment and Public Works of the United States Senate, that the Secretary of the Army is hereby requested to review the report of the Chief of Engineers on Fire Island to Montauk Point, New York, published as House Document Number 86-425, 86th Congress, 2nd session, and other pertinent reports, to determine whether modifications of the recommendations contained therein are advisable at the present time, with a view to preserving, restoring, and protecting Montauk Point and vicinity, including the historic Montauk Lighthouse and associated facilities, from erosion, environmental degradation, and coastal storm damage."*

Although not clearly defined, the terms "associated facilities" and "vicinity" possess meanings greater than their standard usages with regard to this particular case. Both the natural landscape of the bluff and the cultural landscape of the Lighthouse Complex must be considered one and the same in terms of protection. Without each aspect, neither can exist. If the bluff, which has eroded almost 200 feet in approximately 200 years, continues to erode, the Lighthouse Complex will be destroyed. Conversely, if the Lighthouse Complex is moved, the cultural landscape will also be destroyed, affecting the current landscape views of eastern Long Island.

### 3.7.1 The Cultural History of the Montauk Point Area: Overview

The eastern portion of Long Island contains evidence for prehistoric occupation dating back to the Paleo-Indian period, as indicated by the recovery of 14 fluted points and biface blades across Long Island. However, permanent prehistoric occupation of the study area by prehistoric peoples is not clearly represented until the Archaic Period, with eastern portions of Long Island occupied during the Middle Archaic Period by groups who would eventually become the historic-period Montauket, and by Terminal Archaic or Transitional Period groups, represented on the island by sites dating to the Orient Complex. A variety of unprovenienced, diagnostic projectile point types from a collection of prehistoric artifacts of Montauk Point are indicative of Late Archaic to Late Woodland occupations.

The structures of the Montauk Point Lighthouse Complex, including the Lighthouse, keeper's dwelling, and other associated buildings, have remained the only evidence for historic-period settlement of the eastern tip of Long Island. The Lighthouse is the oldest lighthouse in the State of New York. President George Washington authorized construction for the Lighthouse in 1796, and John McComb, Jr., constructed the tower and surrounding structures later that year. From the seventeenth century until 1873, the greater part of the surrounding Montauk peninsula was pastureland. In 1873, Frank and Mary Benson purchased the land surrounding the Lighthouse property for use as a hunting and fishing resort. However, for the most part, the peninsula has remained an undeveloped area into the mid 20th century (Brighton 1992, McLean 1999).

The structures associated with the Lighthouse property underwent periodic repairs and renovations throughout the 19th century. After 1900, a number of additions and renovations were made to the Lighthouse property, including the construction of buildings related to safety and rescue, as well as defense, during World War II. Early to mid 20th century buildings at the Lighthouse property included an oil house (1904), and World War II and post-war period structures such as the fire control tower (1942), a fire control station/bunker, and a troop barracks, although the barracks were demolished by 1951, and erosion of the bluff has caused the control station/bunker to slide off of the bluff. In 1987, the Lighthouse was fully automated, with a new automated optic revolving beacon (Brighton 1992, Montauk Point Lighthouse Museum 1996, McLean 1999; see also Heffner 1988, 1989, and 1994, for further information related to the historical and structural aspects of the Lighthouse).

### 3.7.2 Project Area Cultural Resources

Three previous cultural resources investigations have been conducted at the Lighthouse. These investigations included documentary research, field survey, and limited subsurface testing. Coordination with the NYSOPRHP, the New York State Museum, the Suffolk County Historical Society, and local historians were undertaken to help build the documentary history/record of the area. All projects resulted in the identification of historic sites at the Lighthouse property, and recommended further testing where appropriate.

In 1992, the District conducted a limited Phase I cultural resources survey (Brighton 1992). These investigations of the survey was to assess the impact erosion control measures might have on NRHP-eligible historic properties or archaeological resources. The Phase I survey was conducted on the bluff to the south of the Lighthouse and museum, in areas west and south of the garage, and on the bluff north of the guardhouse (Brighton 1992).

Between 1999 and 2000, a private consultant, Jo-Ann McLean Archaeological Consultants, performed additional Phase I investigations at the Lighthouse (McLean 1999, McLean 2000). These Phase I surveys, which were conducted under contract to the Montauk Point Historical Society, were designed to assess the impact of the proposed construction of a gift shop west of the garage, based on the high sensitivity of the Lighthouse grounds for cultural resources (McLean 1999, McLean 2000).

In 2002, building upon the earlier Phase I cultural resources investigations, the District contracted with Panamerican Consultants, Inc. to conduct Phase II cultural resources investigations at the Lighthouse, including subsurface testing along the edge of the bluff area (Panamerican Consultants, Inc. 2002). Results of the Phase II investigations indicated several sites within the Project area may be eligible for the NRHP, including a stone walkway or floor, a trash pit, a well and barn foundations. Aside from the recovered historic materials, there is a high potential for the recovery of Native American remains (Panamerican Consultants, Inc. 2002).

### 3.7.3 Archaeologically Sensitive Areas: Identification and Evaluation Methodologies

All cultural resource investigations conducted within the Lighthouse Project area were performed in accordance with the *Secretary of Interior's Standards and Guidelines for Archaeological Documentation* (48 FR 44734-37) and the *Treatment of Archaeological Properties* (ACHP 1980). These investigations focused on the potential culturally recovered sites and remains relating to both Native American and the historic period of the Lighthouse's operation.

The Lighthouse property is archaeologically sensitive for prehistoric remains. Diagnostic prehistoric artifacts found at Montauk Point, including projectile points, groundstone tools and a pestle, are displayed in a glass-covered wooden case within the Montauk Lighthouse Museum. A variety of projectile point types are present in the collection, although unfortunately, these artifacts have no recorded provenience. Although close analysis of these points was not conducted, some have shape characteristics of Squibnocket Triangle, Bare Island, Levanna and Madison, which are indicative of Late Archaic to Late Woodland occupations. Cultural resource investigations conducted by Brighton in 1992 recovered the tip of a quartz projectile point on the slope southwest of the Lighthouse (Brighton 1992).

The Lighthouse property is also archaeologically sensitive for historic remains. In particular, the historical archaeological record at this property has the potential to contribute information relating to the keepers' lifestyles and households, including "the day-to-day operation," the "types of goods that they used, the types of foods that they ate, and how they ordered and landscaped the lighthouse grounds to suit their needs" (Brighton 1992:46). The continued investigation of the historic archaeological sites at the Lighthouse Complex will add to the growing information that exists on the daily function and activity of this area.

### 3.7.4 Historic Structures

As previously stated, the Lighthouse, located on the eastern tip of Long Island and constructed in 1796, is the oldest lighthouse in the State of New York. From the seventeenth century until 1873, the greater part of the Montauk peninsula was pastureland, and the lighthouse, keeper's dwelling, and other associated buildings have remained the only historic-period settlement of the point. In 1873, Frank and Mary Benson purchased the land surrounding the Lighthouse property for use as a hunting and fishing resort, and the peninsula has remained an undeveloped area up to the present day, with Montauk Point State Park northwest of the Lighthouse property, and Town of East Hampton lands and Camp Hero (now a state-run former U.S. military reservation) to the south and southwest (Brighton 1992, McLean 1999).

The Lighthouse was constructed of "brown Chatham stone" between June and November of 1796, on Turtle Hill, 390 feet (119 m) from the water's edge (Britten 2000). A keeper's dwelling was built 200 ft (61 m) west of the Lighthouse tower to facilitate well water access. The original keeper's dwelling was a two-story frame house. By 1838, the keeper's dwelling was in such poor condition that a new house was built, under contract, by Henry B. Havens. Instead of replacing the old keeper's dwelling, the new 1½-story brick and frame structure was built against the south wall of the old building. By 1857, further work was needed on this new house, as well as the Lighthouse itself. The tower renovations were completed in 1860. During this period of renovation, the first keeper's dwelling was demolished, along with an 1806 kitchen addition attached to its north side. A new keeper's house was built on the hill next to the Lighthouse tower, along with an oil house and well. A fog signal was built east of the tower in 1873. The brick-and-frame 1838 keeper's dwelling was converted into a barn after the original barn was destroyed by a hurricane (McLean 1999:25). It was again renovated between 1937 and 1939 to serve as a garage.

After 1900, additions and renovations to the Lighthouse property included the construction of buildings related to safety and rescue, as well as defense during World War II. A new oil house was built in 1904. War and post-war period structures include the fire control tower (1942), a fire control station/bunker, and a troop barracks. The barracks were demolished by 1951, and erosion of the bluff has caused the control station/bunker to slide off of the bluff. In 1987, the lighthouse was fully automated, with a new automated optic revolving beacon (Brighton 1992, Montauk Point Lighthouse Museum 1996, McLean 1999; see also Heffner 1988, 1989, and 1994, for further information related to the historical and structural aspects of the Lighthouse).

Over the years there have been many Lighthouse keepers. The first were Jacob Hand and his son (Josiah or Jared). In the 1820s, Henry Baker was the keeper, and by 1837, Patrick Gould was in charge. It was Gould who had asked that a new house (the 1838 dwelling) be built. During the summers between 1819 to 1857, the keepers opened the house to seasonal overnight guests, charging a fee to stay, and "vending intoxicating liquors on the government premises" (Hefner, quoted in Brighton 1992:20). The visitors hunted, fished, picked berries, and sketched (McLean 1999:22). The poet Walt Whitman was one of these guests in the mid-1850s (Brighton 199[illegible] However, by 1857, the newly created Lighthouse Board had established a policy against [illegible] visitors.

## 3.8 LAND USE AND ZONING

Land use in the Project area is classified as recreational open land (SCPD 2001), and consists of Federally-owned property associated with the Lighthouse, and state-owned property associated with the Montauk Point State Park (USACE 2005). The MHS owns the Lighthouse, which is listed on the NRHP (USACE 2005). Several other structures are associated with the Lighthouse, one of which houses a museum for the Lighthouse. These properties, including the museum, are maintained and operated by the MHS (USACE 2005, Montauk Historical Society 2000). Currently, the associated structures to the lighthouse are not listed on the National Register. However, the NYSOPRHP has recommended to the MHS that they reapply for National Register status for these structures to join the Lighthouse, which is already on the list. This will create a "Historic District/Complex" for Montauk Point. The MHS is currently preparing to begin the submission process. Because the navigational aids associated with the Lighthouse are automated, the historic structures, including the Lighthouse, are used primarily to support tourism-related activities at Montauk Point (Montauk Historical Society 2000). The 862-acre Montauk Point State Park, which surrounds the Lighthouse and associated historic structures, is currently owned, maintained, and operated by the NYSOPRHP (NYSOPRHP 2003). The state park is used for a variety of recreational activities, including sightseeing, surfing, fishing, hiking, in-season hunting, and picnicking.

Camp Hero State Park is located south of Montauk Point State Parkway, and south of Turtle Cove. It is 754 acres, with an annual visitation of approximately 35,000. It provides recreational uses similar to Montauk Point State Park, with the exception of picnicking, and includes ball-fields and cross-country skiing (NYSOPRHP 2002).

The Town of East Hampton has established three zoning districts in the Project area: single family residential (A-5); single family residential (B); and park and conservation land (PC). In the A-5 district, the minimum residential lot size is 5 acres. In the B district, the minimum residential lot size is 1/2 acre. The PC district has potential for rezoning for development as an A-5 district (USACE 2005).

## 3.9 COASTAL ZONE MANAGEMENT

The Federal Coastal Zone Management Act of 1972 requires Federal agency activities to be consistent with the state's approved Coastal Management Program (CMP). This requirement applies to all Federal activities and Federally-authorized activities within, as well as activities outside, the state's coastal zone that affect the zone. The Project is located in the designated coastal zone in New York (New York State Department of State [NYSDOS] 2002).

For the proposed Project, the USACE is the lead Federal agency and the NYSDEC is the non-Federal cooperating agency. The NYSDOS, Division of Coastal Resources reviews projects and activities of Federal agencies for consistency with the policies of the New York State CMP. For state agency actions involving an EIS, the EIS must include an identification of the applicable coastal policies and a description of the effects of the action on those policies, whether the agency is acting as the lead or the involved agency (NYSDOS 2002).

## 3.10 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

An assessment of Hazardous, Toxic, and Radioactive Waste (HTRW) in the Project area was conducted by reviewing recent state and Federal data sources. No HTRW sites or New York State-listed Inactive Hazardous Waste Disposal Sites have been identified within the Project area (NYSDEC 1998b, USEPA 2002). The initial reconnaissance report (USACE 2005) for the Project included a survey for HTRW in and around the Project area. No evidence of HTRW was identified within the Project area. However, there were two sites nearby that contain HTRW.

The Montauk landfill is located several miles away from the Project area and was being investigated for potential seepage from septic lagoons. However, there was no evidence that this seepage would impact Montauk Point. Camp Hero, a former military installation, is approximately 1 mile southeast of the Project area. Potential HTRW at Camp Hero consisted of underground storage tanks (oil storage), above ground storage tanks, transformers, and a deteriorating sewage treatment plant. Although some seepage from these HTRW sources may have occurred at Camp Hero, there is a very low probability that the contaminants would impact the Project area in hazardous concentrations (USACE 1993). Additionally, an HTRW

assessment at the Montauk Military Reservation, which is closer to Montauk Point than Camp Hero, resulted in a NOFA (no further action) finding (USACE 1993).

## 3.11 NAVIGATION

Montauk Point is located at the extreme eastern end of the southern fork of Long Island and separates the Atlantic Ocean to the south and Block Island Sound to the north. Due to the proximity of the open ocean (i.e., deep water) to Montauk Point, no Federal or state navigational channels are present near the proposed Project area. The Lighthouse, commissioned by President Washington in 1796, was completed in 1797 and served as an important navigation aid for the first land encountered by ships headed for New York Harbor and Long Island Sound, as well as other eastern seaboard ports.

## 3.12 AESTHETIC AND SCENIC RESOURCES

Aesthetic and scenic resources in the Project area are derived from the open coastal vistas of Montauk Point, and have been enhanced through the area's use for recreation and open space as part of Montauk Point State Park. Due to the vantage point offered by the elevation of the Turtle Hill plateau, the view from Montauk Point includes relatively undeveloped natural scenic resources associated with views of the Atlantic Ocean, Long Island Sound, and Block Island Sound, as well as adjacent uplands to the west, and islands to the north. The Project area attracts sightseers interested in views of natural scenic resources that include vistas of open water, as well as the potential for wildlife observation, such as migratory waterfowl.

In keeping with the open coastal setting of the Project area, development within the Project area has been modest, and consists primarily of the Lighthouse and its six associated historic structures. The Lighthouse and the six associated historic structures have an aesthetic and scenic value that is associated with a specific type of cultural resource, Lighthouses, which sustain an enormous popular interest by the public, and which have a close association with maritime history. The aesthetic quality of the Lighthouse complex is enhanced by its large number of original structures in their original locations on the landscape of Montauk Point, reflecting the development of the Lighthouse system of navigational aid through time (USACE 1993). The contribution of the Lighthouse to the aesthetic and scenic resources of the Project area has been recognized with the registration of the Lighthouse on the NRHP, and its consideration for NHL status. The Lighthouse and the six associated historic structures of the Lighthouse complex may also be eligible for listing as a National Historic District (USACE 1993).

## 73.13 RECREATION

Recreational opportunities within the Project area are associated with Montauk Point State Park, Lighthouse and its associated historic structures, and offshore areas along Montauk Point. The facilities of the approximately 862-acre Montauk Point State Park support a variety of year-round recreational activities, including sightseeing, seashell collecting, picnicking, wildlife observation, recreational fishing, hunting, and the multiple uses of trails for hiking, cross-country skiing, and horseback riding. The trails within Montauk Point State Park also comprise the easternmost extension of the Paumanok Path, a more than 100-mile-long system of trails that traverse Long Island, and that includes the Pine Barrens Trail, East Hampton's Northwest Path, and the Stephen Talkhouse Path. The Lighthouse and its associated historic structures provide a museum that interprets the history of the Lighthouse, and access to an enclosed deck at the top of the Lighthouse for sightseeing. Offshore and shorefront areas along Montauk Point are particularly popular for recreational activities such as surfing and fishing. The Montauk Point State Park also issues about 20 to 30 photographic permits for commercial filming of the parks scenic setting.

Montauk Point is considered to be one of the best surfing locations along the East Coast, primarily due the physical characteristics of the shoreline at Montauk Point. The particular projection of the land surface into the currents of the Atlantic Ocean at Montauk Point suggests that wave conditions at Montauk Point are transformed and enhanced by diffraction, a "wrap around" effect of the waves caused when they pass the end of Montauk Point. This diffraction, or "wrap around" effect, results in "clean surfable waves" off of the shoreline (Nelsen 1996). The diffraction of waves at Montauk Point is enhanced by the headland effect of the projection of the land surface at Montauk Point, which serves to concentrate wave energy as the waves converge on the projection of the land surface into the nearshore waters of the Atlantic Ocean. Surfers or "surfriders" are attracted from all over the country to enjoy the specific waves and scenic setting that the point offers. The "Alamo" is the most popular surfing location and is located south of the Project area.

The Surfrider Foundation, with over 28,000 members and 52 local chapters in the United States, represents the locally and nationally organized group dedicated to the protection and enjoyment of the world's oceans, waves, and beaches for all people, through conservation, activism, research, and education (Surfrider Foundation 2002). Members of this group have expressed interest in the study of erosion control and storm protection at Montauk Point (USACE 2002).

Montauk Point is considered to be one of the great fishing areas for migratory game fish in the Northeast, and the premier east coast striped bass fishery spot. Recreational fishing is an important part of the local economy, attracting "surfcasters" from across the nation. The stone walkway that surrounds the entire point was built into the design of the current revetment to provide access for surfcasters to all the near shore waters surrounding the point. The existing revetment also provides stone platforms that provide casting areas. With over 900 members, the Montauk Surfcasters Association represents the locally organized fishing group (Montauk Surfcasters Association 2002). The New York Sport Fishing Federation has also expressed interest in the study of erosion control and storm protection at Montauk Point.

Camp Hero State Park is located south of Montauk Point State Parkway, and south of Turtle Cove. It is 754 acres, with an annual visitation of approximately 35,000. It provides recreational uses similar to Montauk Point State Park, with the exception of picnicking, and includes ball-fields and cross-country skiing (NYSOPRHP 2002).

## 3.14 TRANSPORTATION

The Project area is geographically linked to adjacent population centers by two main roads: Montauk Point State Parkway (State Route 27) and Old Montauk Point Highway (County Route

80). Montauk Point State Parkway runs on an east-west axis through the center of Montauk Point, and functions as the main transportation route in the Project area. Old Montauk Point Highway also runs on an east-west axis, but is located along the southern edge of Montauk Point, and functions as a secondary transportation route in the Project area. A small network of local access roads links the various internal activity areas within Montauk Point State Park (USACE 2005).

The Project area is also served seasonally by the Suffolk County Transit System's Summer Bus Route 94, which provides daily service between Montauk Village and the Lighthouse from Monday through Saturday, between July 1 and August 31.

## 3.15 AIR QUALITY

Suffolk County is within the New York-New Jersey-Long Island Air Quality Control Region, which is designated as a severe ozone nonattainment area. Suffolk County is designated as an attainment area for carbon monoxide, sulfur dioxide, respirable particulate matter, lead, and nitrogen dioxide (USEPA 1997).

## 3.16 NOISE

Noise is generally defined as unwanted sound. The day-night noise level ($L_{dn}$) is the most widely used descriptor of community noise levels. The unit of measurement of the $L_{dn}$ is the A-weighted decibel (dB-A) that closely approximates the frequency responses of human hearing.

The primary source of noise in the Project area is vehicular traffic on local roadways. Noise level measurements have not been obtained in the Project area. In lieu of measurement, the noise levels in the Project area can be approximated based on the existing land uses. The USEPA document Protective Noise Levels (USEPA 1978) lists typical day-night sound levels at various locations. The primary land use in the Project area is recreational. Typical day-night sound levels in recreational areas range from 39 to 59 dB-A (USEPA 1978). Therefore, it can be assumed that the existing sound levels in the Project area are within this range. Similarly, it can be assumed that sound levels in the Project area are at the lower end of this range due to the lack of development in the area.

# 4.0 ENVIRONMENTAL CONSEQUENCES

## 4.1 TOPOGRAPHY, GEOLOGY, AND SOILS

The topography of the Project area would be impacted by the construction of the revetment. In particular, the revetment would involve the placement of boulders along the lower portion of the bluff, raising the elevation by approximately 7 feet along the revetment upper footprint, a negligible direct impact. The expected lifespan of the revetment is at least 50 years, which is considered a permanent impact to the local topography. The new revetment will not change wave refraction patterns around Montauk Point, change erosion or accretion rates of the adjacent shoreline, or alter the near shore bathymetry. Existing wave down-rush conditions will be maintained by replacing existing large loose toe stones at the base of the revetment that are not required for construction in their existing patterns.

Implementation of the revetment is expected to result in significant benefits to the existing topography by stabilizing the bluff and shoreline. The current revetment structure is expected to fail during the next 15-year or greater storm event (USACE 2005), possibly resulting in the loss of one or more large chunks of shoreline during each storm. Subsequent to the failure, the bluff at Montauk Point would continue to erode at an estimated average long-term rate of 1 to 3 feet per year at the top of the bluff(USACE 2005).

## 4.2 WATER RESOURCES

### 4.2.1 Regional Hydrogeology and Groundwater Resources

The construction of the revetment would not impact regional hydrology or groundwater resources because the revetment construction would occur at the surface of the bluff and along the Montauk Point shoreline.

The existing topography at Montauk Point provides the hydrology and groundwater flow that have been determined to play an important role in the nutrient availability at the sensitive interdunal pond communities along the northern shore of Montauk Point State Park (USACE 2005). Initial studies conducted at coastal ponds (Schneider 1992) suggest that nutrient availability is an important factor in determining plant community composition. The existing revetment structure is expected to fail during the next 10-year storm event, possibly resulting in the loss of one or more large chunks of shoreline during each storm. Subsequent to the failure, the exposed bluff of Montauk Point would continue to erode at an estimated average long-term rate of 1 to 3 feet per year (USACE 2005). Loss of the bluff would be expected to negatively influence the nutrient availability at these coastal ponds through the permanent alteration of existing groundwater sources, water levels, and topography (USACE 2005). Implementation of the proposed revetment is expected to result in significant long-term benefits to the existing hydrology and groundwater flow by stabilizing the bluff and shoreline.

### 4.2.2 Tidal Influences

The construction of the revetment, which includes placement of large boulders along Montauk Point shoreline, would not impact large scale tidal patterns of the area. The revetment would not have any significant impact on the existing wave refraction around Montauk Point, because the existing loose stones at the toe of the revetment would be replaced after the buried toe is constructed. Because the buried stone toe of the proposed revetment, would stabilize the toe of the offshore slope, no further bathymetric changes are expected adjacent to the Montauk Point. The District has designed the revetment to have minimal impact on wave patterns while still providing adequate erosion protection by minimizing the revetment footprint to that necessary to accomplish bluff and shoreline stabilization objectives.

### 4.2.3 Surface Water

During construction of the revetment, a temporary increase in turbidity of nearby surface water is expected. However, the suspended materials (i.e., unconsolidated organic and inorganic particles) would be expected to settle out quickly or would be rapidly transported away by the strong tidal currents. Following completion of in-water construction activities, water quality would be expected to quickly return to pre-construction conditions. No significant long-term impacts on surface water quality are expected. A draft CWA Section 404(b)(1) Guidelines Evaluation has been completed and is provided as Appendix D.

### 4.2.4 Erosion and Downdrift Sand Movement

Coastal Processes. The proposed project alternative to protect Montauk Point will essentially continue the coastal process impacts of the 1992-1993 revetment over the 50 year planning horizon. The effects on coastal processes at the Point from the man made intervention date back nearly 60 years. Shoreline erosion rates are a function of many factors including the type of material at each shoreline location, total mass of material at each location, and the wave energy impinging upon it. The Long Island shoreline both north and south of Montauk Point consists of a series of concave and convex shoreline reaches, indicating a variation in erodability alongshore. Historic shoreline mapping shows that the 1870, 1933 and 1938 shorelines, preceding construction of revetments at Montauk Point in the 1940's, all have an indentation at Turtle Cove, similar to the shoreline shape that exists now. This indicates that the Turtle Cove reach erodes at a faster rate than the point, and that this indented curvature was not caused by construction of the revetment. Shorelines also show that the Atlantic shore west of the point has been generally erosive over the 1870-1995 period. The existing and the proposed revetment alternative will act to hold or anchor the eastern most end of the Turtle Cove area. While the proposed revetment alternative will continue to limit the coastal erosion at the Point protecting the Lighthouse complex, forces such as the tidal currents and waves will continue to erode the north and south downdrift shores continuing the curvature process, especially immediately adjacent to the revetment.

Downdrift Effects. The erosion of the areas just west of the Point tends to make up for the material covered by the existing revetment that is prevented from entering the littoral system. Since the proposed revetment alternative will extend over virtually the same lineal extent of the shoreline as the existing revetment, the proposed revetment will continue this trend. The effect of both the existing revetment and the proposed revetment on the downdrift, unprotected shoreline is to reduce the amount of sand moving alongshore by a small amount estimated to be approximately 3,000 cy/yr for the south shore. The sediment deficit would tend to increase the erosion rate of shoreline immediately adjacent to the revetment by a similar increment, over a short distance downdrift. Shoreline change mapping for the Turtle Cove area shows approximately a 2-ft/yr increase in retreat rate in the post-revetment period (1938-to 1995) as compared to the pre-revetment period (1870-1938), which may be due in part to the construction of the existing revetment, as well as to all other factors contributing to shoreline erosion. Indications from the shoreline change mapping are that any sediment deficits caused by the revetment are made up within approximately 2,500 feet of the end of the structure, at which point the shorelines changes to one of fluctuation of erosion and accretion. Shorelines north of the existing revetment have a similar response, which would continue with the proposed structure in place. At the same time, the relative impact of the small amount of reduced littoral material due to the revetment also diminishes because the net amount of littoral material moving westerly along the shores gradually increases as the waves and currents act upon the more westerly shores.

The curvature of the immediately downdrift or westerly shore areas will continue but will not pinch off or cause flanking of the protected area during the 50 year project evaluation period. It is also likely that as the curved recession due to waves and currents continues, there would be a tendency toward stabilization as the landform adjusts to the prevailing coastal forces. Subject to the occurrence of future storm events, the rate of erosion observed in relatively recent years could be somewhat reduced.

The following paragraphs give an indication of the volumes of littoral material involved in determining downdrift impacts of the project:

Contribution to Littoral Drift. Erosion of bluffs and beach fronting the Montauk Lighthouse does contribute a small amount of material to the littoral drift that moves along the Atlantic shore southwest of the lighthouse as well as along the Block Island Sound shore northwest of the lighthouse. Based on measurement over the period of record (1868-1993) the average annual erosion rate of bluff and beach as stated in the Feasibility Report, is estimated at 6 cubic yards per year per foot of shoreline. This average includes periods of time when the bluff was covered by a revetment, as well as prior to the construction of protective works. As such, this long-term average is a reasonable estimate for shoreline loss for periods of time covering conditions when the protective works are intact and limit loss, and periods of time when the protective works have lost integrity, resulting in greater amounts of erosion.

The proposed revetment covers approximately 840 linear feet of shoreline, which is virtually identical to the length of the existing revetment. Using the long-term erosion rate of 6 cubic yards(cy) per linear foot per year, approximately 5,000 cy of material can be assumed lost from the beach and bluff per year. Note that the material comprising the bluff is a mix of sand, gravel, and silt, based on boring logs. Some percentage of the eroded material is lost to the net longshore sand transport as it is either too fine, or too coarse. This percentage could be in the

10-30% range, but for this discussion no reduction has been taken for loss of fines or coarse material to the quantity of sediment transport.

The estimated volume of material per year will move either northwest or southwest of the point, except for some finer sediment moved permanently offshore or larger material that settles out. Based on the shape of the point and the length of the revetment, approximately 60% of the eroded material can be expected to move southwest, and approximately 40% can be expected to move northwest, i.e. approximately 3,000 cy/year will be contributed to the littoral drift along the Atlantic shore and approximately 2,000 cy/year along the Block Island Sound shore from the revetted shoreline. The shores to the northwest and southwest tend to make up for the effects of the revetment by contributing substitute littoral material over a relatively short distance downdrift.

For comparative purposes along the Atlantic shore, sediment budget estimates of the net longshore sand transport rate moving westward at Ditch Plains is approximately 70,000 cy per year. At the Montauk beaches, the net longshore transport rate increases to approximately 100,000 cy/yr. There is considerable uncertainty in sediment budget calculations, such that the given amount may differ by +/-40,000 cy/yr. Effects of both the existing structure at Montauk and the proposed structure on the littoral sand transport are small and are expected to be local, i.e. are not likely to extend as far alongshore to developed areas such as Ditch Plains or more developed points further west, especially in view of the variable shoreline shape and materials in between.

The amount of material that would be contributed downdrift if the proposed revetment alternative was not constructed is very small relative to the total sediment budget and this small amount is added back by some equally minor increase in erosion, a relatively short distance west of the revetment. Any adverse impacts from the proposed revetment alternative are not considered to be significant, and would not materially effect areas being considered for protection under the Fire Island Inlet to Montauk Point Reformulation Study.

## 4.3 ECOLOGICAL COMMUNITIES

No direct or indirect impacts to vegetation would occur because the areas where the selected Project footprint would impact beyond the footprint of the existing revetment are unvegetated. In addition, because existing roads and parking areas would be used for construction equipment and material access and staging, no direct or indirect impacts to vegetated habitats as a result of the movement or staging of equipment and materials are expected. Individual community type impacts are address in the following sections.

### 4.3.1 Marine Rocky Intertidal Habitat

The proposed stone revetment would impact approximately 2.4 acres of land and ocean bottom along the shoreline. Of this 2.4 acres, 0.7 acre would be beyond the footprint of the existing revetment and would impact marine intertidal gravel/sand beaches, maritime beaches, and marine rocky intertidal habitat located to the south of the existing revetment. Although the 200-foot extension of the revetment southward would impact some marine intertidal rocky habitat, the majority and richest portion of this habitat type occurs north of the revetment (USFWS 2003) and outside of the Project impact area.

Construction of the Project would result in the creation of rocky intertidal habitat at the toe of the new revetment. The extension and enhancement of the existing revetment is expected to replace direct losses of marine rocky intertidal habitat through the creation of the same habitat type at the toe of the revetment where intertidal zones would form. The USFWS concluded in the FWCAR that the habitat developed following Project construction will be approximately the same quantity and quality as the habitat lost due to construction of the Project and thus no net loss of in-kind habitat values would be experienced (USFWS 2003). A discussion of impacts to the benthic community of the marine intertidal rocky habitat is detailed in Section 4.4.1.

### 4.3.2 Beaches and Dunes

Although Access Road 2 (Figure 7) is currently used by off road vehicles, the USFWS indicated that the additional vehicle use, especially by heavy equipment, could exacerbate erosion at Montauk Point. The passage of vehicles on beaches can displace large quantities of sand seaward, alter the profile of dunes, reduce the vegetative cover on dunes, and damage wrack lines (USFWS 2003). The use of Access Road 2 would require construction equipment to traverse approximately 1,600 feet more beach front than Alternate Access Road 2 (Figure 7), therefore the USFWS recommended within in its FWCAR that Alternate Access Road 2 be used instead of Access Road 2 (Appendix E). The District agreed with this recommendation and would use Alternative Access Road 2 to avoid and minimize impacts to beach and dune habitat under the selected alternative.

### 4.3.3 Vegetated Uplands and Bluffs

Maritime grasslands, heathlands, and shrublands occur to the north, south, and west of the Lighthouse, on top of the Turtle Hill plateau, and outside of the revetment construction area. Thus, these upland areas would not be directly or indirectly impacted by construction of the revetment. However, these community types, mostly maritime shrubland, occur immediately adjacent to proposed access roads and staging areas. Heavy and over use by construction equipment in these areas has the potential to directly and indirectly impact these community types. As a result of this potential impact to these communities, the District would clearly mark access road side and staging area limits with stakes and flagging. These areas also would be monitored to ensure road widths and designated staging areas are not widened or extended beyond the designated area or the existing condition. In addition, the District would implement soil and water protection measures along access roads and at staging areas to protect adjacent vegetated habitats from excess erosion caused by construction equipment use. The coastal bluffs surrounding the Lighthouse would not be impacted and would receive protection from erosion through implementation of the selected alternative.

### 4.3.4 Wetlands

No direct or indirect impacts to freshwater wetlands, coastal ponds, or interdunal swales in the Project area are expected due to construction of the stone revetment. The three unvegetated marine wetlands (wetlands M2US2P, M2AB1N, and M2US1P) that comprise the sand and cobble shores to the north and south of the existing revetment would not be filled or dredged by construction of the new revetment. The new revetment would essentially replace and stabilize the existing revetment within the existing revetment footprint. The minor, temporary and localized suspended sediment generated by revetment construction would quickly settle out of the water column, and would not result in significant sedimentation in the Project area or the adjacent three unvegetated marine wetlands.

The existing topography at Montauk Point provides the hydrology and groundwater flow that have been determined to play an important role in the nutrient availability at the sensitive coastal pond communities (wetlands PUBV and PEMV5) along the northern shore of Montauk Point State Park (USACE 2005). Initial studies conducted at coastal ponds (Schneider 1992) suggest that nutrient availability is an important factor in determining plant community composition. The existing revetment structure is expected to fail during the next 10-year or greater storm event. Subsequent to the failure, the bluff of Montauk Point would continue to erode at an estimated average long-term rate of 1 to 3 feet per year at the top of the bluff (USACE 2005). Loss of the bluff would be expected to negatively influence the nutrient availability at these coastal ponds through the permanent alteration of existing groundwater sources, water levels, and topography (USACE 2005). Implementation of the revetment is expected to offer protection to these coastal pond communities by stabilizing the shoreline and preventing the loss of the bluff.

### 4.3.5 Invasive Species

Consistent with Executive Order 12112, the USACE would use general invasive plant species control measures, such as requiring contractors to clean equipment prior to beginning of work in the Project area and avoiding the use of hay bales for erosion control. Because no direct or indirect impacts to existing vegetation are anticipated, and the Project will result in the construction of an unvegetated stone revetment, the introduction or spread of invasive species as a result of construction of the Project is unlikely. The existing common reed communities exist over 50 feet from any proposed activities and would not be impacted; therefore, the accelerated spread or introduction of this species to new areas as a result of construction of the Project is unlikely.

## 4.4 WILDLIFE

The Fish and Wildlife Coordination Act (FWCA) (16 USC 662(a)) provides that whenever the waters of any stream or other body of water are proposed to be impounded, diverted, the channel deepened or otherwise controlled or modified, the District shall consult with the USFWS, the NMFS as appropriate, and the agency administering the wildlife resources of the state. The consultation shall consider conservation of wildlife resources with the view of preventing loss or any damages to such resources as well as providing for development and improvement in connection with such water resource development. Any reports and recommendations of the wildlife agencies shall be included in authorization documents for construction or modification of projects (16 USC 662(b)).

A FWCAR was submitted to the USACE by the USFWS on July 31, 2003 (Appendix E). The FWCAR incorporates consultations with the NYSDEC and NMFS, regarding existing fish and wildlife resources, anticipated impacts, and recommendations for avoidance and minimization of impacts. Overall, the USFWS concluded the impacts to fish and wildlife resources occurring within the footprint of the proposed construction area would be minimal (Appendix E). The NYSDEC concurred with the FWCAR's conclusions and recommendations (Appendix B).

### 4.4.1 Benthic Communities

Construction of the Project would impose a one-time, temporary impact on existing benthic communities at the nearshore area of the Project area. Certain species of benthic organisms (e.g., algae, barnacles, oysters, and mussels) that occur in rocky intertidal zones have developed strong means of attachment for clinging onto rock surfaces or other firm substrates, an adaptation that prevents them from being washed away by waves and currents (Lalli and Parsons 1993). Because of the sessile nature of these organisms, removal or building up of the existing revetment would result in the removal/burial and mortality of any attached benthic organisms located within the footprint of the proposed revetment. Less motile benthic organisms (e.g., polychaetes, isopods, amphipods, clams, periwinkles) would be able to avoid disturbance to varying degrees, however mortality of several individuals of these species is expected as a result of construction of the Project. More motile species such as the American lobster and crab species are expected to suffer these least mortality of the benthic communities.

Construction of the revetment in the nearshore area of Montauk Point also would cause a slight temporary increase in turbidity to the adjacent waters of the Project area. The sedimentation that settles may have the potential to cover the openings of dwellings of adjacent benthic organisms (e.g., polychaetes, clams, and crabs). However, these benthic organisms have the ability to burrow through the sand and seek protection as an adaptation to living in the naturally harsh conditions of the Project area (i.e., exposure to high energy waves and potential for desiccation), and therefore would not be significantly impacted by the minor, temporary increase in sedimentation of adjacent waters during construction of the Project.

The irregular surface and the crevices of the newly constructed stone revetment would provide protection, shelter, and a food source for many benthic organisms (Carter 1989) that inhabit the existing structure. The extension and building up of the existing revetment would increase available space and refuge areas for colonization by early successional benthic organisms. Reconlonization by higher trophic level organisms is expected to occur soon after early successional species colonization. Studies have demonstrated relatively rapid recolonization and recovery of the benthic community (USFWS 2003), especially in areas of high sediment mobility (Hall et al. 1991) such as the conditions present at the Project area. The USFWS's FWCAR concluded that, due to the amount of data supporting the rapid recovery of benthic organisms, there will be limited impacts to the subtidal benthic community as a result of Project implementation except in areas of direct stone placement where infaunal communities would be replaced with epifaunal communities (Appendix E).

### 4.4.2 Finfish and Shellfish

Construction in the nearshore area of the Project area consists of 840 linear feet of revetment protection, replacing the existing revetment. Construction of the stone revetment would impose a one-time, temporary impact on the existing finfish and shellfish species at the nearshore area of the Project area.

Finfish

During construction, finfish species that feed in the nearshore waters of Montuak Point, such as black sea bass and striped bass, would experience a short-term displacement and/or removal of food sources that live on and/or nearby the existing revetment. Because of this food source disturbance and construction related disturbances to the water column, finfish species are expected to simply leave the area during construction and seek out appropriate food sources in areas adjacent to the Project area. Temporarily displaced finfish are expected to return to the Project area and recruitment from adjacent habitats is expected to occur after completion of construction. This recolonization would likely follow the recovery of the benthic communities which is expected to be rapid (see Section 4.4.1). The USFWS concluded within their FWCAR that negative impacts to finfish are not expected as a result of implementation of the Project (Appendix E). The District has prepared a detailed EFH Assessment for the Project, provided as Appendix C.

Shellfish

Similar to other benthic organisms, sessile shellfish species that are attached to hard surfaces of the existing revetment, such as blue mussel and common oyster, would experience a one-time, short-term impact from the temporary removal and building up of the existing revetment. Motile shellfish species such as American lobster and Atlantic rock crab would also experience a one-time, short-term impact resulting from the temporary removal or disturbance of potential shelters and food sources. Although some species of shellfish are fairly motile, the mortality of individuals unable to escape construction activities is expected. However, similar to the finfish species in the Project area, recolonization of the Project area by shellfish species is expected to occur after completion of the proposed Project. Once the revetment is constructed, motile animals such as American lobster, crabs, and sea urchins will seek rock crevices and rock pools where the wave action is reduced and to avoid desiccation (Lalli and Parsons 1993).

Construction of the revetment in the nearshore area of Montauk Point also would cause a slight temporary increase in turbidity to the adjacent waters of the Project area. Increases in turbidity could affect the settling rate of shellfish ova and larva, and can clog and damage the gills of fish species (Uncles et al. 1998). However, the majority of finfish and shellfish occurring in the Project area are adapted to wide fluctuations in turbidity of the nearshore waters of the Project area, such that these indirect impacts to finfish and shellfish area expected to be minimal as a result of construction of the proposed Project.

### 4.4.3 Essential Fish Habitat

Temporary impacts on EFH are predicted during periods of active construction and would be the same as those described in Sections 4.4.1 (Benthic Resources) and 4.4.2 (Finfish and Shellfish). Habitat would be temporarily degraded during seawall and levee construction, as a result of elevated suspended sediment levels, temporarily lowering visual feeding efficiency, and irritating gill tissue. However, the suspended sediments are expected to settle quickly out of the water column. Therefore, no long-term adverse impacts on the water quality aspects of EFH are expected.

Although sessile benthic invertebrates within and immediately adjacent to the 0.33 acres of permanently impacted intertidal zone would likely be destroyed or smothered during construction, benthic communities would naturally begin to re-establish nearby areas shortly after construction is completed.

Of the EFH species that have designated habitat in the Project area, the species that are most likely to utilize areas in close proximity to the selected Project plan footprint are those that occur in shallow-depth coastal waters with sandy substrates. Certain bottom dwelling species known to occur in areas of shallow-depth and sandy substrates, such as the flounder species, will lose a small amount of habitat as a result of the permanent placement of materials for the seawall. However, the total area that will be lost is minor in comparison to the remaining areas of this type of habitat available in the Project vicinity. In addition, the vertical structure community that the revetment would promote may benefit several other EFH designated species.

In compliance with the MSFCMA, the District has coordinated with the NMFS to assess impacts to EFH as a result of the Project. The NMFS evaluated the existing resources and anticipated impacts of implementation of the selected Project plan to EFH in conjunction with the public and agency review period for this Draft EIS. The NMFS determined that there are no anticipated impacts based on the project. One issue, with regard to seal haul out areas, will be coordinated with, during the construction phase of the project, if necessary. The District has prepared a detailed EFH Assessment for the Project, provided as Appendix C.

### 4.4.4 Reptiles and Amphibians

The majority of amphibians and reptiles known to exist in the region generally prefer fresh water and vegetated environments and are not likely to be associated with the unvegetated marine conditions of the area of new revetment construction. The primary construction impacts would be concentrated in and around the intertidal, subtidal, and beach areas where reptile and amphibians would not likely occur. In addition, existing parking lot and access roads would be used for construction equipment and material staging and access, such that no direct or indirect impacts to vegetated reptile and amphibian habitats are expected. Therefore, impacts to reptile and amphibian species due to Project construction would be minimal.

### 4.4.5 Birds

Construction of the proposed Project could have minor short-term and long-term impacts on terrestrial and pelagic bird populations occurring in the Project area. Construction activities would result in the temporary and permanent loss of both marine intertidal gravel/sand beaches, maritime beaches, and maritime rocky intertidal habitats totaling approximately 0.7 acre. Temporary impacts would be those associated with the construction of the revetment, as the presence of construction machinery and human disturbance may deter some species from utilizing the Project area. The permanent loss of 0.7 acre of gravel/sand beach and rocky intertidal habitat would occur as a result of the extension of the existing revetment 200 feet beyond its current extent. Loss of beach habitat could negatively impact several species of shorebirds that utilize the beaches for feeding and resting, such as the spotted sandpiper and sanderling. The Project would result in the temporary disturbance to those species of birds that may utilize the existing revetment for resting, however the new revetment would mimic the old revetment in material and design and immediate reestablishment of resting use is expected. Negative impacts to pelagic seabirds are not expected due to the high mobility and use of deeper water habitats by these species. Also, because the tide and currents concentrate food sources, and would not be altered by the Project, impacts to wintering seabirds are not expected (Appendix E). Following construction, bird species are expected to resume their normal habits consistent with post-construction habitat availability in and within the vicinity of the Project area.

### 4.4.6 Mammals

Construction of the proposed Project could have minor short-term impacts on terrestrial mammal populations occurring in the area. Construction equipment traveling over terrestrial habitat could result in the temporary disturbance of habitat and possible mortality of less mobile, burrowing, and/or denning species of mammals during construction activities. The return of ground dwelling species may be reduced, depending on the level of soil compaction that results from construction equipment traveling over terrestrial habitat. Construction activities may also cause the temporary and permanent displacement of more mobile species due to increased human activity and habitat alterations. All of these potential impacts are expected to be of minimal significance because vegetated environments would not be impacted by the Project. In addition, existing parking areas and roads already subjected to compaction, and generally avoided by wildlife, would be used for access and staging. Following construction, wildlife species are expected to resume their normal habits consistent with post-construction habitat availability in and within the vicinity of the Project area.

Although there is a seal haulout area located one mile to the north, northeast of the Project area, seals do not appear to utilize the Lighthouse revetment or the beach proximal area (USFWS 2003; Appendix B). It appears that the human presence, local topography, hydrodynamics, and food availability at the Lighthouse conspire to limit the desirability of the area for seal activities (Appendix B). Because of low habitat suitability, NMFS concluded that there exists a "no species present" condition in the Project area and no further coordination regarding impacts to seals would be required (Appendix B).

The District is committed to avoiding level B harassment of marine mammals. Level B harassment is defined by the Marine Mammal Protection Act as activities having the potential "to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering". As recommended by NMFS (Appendix B), the District would obtain a Marine Mammal Protection Act Incidental Harassment Authorization for the unlikely isolated event in which a seal harassment incident may occur. This authorization would be obtained during construction if seals were encountered.

## 4.5 THREATENED AND ENDANGERED SPECIES AND COMMUNITIES OF SPECIAL CONCERN

### 4.5.1 Federal Species of Concern

Although several species of Federally-listed endangered and threatened species of animals and plants (discussed in Section 3.5.1) can be expected to occur in the general vicinity of the Project area at any time (USFWS 1992, Beach 1992), no impacts to these species are expected to occur as a result of construction of the stone revetment alternative (USFWS 2003). The sea turtle and marine mammal species listed in Section 3.5, Table 6, are highly mobile and are only considered transient species in the Project area (Beach 1992). Therefore, these species are highly unlikely to be present in the Project area during construction or would avoid the Project area during construction. Furthermore, the construction of the revetment is not expected to negatively impact the preferred habitat of these species because they do not breed in the region and are considered pelagic.

The Federally- and state-listed endangered sandplain gerardia (*Agalinis acuta*) has been historically known to occur at several locations within the Project area. However, the NYSDEC Wildlife Resources Center has indicated that the sandplain gerardia has not been recorded since 1927. Several site visits by District personnel, along with local naturalists and biologists, have concluded that sandplain gerardia is no longer present in the Project area. Therefore, the proposed stone revetment alternative is not expected to have any impacts to extant populations of the Federally-listed endangered sandplain gerardia.

Additionally, the FWCAR concluded that no Federally-listed or proposed endangered or threatened species under the jurisdiction of the USFWS are known to exist within the Project impact area and that no habitat in the Project area is currently designated or proposed critical habitat in accordance with the provisions of the ESA (Appendix E).

### 4.5.2 State Species of Concern

Impacts to the state-listed rare seabeach knotweed, endangered Small's knotweed, and threatened saltmarsh spike rush and southern arrowwood, which may be present within the Project area (USACE 2005, USFWS 2003, NYSOPRHP 2003), are not expected because construction activities would not impact vegetated areas (see Section 4.3). To further minimize the potential impacts to those species potentially occurring along the northern shoreline of the Project area (i.e., seabeach knotweed, saltmarsh spike rush, Small's knotweed), the District has agreed not to use Access Road 2, but will use Alternate Access Road 2 (Figure 7) as recommended by the

USFWS (USFWS 2003). In addition, the District would implement soil and water protection measures and monitoring along access roads and staging areas to protect adjacent vegetated habitats from excess erosion caused by equipment use.

The state-listed threatened northern harrier may breed in the general vicinity of the Project area. The northern harrier nests on the ground, usually in dense vegetation. This species is more commonly associated with vegetated tidal wetlands and marshes. Because implementation of the selected Project alternative would not impact vegetated habitats (see Section 4.3), impacts to individual northern harriers or their habitat are unlikely due to the Project.

The state-listed threatened least bittern usually breeds in freshwater marshes. The nest, which is constructed by both adults out of dead and live plant stems, is a platform with a shallow hollow. It is placed about one foot above water, usually on the base of dried plants. Because the Project would not impact vegetated habitats (see Section 4.3), impacts to individual least bitterns or their habitat are unlikely.

The red-shouldered hawk may breed in the general vicinity of the Project area. Red-shouldered hawk nests are large, constructed of sticks, bark, leaves, and mosses, and built in large trees, usually 20 – 60 feet high (USFWS 2003). Because implementation of the Project would not impact vegetated habitats (see Section 4.3), impacts to individual red-shouldered hawks and their habitat are unlikely. Similarly, the osprey builds large nest platforms in large diameter trees or on artificial nest structures, therefore impacts to individual ospreys and their habitat due to the Project are unlikely.

The whip-poor-will prefers open hardwood or mixed woodlands of pine, oak, and beech, particularly younger stands in fairly dry habitats (USFWS 2003). Because implementation of the Project would not impact vegetated habitats (see Section 4.3), and because the whip-poor-will prefers forested habitats more inland than the Project area, impacts to individual whip-poor-wills or their habitat are unlikely.

Although many of the animal and plant species discussed above are unlikely to be impacted by the proposed Project, the District would conduct pre-construction surveys for state-listed plants and birds and would coordinate with the NYSDEC regarding proper survey protocols as recommended in the USFWS's FWCAR (Appendix E). Further coordination with the NYSDEC would be initiated regarding recommendations to minimize and avoid disturbance if listed species are encountered.

### 4.5.3 Areas or Communities of Special Concern and/or Management

Because the Project is, for the most-part, an in-kind replacement of the existing structure, the District anticipates that construction of the stone revetment alternative would have no effect on the ability of the Project area to continue to play an important role as part of the USFWS's Montauk Peninsula Significant Habitat Complex, the USEPA's Peconic Estuary, and the National Audubon Society's IBA. Montauk Point would continue to function as an important area for waterfowl, seabirds, and shorebirds. The District does not anticipate any long term impacts to areas of special concern or management discussed above.

## 4.6 SOCIOECONOMICS

### 4.6.1 Demographic Characterization

The stone revetment alternative is expected to have no effect on the demographic characteristics associated with the Project area at the present time or in the future. There would be no impact on the number, density, or racial composition of residents living within the Project area.

### 4.6.2 Economy and Income

The stone revetment alternative is expected to have a beneficial, long-term effect on the economic characteristics associated with the Project area through the protection of Montauk Point from inevitable future erosion and storm damage. Such protection would preserve the bluff top and the Lighthouse for continued use by seasonal and permanent residents, and would result in a continuing contribution by the diverse recreational facilities located within the Project area to various aspects of the local economy, including the continued demand for seasonal housing, restaurants, and local businesses in support of the recreational uses of the Project area.

The stone revetment alternative is expected to have limited short-term impacts on the local economy. The District believes that this short-term impact to the local economy would be limited because areas adjacent to the Project area, including Turtle Cove and Camp Hero State Park, would remain open and usable to all. In addition, the construction schedule would not have an effect on access to the Montuak Point Lighthouse or its regularly scheduled hours of operation.

To mitigate any potential short-term impacts on the local economy, the District has coordinated with the Montauk Historical Society and NYSOPRHP to develop a plan that would minimize impacts on access as well as the aesthetic setting during construction. Currently, the plan includes limiting the time of day when equipment and heavy-duty trucks access the area to off-peak visitation hours. This would reduce the negative impact that these vehicles may have on traffic and the relatively quiet, peaceful setting provided by the Montauk Point State Park. Although these off-peak hours have not yet been determined, a seasonal schedule would be developed in coordination with the Montauk Historical Society and NYSOPRHP. In addition, reduced access to the revetment and portions of the beach would be ameliorated by allowing limited access to the current revetment for fishing during the construction period to the maximum extent practicable without causing a safety hazard. This is proposed to be accomplished by initiating construction on the south end of the revetment while having a delayed construction start date on the north end of the revetment. This delay could allow a few additional months of access to the revetment by fisherman and could be scheduled to encompass peak use times for fishing (September to November). However, eventually the entire revetment and staging areas immediately adjacent to the northern and southern ends of the revetment would need to be closed to the public. At this time fisherman would still be able to fish from the adjacent beach areas. In addition, a plan for notice and signage to the shorefront for sightseers, trail walkers, and fisherman would also be developed as needed during construction.

The implementation of the above measures would reduce the impacts to access and aesthetic setting at Montauk Point.

### 4.6.3 Housing

The stone revetment alternative is expected to have no effect on the housing characteristics associated with the Project area at the present time or in the future. The Project area is currently developed as recreational or open land, and is considered to have no land available for significant development as residential property (SCPD 2001).

## 4.7 CULTURAL RESOURCES

As previously described, all cultural resources investigations conducted at the Lighthouse were conducted in accordance with the *Secretary of Interior's Standards and Guidelines for Archaeological Documentation* (48 FR 44734-37) and the *Treatment of Archaeological Properties* (ACHP 1980). Information provided in the documentary record for the Project area, as well as from Phase I (site survey) and Phase II (field testing) investigations, has identified the potential effects of the proposed action on cultural resources at the Lighthouse, and the recommendations for avoiding, reducing, or mitigating these potential effects.

### 4.7.1 Project Effects upon Prehistoric and Historic Sites

Based on the results of previous cultural resource investigations, several of the archaeological sites uncovered around the Lighthouse are eligible for inclusion on the NRHP under several of the prescribed criteria. Furthermore, the entire Lighthouse Complex itself is eligible as a National Register Historic District, possessing integrity and significance based upon the characteristics of location, setting, feeling, association and design, including "a significant concentration, linkage, or continuity of sites, buildings, structures, or objects, united historically or aesthetically by plan or physical development (US Department of the Interior n.d.:5)."

As previously stated, the replacement of the stone revetment at Montauk Point will not significantly impact the buried cultural resources that are located at the Lighthouse Complex, and, in fact, will help to preserve the cultural resources that have been identified by reducing the potential for further erosion of the bluff face. However, it is the recommendation of the District that archaeological monitoring be conducted during the construction phase of the Project. Archaeological monitoring during the removal and replacement of the revetment stones will ensure that buried archaeological materials are not disturbed. If previously unidentified archaeological materials are uncovered during construction, the on-site archaeologist would evaluate their significance. If any identified archaeological sites are determined to be potentially eligible for the NRHP, work will be halted and consultation with the NYSOPRHP will occur. Upon completion of consultation, if a finding of no-significance is determined, the Project will continue after the materials are recorded.

### 4.7.2 Further Analysis of Project Effects

As noted above, archaeological monitoring during the removal and replacement of the revetment stones will ensure that buried archaeological materials are not disturbed. If previously unidentified archaeological materials are uncovered during construction, the on-site archaeologist would determine their significance. If significance is determined, work will be halted and consultation with the NYSOPRHP will continue. If a finding of no-significance is determined, the Project will continue after the materials are recorded.

## 4.8 LAND USE AND ZONING

Construction, operation, and maintenance of the revetment would not have any direct or indirect impacts on the existing land use and zoning in the Project area. The existing land uses in the area would not change as a result of the Project. Zoning designations would not be changed, nor would any homes or businesses be removed or displaced.

With the NYSDEC acting as the non-Federal sponsor for the Project, and the MHS and the NYSOPRHP owning land surrounding the Project area, the revetment plan would be submitted to both the NYSDEC and the NYSOPRHP for review and comment prior to construction of the Project. Similarly, because the Lighthouse and associated historic structures and proper[illegible] been maintained by the Montauk Historical Society, the revetment plan would also be submitted to the Montauk Historical Society for review and comment prior to construction of the Project.

## 4.9 COASTAL ZONE MANAGEMENT

As required under the Federal Coastal Zone Management Act of 1972, the District reviewed the proposed Project in relation to the applicable policies of the New York State CMP and determined that it is consistent with all relevant policies. The New York State CMP Consistency Statement is provided as Appendix F of this DEIS.

## 4.10 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

No impacts to any HTRW sites are expected to occur as a result of the proposed Project because no sites have been identified in the Project area. The District would implement standard guidelines for the storage and cleanup of hazardous materials in the Project area during construction. In addition, as recommended by the USFWS (Appendix E) an oil-spill contingency plan would be developed and coordinated among the USCG, NYSOPRHP, NYSDEC, and the construction contractor prior to any construction.

## 4.11 NAVIGATION

Construction and replacement of the existing revetment is limited to the nearshore area of the Project area. Due to the proximity of the revetment to the shore and the absence of Federal or state navigational channels near the Project area, no navigational channels would be impacted as a result of the proposed Project. Construction of the proposed Project would have a long-term beneficial impact in securing the integrity of Turtle Hill plateau where the Lighthouse and associated facilities presently stand. The Lighthouse and associated facilities are important because they act as a junction marker and a navigation aid for ships heading for New York Harbor and Long Island Sound, as well as other eastern seaboard ports.

## 4.12 AESTHETIC AND SCENIC RESOURCES

Long-term impacts to aesthetic and scenic resources resulting from the construction of the revetment are expected to be of minimal significance to natural and manmade landscapes. The proposed revetment structure would be consistent with the existing revetment structure in the Project area and would result in very low levels of change in the surrounding landscape that would not attract undue visual attention.

The proposed revetment would be located at the base of the bluff, and would not be a prominent part of scenic views from either the Turtle Hill plateau or from the Lighthouse. Thus, any impacts to scenic resources would be primarily associated with offshore vantage points facing inland towards Montauk Point. The proposed revetment would extend the length of the raised, curving, linear landscape element of the existing revetment by 200 feet to the south, and would be 7 feet higher than the existing revetment, making the proposed revetment slightly more prominent. This prominence would be mitigated somewhat by incorporating stone material from the existing revetment into the proposed new revetment, allowing this landscape element to remain visually consistent with the current appearance of the Project area.

Short-term impacts to aesthetic and scenic resources during the construction phase are also expected to be of minimal significance. However, the District recognizes that construction equipment operating and traveling through the Project area during the 2-year construction period could have a negative effect on the scenic resources as well as the relatively quiet and peaceful setting normally provided by Montauk Point State Park. As a result, the District has coordinated with the Montauk Historical Society and NYSOPRHP to develop a plan that would minimize impacts to these aesthetic resources.

Currently, the plan includes limiting the time of day when equipment and heavy-duty trucks access the area to off-peak visitation hours. This would reduce the number of encounters that visitors would have with construction equipment traveling to and from the staging areas and revetment. Although these off-peak hours have not yet been determined, a seasonal schedule would be developed in coordination with the Montauk Historical Society and NYSOPRHP.

The Montauk Historical Society, which operates the Lighthouse Museum, has further indicated the aesthetic and scenic resources of the Project area would be enhanced by the removal of the bunker (Figure 2) from the shoreline during construction of the stone revetment alternative. The District would remove this bunker during construction of the new revetment.

## 4.13 RECREATION

Visitors to Montauk Point use a substantial portion of the Project area specifically for recreational purposes as described in Section 3.13. The majority of Project related activities (i.e., staging areas and revetment construction) primarily would be located at the base of the Turtle Hill plateau. Recreational activities that occur on the Turtle Hill plateau, including those associated with the enjoyment of the Montauk Point State Park and the Lighthouse, would not be directly impacted during construction or maintenance of the proposed revetment. However, numerous local members of interested parties such as the Montauk Surfcasters Association, New York Sport Fishing Federation, and the Surfrider Foundation, have expressed concerns that the proposed revetment could have a negative effect on the recreational qualities of the Project area, including recreational fishing and surfing (USACE 2002b).

Construction of the stone revetment alternative in the Project area would result in short-term, direct impacts to recreational uses, such as use of pedestrian trails and the revetment for fishing, by temporarily limiting and/or blocking access to the beach front and the existing revetment. These short-term, direct impacts would primarily affect recreational fishing because surfcasting from the existing revetment is a popular activity at Montauk Point. As a result of this potential impact, the District has coordinated with the Montauk Surfcasters Association and the New York Sport Fishing Federation to develop a plan that would minimize impacts on access to the revetment by fishermen during construction and enhance access after construction.

A meeting was held between the District and the Montauk Surfcasters Association and the New York Sport Fishing Federation to discuss the proposed Project on May 8, 2003. Representatives were primarily concerned about access to the revetment wall for fishing. The District informed the Montauk Surfcasters Association and New York Sport Fishing Federation that access to the revetment for recreation fishing would be restricted, and times prohibited during construction. The District, in coordination with these organizations, has developed a construction schedule that will allow fishermen limited access to the revetment area during the initial stages of construction. Both organizations understand the importance of ensuring that there is a strong, stable, and long-lasting revetment wall at Montauk Point and offered their full support of the Project.

Specifically, access impacts during construction would be ameliorated by allowing limited access to the current revetment for fishing during the construction period to the maximum extent practicable without causing a safety hazard. This is proposed to be accomplished by initiating construction on the south end of the revetment while having a delayed construction start date on the north end of the revetment. This delay could allow a few additional months of access to the revetment by fishermen and could be scheduled to encompass peak use times for fishing (September to November). However, eventually the entire revetment and staging areas immediately adjacent to the northern and southern ends of the revetment would need to be closed to the public. During this time, fishermen would still be able to fish from the adjacent beach areas. In addition, the District has informed the Montauk Surfcasters Association and New York Sport Fishing Federation that the post-construction revetment design would maintain or enhance current levels of access and provide flat, stone fishing platforms from which to safely fish. A plan for notice and signage to the shorefront for sightseers, trail walkers, and fishermen would also be developed as needed during construction. As a result of implementation of these measures, short-term impacts on access to the shorefront by all users would be minimized.

Although difficult to assess, the Surfrider Foundation believes that the construction of the existing revetment is thought to have negatively affected the natural surfing conditions in the Project area by affecting the way waves are reflected or redirected oceanward. This consequently is thought to have a reducing effect on incoming wave height and velocity of offshore surf. Most local surfriders are concerned that the increase in length and width of the proposed revetment would increase the degree of wave reflection over a wider area of the coastline, resulting in negative impacts to surfing conditions in the Project area.

The Surfrider Foundation, Long Island Chapter, raised concerns regarding the impact of the proposed Project on recreational surfing during a Project scoping meeting held during two sessions on November 14, 2001. In response, the District has held meetings and conference calls with the Surfrider Foundation in an effort to determine the their specific concerns. The primary concern of the Surfrider Foundation is that an overall increase in the dimensions of the existing revetment wall by 20 feet seaward would have a negative impact on the quality and surfability of the waves in the offshore waters of Montauk Point, specifically in an area known as "The Alamo".

In response to the Surfrider Foundation's concerns, the District performed modeling to determine the potential effect of implementation of the proposed Project on offshore waves. The results of this modeling determined that the reflection coefficient for the existing revetment ranged from 0.30 to 0.33, whereas the reflection coefficient for the proposed revetment would range from 0.25 to 0.28, an approximate 15 percent reduction from that of the existing revetment. This reduction is due to the milder front slope and the greater porosity of the thick layers of randomly placed stone of the proposed revetment. Based upon the modeling results, the District believes that implementation of the proposed Project would have little to no impact on the quality or surfability of the waves in the offshore waters of Montauk Point, and may, in fact, have less impact than the existing structure. The District has provided the modeling results and other pertinent information to the Surfrider Foundation for review and consideration. The District also has encouraged the Surfrider Foundation representatives to present comments in writing during the public comment period for this DEIS.

There is a revetment in place at Montauk Point now, and the surfing is considered to be good. The proposed revetment will be in the same place as the existing revetment, made of similar rock material, and will be similar to it in all particulars which might effect waves. As shown in the Feasibility Report, Table 10, and discussed in Section 4.0 – Recreation, wave reflection coefficients are estimated at 13-19 percent less for the proposed revetment alternative than for the existing revetment. The proposed plan will not change wave conditions in any perceivable way.

Overall, implementation of the stone revetment alternative would not result in a significant short-term loss of recreational use of Montauk Point. Although the revetment wall would be closed to the public, the Turtle Hill plateau and adjacent beach front areas would remain open and usable by the public. The District would implement the measures discussed above to ameliorate the temporarily reduced access to the beach front by recreational users. Long-term impacts on recreation due to implementation of the proposed Project are considered to be beneficial, primarily as a result of the long-term preservation of Montauk Point State Park and the Lighthouse.

## 4.14 TRANSPORTATION

The stone revetment alternative is expected to have limited, short-term impacts to transportation within the Project area. Such impacts would be associated with construction of the revetment, and would include the added presence of construction-related vehicles through Montauk Point State Park, and along access roads from the bluff top down to the shoreline. Construction-related vehicles are expected to include slow-moving, heavy-duty construction equipment, as well as worker's vehicles. The added presence of construction-related vehicles may result in increased traffic and impediments to normal traffic flow in the Project area. To help alleviate this impact during construction phase of the Project, flagmen would be available and construction signs would be posted. In addition, the District has coordinated with the Montauk Historical Society and NYSOPRHP to develop a plan that would limit the time of day when equipment and heavy-duty trucks access the area to off-peak visitation hours. This would reduce congestion along the Montauk State Park Highway (the only road in and out of the park). Although these off-peak hours have not yet been determined, a seasonal schedule would be developed in coordination with the Montauk Historical Society and NYSOPRHP. Following construction, the [illegible] revetment alternative is not expected to have any impacts to transportation condition [illegible] the Project area. In addition, all roads would be monitored during the construction phase and returned to their pre-construction condition.

## 4.15 AIR QUALITY

No short-term or long-term impacts to air quality are expected to occur as a result of construction or maintenance of the stone revetment alternative. A Clean Air Act, Statement of Conformity (Appendix G) has been signed by the Chief of the Planning Division.

## 4.16 NOISE

Construction of the stone revetment alternative would result in a minor, temporary increase in noise generation as a result of the use of construction equipment. After construction, the stone revetment alternative is expected to have no impact on noise.

## 4.17 ENVIRONMENTAL JUSTICE

In accordance with Executive Order 12898 (dated February 11, 1994), Federal agencies are required to identify and address the potential for disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low income populations.

According to the 2000 Census, 21% of the population residing within Suffolk County consists of racial minorities (SCPD 2002). However, the proposed Project area is not located within a residential setting, indicating that the stone revetment alternative would not disproportionately affect clustered minority populations.

Per capita income in Suffolk County was $31,300 in 1999, with approximately 6.7% of the individuals in Suffolk County identifying incomes below the poverty level (United States Census Bureau [USCB] 2000). Again, because the proposed Project area is not located within a residential setting, no impacts are expected on the county's low-income community.

No adverse human health impacts are anticipated to result from the implementation of the proposed Project. The proposed Project would provide an increased level of erosion and storm protection to the Suffolk County community, and residents would experience beneficial impacts in terms of preservation of the socio-cultural resources of the Project area. Therefore, no mitigation measures are required to address disproportionately high and adverse impacts to minority and low-income populations.

## 4.18 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS AND CONSIDERATIONS THAT OFFSET ADVERSE EFFECTS

The construction of the stone revetment alternative would result in certain unavoidable adverse impacts on the environmental resources located within the Project area. Temporary and localized adverse environmental effects that may occur during construction include: an increase in traffic, an increase in noise levels due to construction equipment, an increase of turbidity and sedimentation into water resources during construction, loss of less mobile wildlife including shellfish and other benthic organisms, and disruption of aesthetic, visual, and recreational resources.

However, implementation of the stone revetment alternative is expected to generate numerous long-term beneficial impacts that would offset temporary adverse environmental impacts. These long-term beneficial impacts include the protection of the most vulnerable portion of the bluff area from failure, offering protection to the Turtle Hill plateau, the Lighthouse and associated structures, and other historically important resources. This protection would provide long-term protection to the socioeconomics of the area through the preservation the aesthetic, visual, historic, and recreational appeal that the Project area currently offers. In addition, implementation of the stone revetment alternative is expected to offer protection to valuable interdunal pond communities that exist along the northern shore of Montauk Point State Park (see Section 4.3.1).

## 4.19 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The stone revetment alternative would entail a short-term commitment of resources, including construction equipment, construction materials, labor, public monies to fund construction, and maintenance equipment and activities.

Areas in the vicinity of the proposed revetment would be subject to the disruption of natural habitat (i.e., mostly rock) during construction. There would be a short-term disruption of transportation systems and infrastructure along access roads and parking lots in the Project area during construction. There also would be a disruption of the availability of recreational and scenic uses as the existing revetment and walkway would be temporarily closed. These disruptions would temporarily limit the use of local recreational facilities and transportation routes by local residents and tourists, and habitats by indigenous animal species.

To contrast this short-term commitment of resources, there are several long-term enhancements in productivity that would result from the selected plan. There would be beneficial impacts on the local economy, resulting from the preservation of the NRHP-listed Lighthouse and bluff face, which would continue to attract visitors and recreational users.

In the long-term, the stone revetment alternative is anticipated to result in a more economically and environmentally stable community, both in the immediate Project area and in the surrounding municipalities. Therefore, the long-term productivity of the overall region may experience benefits from this short-term impact on the environment.

## 4.20 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable resources would be committed to the Project area by the USACE, NYSDEC, Montauk Historical Society, Montauk Point State Park, and any other involved local agencies and municipalities. Resources committed include construction materials and costs; labor costs for the planning phase; natural resources such as soil, water, and energy resources such as fossil fuels (gasoline, petroleum products, and lubricants) and electricity; and, land to accommodate the revetment.

The District would implement standard protection measures for soil and water (i.e., erosion and sedimentation controls) and other resources during and after implementation of all activities associated with construction of the Project to minimize the short- and long-term commitment of these irreversible and irretrievable resources.

Not all of these resources are irretrievable. The monies committed to the Project would be offset through savings in municipal expenditures that would be needed to implement emergency storm protection measures at Montauk Point. Implementation of the stone revetment alternative would also provide stability to the revenues of the local tourism-dependant businesses as the Lighthouse and the aesthetic, visual, and recreational appeal of the Project area would be preserved.

## 4.21 CUMULATIVE IMPACTS

The CEQ Rules and Regulations for implementing NEPA (Title 40, CFR Part 1508.7) defines cumulative impact as the impact on the environment which results from the incremental impact of the Proposed Action (the selected alternative) when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. This section identifies baseline conditions upon which cumulative impacts will be assessed, identifies the area of potential effect or "cumulative impact zone" that will be considered, identifies and briefly describes reasonably foreseeable future actions (RFFAs) within the cumulative impact zone, and evaluates subsequent cumulative impacts by resource area.

### 4.21.1 Cumulative Impact Zone

The baseline for cumulative effects analysis includes the site conditions at Montauk Point immediately after the completion of terracing in the 1970s and 1980s and the 1990 and 1992 revetments, as well as the current affected environment described in Section 3.0. Current environmental conditions at and in the immediate vicinity of Montauk Point are very similar to conditions present immediately following these shore and bluff protection activities.

The Proposed Action's cumulative impact zone for this analysis is the south shore of Long Island consisting of an approximately 83-mile-long shoreline from Fire Island in the west to Montauk Point in the east, because the effects of projects are generally felt more westward due to ambient littoral drift. This cumulative impact zone is defined by the dominance of littoral drift forces that carry sediments in a predominantly east-to-west direction, due to prevailing wind direction. Most of the overall cumulative impacts from the renourishment and dredging projects that are part of the Fire Island Inlet to Montauk Point, New York Reformulation Project (FIMP) will be addressed in that project. Because the Proposed Action is located within the FIMP, the FIMP will also include the potential impacts from the Proposed Action (Montauk Point Storm Damage Reduction Project) and any of its effects on Long Island. This is a logical path to address them as FIMP is set up as a more comprehensive, broad-based project/plan, and NEPA/cumulative impacts guidance indicates that broader management plans are an appropriate venue for exploring cumulative effects as they take into account the big picture and wider scopes.

### 4.21.2 Reasonably Foreseeable Future Actions

Federal activities that occur along the south shore of Long Island include beach replenishment/storm protection projects. The majority of these projects have a project life of 50 years. This analysis therefore assumes that the project life of Federal activities on the shore of Long Island is 50 years. Although the scope of this analysis is limited to Federal activities, non-Federal activities occur which also impact the south shore of Long Island. These activities include but are not limited to:

**a)** Shoreline development/storm protection structures;
**b)** State, county, and local agency beach by-passing and beach raking;
**c)** Water quality degradation from point and non-point sources;
**d)** Commercial and recreational fishing/shellfish harvesting; and,
**e)** Use of recreational vehicles, pleasure boats, and personal water craft.

The Proposed Action is located within FIMP's study limits. A reformulation is being conducted to formulate a plan seeking to provide long-term reduction of storm damage along the south shore of Long Island from Fire Island Inlet to Montauk Point (83 miles total). Alternatives being considered include: no-action; removal/modification of existing structures; buy-out plan/non structural measures; sand by-passing; beach restoration/nourishment; groins; revetments; seawalls; break waters; ring levees; tidal gates; and various combinations of the above. Any projects resulting from the FIMP reformulation would be implemented at the earliest in 2008. Any plans derived from this study are presently unknown, but could potentially include beach fill, non-structural measures, inlet modification, groins, and other shore protection/storm damage reduction activities.

The Fire Island Inlet to Montauk Point Project, which was authorized in 1960 based a report in 1958, did not include protective works at Montauk Point. It is likely that the Congress was cognizant of that when it authorized a separate study for the protection of Montauk Point.

The Fire Island to Montauk Point Reformulation Study is premised on the existence of the present revetment at Montauk Point that was constructed by the U.S. Coast Guard and the Montauk Historical Society in 1992-1993. In the absence of a project decision at the Point, the Reformulation Study has assumed that local interests would likely maintain some form [illegible] present revetment for the foreseeable future and there is no reason to expect it to be removed. Accordingly, the FIMP Reformation Study has conservatively estimated that no littoral material is generated into the south shore of Long Island littoral system from the Montauk Point area that is protected by the existing revetment. The small amount of material that potentially could enter the south shore littoral system upon the failure of the existing revetment would not significantly affect the evaluation of without and with-project alternatives in the FIMP Reformulation Study. With regard to coastal and littoral processes, the revetment selected for a potential Montauk Point Storm Damage Reduction Project would tend to continue the effects of the existing revetment and the nearly 60 year history of efforts to reduce erosion. These effects are small and diminish with distance from the revetment well before, or east of, any area where the FIMP Reformulation Study would be evaluating protection measures.

In summary, the proposed alternative has independent utility and does not foreclose any alternatives being considered under the FIMP Reformulation Study. If the Montauk Point Feasibility Report is approved and the proposed alternative is recommended for construction, the FIMP Reformulation Study will include analysis of this project in its cumulative effects analysis.

Other USACE projects associated with the FIMP project area include:

a) **Westhampton Interim Project.** The Westhampton Interim project provides interim storm damage protection via modification of the groinfield and periodic beach nourishment in Westhampton, New York. Initial construction has been completed. Renourishment, involving approximately 1.1 million cubic yards of sand from offshore borrow areas, is expected to occur every 3 years. The next renourishment of 1,000,000 cubic yards is scheduled to occur in Fiscal Year 2007.

b) **Breach Contingency Plan.** This plan establishes a procedure for the rapid closure of breaches. The plan calls for the initiation of closure efforts within 72 hours (start within three days, complete within three months) of the occurrence of a breach. This plan has been approved and is available for implementation from Fire Island Inlet to Southampton, New York. Initial fill material may be trucked in but larger and longer duration breaches would use material dredged from either bay channels or offshore borrow areas.

c) **West of Shinnecock Interim Projects**. This project, constructed in February 2005, with an initial installment of approximately 700,000 cubic yards of sand fill, will be renourished with approximately 400,000 cubic yards in 2007.

d) **Lake Montauk Navigation and Storm Damage Reduction Project**. This project is part of a study for Lake Montauk Harbor, the results of which are not expected to be available for approximately 2 years.

Other government projects within the FIMP project area include:

a) The NYSDOS sand bypassing plant and jetty spur programs, should they be implemented, would complement the proposed beach nourishment project. The sand bypassing plant would transport sand to the area west of the placement area. Spur construction, if successful, could reduce the quantity of beach fill required for renourishment in the placement area.

b) The proposed West of Shinnecock Inlet project would complement the South Shore Estuary Comprehensive Management Plan (CMP) in that the two programs share the goal of protecting the estuary.

c) The Towns of East and Southampton are updating their codes and developing the Local Waterfront Revitalization Plan to ensure orderly development along its south shore waterfront and to minimize the potential for erosion related impacts. The goals and objectives of all of these projects are congruent, and therefore, they would not result in cumulative adverse impacts.

d) Suffolk County periodically dredges local channels for maintenance purposes. This dredging is conducted subject to permits issued by the USACE-New York District and NYSDEC. The dredging takes place mostly in the bays and not on the open Atlantic Ocean coast. The dredged materials are used as beach fill, whenever materials are suitable and placement is cost effective.

This section summarizes cumulative effects associated with the past, present, and reasonably foreseeable future actions conducted by agencies and individuals in the vicinity of Montauk Point and the 83-mile-long section of the south shore of Long Island associated with the FIMP. Cumulative impacts are summarized in this section by resource area, including topography/geology/soils, water resources, ecological communities, threatened and endangered species, socioeconomics, cultural resources, land use, coastal zone management, hazardous materials, air quality, and noise.

### 4.21.3 Topography, Geology, and Soils

The implementation past, present, and RFFAs within the cumulative impact zone, including the Proposed Action revetment, FIMP renourishment measures, and other government actions are expected to result in no impacts on geological resources, while significantly benefiting long-term stability of topography, including bluffs and shorelines. Therefore, no significant negative cumulative effects on geology or topography are expected.

### 4.21.4 Water Resources

The implementation of past, present, and RFFAs in the cumulative impact zone likely would result in no significant adverse impacts on regional hydrology or groundwater resources. Cumulatively, these actions would result in a potential temporary, minor, adverse impact on adjacent surface waters due to potential soil erosion, turbidity, and sedimentation during construction activities, primarily associated with the proposed stone revetment project, borrow area dredging, and beach fill/renourishment placement. However, the use of site-specific [illegible] control measures and best management practices specified in project-specific Erosion Control Plans during construction, dredging, and placement activities, as well as hazardous and toxic material spill control, would reduce potential temporary erosion, sedimentation, and contamination effects to a level that is not undue or significant.

The construction of the proposed stone revetment, which includes placement of large boulders along Montauk Point shoreline, would not impact large-scale tidal patterns in the cumulative impact zone or the existing wave refraction around Montauk Point, since the existing loose stones at the toe of the revetment would be replaced after the buried toe is constructed. Additionally, the FIMP is designed to assess and ameliorate any potential cumulative effects of USACE actions on large-scale tidal patterns and wave refraction within the cumulative impact zone, while ensuring increased stabilization of local shorelines.

### 4.21.5 Ecological Communities

As listed in the Ecological Communities of New York State (Edinger et al. 2002), the cumulative impact zone is located in the coastal lowland ecozone within marine and terrestrial systems. The communities present within the impact zone include:

- Marine Subtidal;
- Marine Deepwater Community-Open ocean areas below lowest tide levels;
- Marine Intertidal;
- Marine Intertidal Gravel/Sand Beach;
- Marine Rocky Intertidal;
- Marine Cultural;
- Marine Submerged Artificial Structure/Reef – Artificially introduced structure submerged in marine waters that provide habitat for marine fauna;
- Marine Riprap/artificial shore – Constructed marine shore composed of broken rock, stones, wooden bulkheads and concrete;
- Terrestrial Open Uplands;
- Maritime Beach;
- Maritime Dunes;
- Maritime Heathland;
- Maritime Shrubland; and,
- Maritime Grassland.

Maritime grasslands, heathlands, and shrublands occur to the north, south, and west of the Lighthouse, on top of the Turtle Hill plateau, and outside of the revetment construction area. However, no direct or indirect impacts to vegetation would occur because the revetment area is unvegetated and existing roads and parking areas would be used for construction equipment and material access and staging. As discussed in Sections 4.3.1 and 4.4.1 marine rocky intertidal habitat would be temporarily impacted by the Project and would be replaced at an equal or greater value than what would be impacted. This marine rocky intertidal habitat is limited to the nearshore waters off of Montauk Point and therefore impacts would be limited by other projects in the cumulative impact zone. No cumulative impacts to ecological communities is expected as a result of implementation of the Project.

### 4.21.6 Threatened and Endangered Species and Communities of Special Concern

Federally-listed endangered and threatened species exist in shoreline communities and include the federally-threatened piping plover (*Charadrius melodus*), Federally-endangered roseate tern (*Sterna dougallii*) and the Federally-threatened seabeach amaranth (*Amaranthus pumilus*). The District coordinates and consults with the USFWS in accordance with the ESA when projects along the south shore of Long Island have the potential of impacting Federally-listed species. Section 7 (of the ESA) consultation usually requires that construction windows and/or monitoring of these species during construction with the implementation of buffer areas to minimize project-specific and cumulative impacts to these species.

### 4.21.7 Socioeconomics

The implementation of past, present, and RFFAs likely would result in long-term, significant, beneficial impact on the economic characteristics associated with the cumulative impact zone through the protection of Montauk Point and the south shore of Long Island from inevitable future erosion and storm damage. Such protection would preserve the bluffs and shorelines for continued recreational use by seasonal and permanent residents within the cumulative impact zone. The implementation of past, present, and RFFAs also likely would result in a continuing contribution by the diverse recreational facilities located within cumulative impact zone to various aspects of the local economy, including the continued demand for seasonal housing, restaurants, and local business services in support of the recreational uses of the area.

There is little concern that the proposed stone revetment alternative would have a detrimental effect on local socioeconomic conditions through the alteration of offshore surfing conditions, because the new revetment will closely replicate the existing revetment effects on the environment. Additionally, the FIMP is designed to assess and ameliorate any potential cumulative effects of USACE actions on large-scale tidal patters and wave refraction within the cumulative impact zone, while ensuring increased stabilization of local shorelines, such that significant, long-term impacts on surfing conditions would be assessed and avoided to the maximum extent practicable.

### 4.21.8 Cultural Resources

Generally, any Federal action would be required to comply with the NHPA for the protection of properties listed or eligible for listing on the NRHP, as well as NYSOPRHP guidelines and recommendations. As a result, implementation of past, present, and RFFAs in the cumulative impact zone likely would result in no undue adverse cumulative impacts on cultural resources.

The implementation of past, present, and RFFAs in the cumulative impact zone also likely would have a long-term, direct, beneficial impact on cultural resources. Specifically, the replacement of the current revetment wall will ratify the Congressional mandate to protect the Lighthouse complex and its surrounding area by ensuring that erosion and the continued loss of the bluff will be reduced.

### 4.21.9 Land Use

The implementation of past, present, and RFFAs in the cumulative impact zone likely would result in direct and indirect, minor impacts on land use, as well as long-term, direct, beneficial impacts on land use. Minor, adverse impacts on land use would occur as a result of temporary reduction in recreational and other access to construction zones. However, these impacts would be limited to periods of active construction, dredging, and renourishment activities. Long-term, beneficial impacts would occur as a result of long-term protection of the Lighthouse and associated recreational and cultural resource features, and shoreline protection and storm damage reduction associated with other Federal and government RFFAs.

### 4.21.10 Coastal Zone Management

As required under the Federal Coastal Zone Management Act of 1972, the District reviews all proposed projects in relation to the applicable policies of the New York State CMP and ensure that construction, operation, and maintenance activities are consistent with all relevant policies. Accordingly, implementation of past, present, and RFFAs in the cumulative impact zone would not result in significant adverse impacts on coastal zone resources.

### 4.21.11 Hazardous, Toxic, and Radioactive Wastes

The implementation of past, present, and RFFAs in the cumulative impact zone may result in temporary, minor, direct and indirect impact on human health by the storage, use, transport, and disposal of hazardous materials associated with construction activities. Cumulatively, these potential impacts would be reduced to a level that is not undue or significant by handling all such hazardous materials in accordance with programmatic and project-specific health and safety and spill contingency plans.

### 4.21.12 Air Quality and Noise

The cumulative impact zone is located within a severe non-attainment area for ozone. The implementation of past, present, and RFFAs within the cumulative impact zone would be programmatically or individually addressed by the District for conformity with the Clean Air Act. Generally, air quality impacts are expected to be temporary, insignificant, and within the ozone limits for the non-attainment area. A project-specific statement of conformity is provided in Appendix G.

The implementation of past, present, and RFFAs within the cumulative impact zone likely would result in temporary, direct and indirect, adverse impacts on noise. The primary cause of increased noise would be the operation of construction, dredging, and beach fill/renourishment equipment, such as barges, bulldozers, backhoes, and other machinery. This increased noise would be temporary, being restricted to individual project construction sites and occurring only during the periods of project construction and maintenance activities. Cumulatively, adverse noise impacts on recreational, residential, and land use activities would be reduced to a level that is not undue or significant by performing construction and maintenance activities primarily during daylight hours. No permanent noise sources would be constructed or operated associated with the RFFAs, therefore no long-term impacts on noise would occur.

## 4.22 Conclusion

Based upon the information gathered during this process, it is the determination that the Recommended Plan of the Feasibility Report, The Stone Revetment (see Section 2.3.1) is the best alternative for the overall project and will not adversely affect either the natural or cultural environments. This alternative will cause only temporary, minimal impacts to the natural and cultural environment during the construction phase of the project only. No long term significant impacts to either the natural or cultural environment were identified.

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# 6.0 LIST OF PREPARERS

**Table 7. List of Preparers**

| Name | Position | Role in DEIS Preparation |
|---|---|---|
| **U.S. Army Corps of Engineers, New York District** | | |
| Dr. Christopher Ricciardi | Environmental Branch | Project Environmental Manager,<br>Principal EIS Manager,<br>Project Archaeologist |
| Frank Verga | Project Management and Plan Formulation | Project Manager and Planner,<br>Principal Author – Feasibility Report |
| Roselle Henn | Environmental Branch | Team Leader, Environmental Branch |
| Thomas Pfeifer | Plan Formulation Branch | Team Leader, Planning Branch |
| Ellen Simon | Office of Counsel | Counsel Review |
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| Stuart Chase | Engineering Division | |
| **Northern Ecological Associates, Inc.** | | |
| Stephen Compton | Principal | Program Manager, Principal Review, Cumulative Impacts |
| Sandra Lare | Managing Environmental Planner | DEIS Task Manager, Summary, Task Manager Review |
| Brad Schaeffer | Senior Environmental Scientist | Purpose and Need, Alternatives, Vegetation (Wetlands, Uplands), Wildlife (Reptiles and Amphibians, Birds, Mammals), Threatened and Endangered Species and Communities of Special Concern, Unavoidable Adverse Effects, Relationship Between Short-Term Use and Long-Term Productivity, Irreversible and Irretrievable Commitment of Resources, Technical Review |
| Natasha Snyder | Senior Environmental Scientist | Purpose and Need, Alternatives, Vegetation (Wetlands, Uplands), Wildlife (Reptiles and Amphibians, Birds, Mammals), Threatened and Endangered Species and Communities of Special Concern, Socioeconomics (Demographic Characterization, Economy and Income, Housing), Land Use and Zoning, Navigation, Aesthetics and Scenic Resources, Recreation, Transportation, Air Quality, Noise, Environmental Justice |
| Tom Shyka | Senior Environmental Scientist | Topography, Geology, Soils, Water Resources, Coastal Zone Management, Coastal Zone Consistency Statement, Hazardous, Toxic, and Radioactive Waste |

**Table 7. List of Preparers (continued)**

| Name | Position | Role in DEIS Preparation |
|---|---|---|
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| Jack Wu | Associate Scientist | Water Resources, Wildlife (Shellfish, Finfish, Benthic Resources), 404(b)(1) Guidelines Evaluation |
| Karla Hyde | Associate Scientist | Figure Preparation |
| Beth Stuba | Technical Editor | Document Review |

# APPENDIX A

# DRAFT EIS DISTRIBUTION LIST

## PART I: DIGITAL AND HARD COPY SENT TO:

Senator Charles E. Schumer
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East Hampton, New York
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# APPENDIX B

# PERTINENT CORRESPONDENCE

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Chris

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

Bernadette Castro
Commissioner

September 26, 2002

Leonard Houston
Chief, Environmental Analysis Branch
Department of the Army
New York District, Corps of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0090

RE: Archeology Survey at the Montauk Point Light Station
Montauk, Suffolk County, NY
02PR04111

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We have begun to review the project in accordance with Section 106 of the National Historic Preservation Act of 1966 and relevant implementing regulations.

James Warren of our National Register unit agrees that the Montauk Point Lighthouse Complex could be listed as a National Register district encompassing the other historic resources associated with the lighthouse. The complex may also be eligible for National Historic Landmark designation, which would enable the property's owners to apply for rehabilitation funding under the National Park Service's Save America's Treasures program (more information available at http://www.saveamericastreasures.org/).

SHPO archeologist Doug Mackey reviewed the archeology report and concurs with its findings. To make a determination of effect the SHPO requests more detailed project information. Any proposal for erosion protection should take into account both visual and archeological impacts. Please forward the revetment plans to the SHPO as they become available.

Thank you again for your assistance. If you have any questions, feel free to call me at (518) 237-8643, ext. 3282. Please refer to the SHPO Project Review (PR) number in any future correspondences regarding this project.

Sincerely,

Greg Donofrio
Historic Sites Restoration Coordinator
(greg.donofrio@oprhp.state.ny.us)

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

19 November 2002

Environmental Analysis Branch

Ruth Pierpont
New York State Office of Parks, Recreation & Historic Preservation
Historic Preservation Field Service Bureau
Peebles, Island, P.O. Box 189
Waterford, New York 12188-0189

Dear Mr. Kuhn:

The U.S. Army Corps of Engineers, New York District (Corps), is pleased to furnish you with a copy of the final report, *Archaeological Survey At The Montauk Point Light Station, Montauk, Suffolk County, New York.*

The report outlines the following recommendations/conclusions: a) no further work is required on Features 2 and 4 (trash deposits) which were determined to be modern, b) Feature 3 (a well) was capped in concrete so no determination could be made, c) Feature 1 (an historic stone pavement) is eligible for nomination for inclusion on the National Register of Historic Places (NRHP) under Criteria A and C, d) further investigation may be required along the eastern bluff of the complex if further work will continue in that area, and finally, e) Feature 1, as well as the entire Lighthouse Complex, is eligible for nomination as part of an Historic District and a National Landmark.

The Corps concurs with all of the recommendations and conclusions of the report as well as your office with regard to the findings uncovered during excavations and the determination of the eligibility of the Montauk Point Lighthouse Complex as a Historic District and as a National Landmark. At this time no further work is planned for the Complex. However, if the nature of the proposed work changes, the Corps will recommend that further action be taken with regard to Feature's 1 and 3 as well as the eastern bluff area. Additionally, the Corps will recommend to the Montauk Point Lighthouse Historical Society that they pursue nominations for both a Historic District and National Landmark status for the Lighthouse Complex.

Thank you and Douglas Mackay for your participation in the Section 106 process for the Phase II portion of the Montauk Point Storm Damage Reduction Project. If you have any questions, please contact the Project Archaeologist, Chris Ricciardi, at (212) 264-0204.

Sincerely,

L. Houston

Leonard Houston
Chief, Environmental Analysis Branch

Enclosure

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

25-March 2003

Environmental Analysis Branch

Michael Ludwig
National Marine Fisheries Service
212 Rogers Avenue
Milford, Connecticut 06460

Dear Mr. Ludwig:

The U.S. Army Corps of Engineers, New York District (Corps), is proceeding with the preparation of an Environmental Impact Statement for the Montauk Point Storm Damage Reduction Project, Town of Easthampton, New York. The project proposed is an in-kind repair of the existing stone revetment wall that surrounds Montauk Point. This work will strengthen the current storm damage protection that the wall provides. A copy of the proposed project description is enclosed to familiarize you with the background, information, area, and proposed work.

The Corps has noted that several species of sea turtles, seals and right whales, covered under the Endangered Species Act (ESA), may potentially inhabit the Montauk Point area on a seasonal basis. Seals in particular are known to utilize rocks located at the toe of the bluff as haul out areas. The proposed project is being designed to retain these features and minimize disturbance during construction. It is our assessment that this project would not adversely affect sea turtles or marine mammals at Montauk Point due to the very limited nature of the work and the transient species usage of the project site. Therefore, we request informal ESA consultation via letter if your agency concurs with the Corps evaluation.

Further, the Corps notes that the Montauk Point area has been designated as an Essential Fish Habitat (EFH). With the aid of the Habitat Conservation Division report of 1999, the Corps has designated nineteen (19) different species that have forty-six (46) different life stages in and around Montauk Point. Based on the proposed project it is our assessment that this project would not adversely affect the EFH species, or their life stages, present in and near the project site. Therefore we request informal consultation via letter if your agency concurs with the Corps evaluation.

It is requested that you review the enclosed project description and provide comments, as pursuant Section 7 of the Endangered Species Act. If you have any questions, concerns or comments, please call Ms. Roselle Henn, Team Leader, 212-264-2119.

Thank you very much for your time and cooperation.

Sincerely,

L. Houston

Leonard Houston
Chief, Environmental Analysis Branch

Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Region
Habitat Conservation Division
Milford Biological Laboratory
212 Rogers Avenue
Milford, CT 06460

DATE: April 23, 2003

TO: Roselle Henn, New York District, Army Corps of Engineers

FROM: Mike Ludwig, NOAA/NMFS, Milford, CT *Mike Ludwig*

SUBJECT: Montauk Point storm Damage Reduction Project, Suffolk County, New York.

1) This memorandum responds to your request for clarification regarding the potential for marine mammal and construction interactions / conflicts at the subject, Montauk Point Lighthouse construction site. We have coordinated our evaluation with members of the NMFS Protected Resources Division and our Stranding Network representative familiar with the site.

2) The Riverhead Foundation (the NMFS, Stranding Network representative for Montauk Point) reports that the haulout area most utilized by the three species of seals recorded in the area (Harp, Harbor and Hooded), is found about one mile north, northeast of the construction area. The seals do not appear to utilize the Montauk Point Lighthouse revetment or the beach proximal area. It appears that human presence, local topography, hydrodynamics and food availability at the Lighthouse conspire to limit the desirability of the area for seal activities. Seals do not actively seek out areas where human presence or noise are components of the environment. Since the commencement of the construction should predate the arrival of the seals, their use of the area would be unusual. We do not expect that the proposed restoration / rehabilitation work will alter those basic incompatibilities for the marine mammals during their overwintering in the area. With such a "no species present" condition at the Montauk point Lighthouse, no further coordination is needed.

3) As always, should new information or a change circumstances occur that might alter the basis for our assessment, we recommend that coordination be reopened.

4) Finally, the New York district should consider obtaining an "incidental take" permit as an extra caution. An application for the permit can be obtained by calling our headquarters staff at (301) 713-2289 or using our NOAA Fisheries National web site at < http://www.nmfs.noaa.gov/prot_res/prot_res.html >. The authorization process is generally 120 days. However, the construction should not be delayed by the authorization process. This is just a precaution to be sure all bases are covered in the event some other unforeseen marine mammal issue arises during the course of the work that had not previously been anticipated.

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

19-August 2003

Environmental Analysis Branch

Michael Ludwig
National Marine Fisheries Service
212 Rogers Avenue
Milford, Connecticut 06460

SUBJECT: Montauk Pont Storm Damage Reduction Project

Dear Mr. Ludwig:

Thank you very much for the participation of the National Marine Fisheries Service (NMFS) in the Environmental Impact Statement (EIS) process for the Montauk Pont Storm Damage Reduction Project. At this time the Corps is preparing to release the Draft EIS.

At this time construction for the Project is not planned until at least 2008. Due to this time lag, the Corps will not apply for an "incidental take" permit at this time. We will continue to monitor and coordinate with your office as the commencement of construction nears. Prior to this, if the Corps and the NMFS determines, based on the updated observation/information, that obtaining the "incidental take" permit prior to work beginning is necessary, the Corps will comply. The Corps agrees with your recommendation to keep the NMFS informed should there be alterations to the project that require further coordinated efforts.

If you have any questions, concerns or comments, please call Ms. Roselle Henn, Team Leader, 212-264-2119.

Thank you very much for your time and cooperation.

Sincerely,

for Leonard Houston
Chief, Environmental Analysis Branch

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

July 16, 2002

Colonel John B. O'Dowd
District Engineer, New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278-0090

Dear Colonel O'Dowd:

The U.S. Fish and Wildlife Service (Service) thanks you for the opportunity to comment on the Notice of Intent (NOI) published in the Federal Register (Vol. 67, No. 101, Friday, May 24, 2002), regarding the Montauk Point Storm Damage Reduction Project, located in the Town of East Hampton, Suffolk County, Long Island, New York (Service's ER#-02/0514). The NOI described the intent of the U.S. Army Corps of Engineers to Prepare a Draft Environmental Impact Statement (EIS).

The Service recommends that the Draft EIS address the cumulative impacts of the proposed action and other proposed actions within the vicinity of the project site. This recommendation is made in light of the Corps' on-going Fire Island to Montauk Point Reformulation (FIMP) Study, which involves the formulation of proposed storm damage reduction alternatives from Fire Island Inlet to Montauk Point. The relationship between the proposed action and the FIMP Study should be clearly explained (i.e., whether it is an alternative formulated through the FIMP Study development process or an interim project).

Additionally, the Draft EIS should adequately describe the areal extent and type of direct and indirect impacts to the nearshore/rocky intertidal habitats present within the project area, resulting from each alternative of the proposed project. The Draft EIS should also describe the construction methods, as well as measures to avoid, minimize, and/or compensate for project impacts to fish and wildlife resources.

The Service looks forward to working with the Corps during the National Environmental Policy Act review process. The comments provided herein do not preclude our providing additional comments pursuant to the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) and/or the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

The Service hopes that these comments are useful in your project evaluation. If you have any questions or require additional information, please contact Mr. Steven Sinkevich of the Long Island Field Office at 631-581-2941.

Sincerely,

David A. Stilwell

David A. Stilwell
Field Supervisor

cc: USDOI, Washington, DC (T. Martin)
USFWS, Long Island Field Office, Islip, NY

110

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

20 September 2002

Planning Division

David A. Stilwell, Field Supervisor
United States Department of the Interior
Fish and Wildlife Service
2817 Luker Road
Cortland, New York 13045

Dear Mr. Stilwell:

Thank you very much for your letter from July 16, 2002 with regard to the Notice of Intent (NOI) published in the Federal Register (Vol. 67, No. 101, Friday, May 24, 2002), regarding the Montauk Point Storm Damage Reduction Project (ER#-02/0514).

I would like to point out that you have incorrectly characterized the association of the Montauk Point Storm Damage Reduction Project with the Fire Island to Montauk Point (FIMP) Project. The Montauk Point Storm Damage Reduction Project has its own authorization and is proceeding in advance of the FIMP Project. I hope that you, and your staff, will treat these projects independently of each other. The FIMP Project will take into consideration the recommendations and results of the Montauk Point Storm Damage Reduction Project.

We will be meeting with representatives from the Long Island Field Office (LIFO) shortly to complete the negotiations and to initiate the work on the Fish and Wildlife Coordination Act Report (FWCAR) for Montauk Point as soon as possible. Our intent is to work with the LIFO so that FWCAR recommendations can be used in preparation of the Draft Environmental Impact Statement, which is scheduled for completion in December of this year.

If you have any questions, or require further information at this time, please contact Ms. Roselle Henn, the Environmental Team Leader at (212) 264-2119.

Sincerely,

Frank Santomauro
Frank Santomauro
Chief, Planning Division

cc. Mr. Steven Mars
Mr. Steven Sinkevich
Long Island Field Office

Faxed 01/23/03

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

January 22, 2003

Christopher Ricciardi, Archaeologist
U.S. Army Corps of Engineers
New York District, Planning Division
Jacob K. Javits Federal Building
26 Federal Plaza - Room 2131
New York, NY 10278-0090

Dear Mr. Ricciardi:

This Interim Letter (IL) provides our preliminary review and comments on the Montauk Point Storm Damage Reduction Project in the Town of East Hampton, Suffolk County, New York. Currently, the U.S. Army Corps of Engineers (Corps) is studying the feasibility of "...preserving, restoring, and protecting Montauk Point and vicinity, including the historic Montauk Lighthouse and associated facilities, from erosion, environmental degradation, and coastal storm damage." The study is being conducted under the authority of resolutions adopted by the Committee on Environment and Public Works of the U.S. Senate on May 15, 1991. This IL is intended to assist in subsequent project planning and does not constitute the report of the Department of the Interior or the U.S. Fish and Wildlife Service (Service) on the project within Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

**Description of Project and Study Area**

Montauk Point is located in Suffolk County, on the extreme eastern tip of the south shore of the Atlantic Coast of New York, approximately 125 miles east of New York City. The study area consists of the existing stone revetment wall area, approximately 700 feet around the bluff that the lighthouse and structures rest upon, and Turtle Hill Plateau, which encompasses approximately 2,200 linear feet of shoreline surrounding Montauk Point. There are six preliminary alternative project solutions provided in the Corps P7 Preliminary Alternatives Report dated April 2002. The Corps prefers Alternative #2-Stone Revetment solution to repair and protect the Montauk Lighthouse and associated structures by reinforcing and strengthening the existing wall with similar material of greater size.

The following list consists of categories of the natural resources found in the project area that the Service will comment on in the draft Fish and Wildlife Coordination Act (FWCA) report for the Montauk Point Storm Damage Reduction Project.

## 1. Fish and Wildlife Resources

Threatened and Endangered Species (see below) - Federal and State
Benthic Invertebrates
Fish and Shellfish
Birds (shorebirds, waterfowl, passerine)
Mammals (terrestrial and marine)
Vegetation (submerged, floating, emergent, woody)
Wetlands (estuarine and palustrine identification and delineation)
Communities and Ecosystems (Marine Rocky Intertidal, Maritime Grassland)
Animal Concentration Areas (Waterbird Nesting Colonies, Waterfowl Concentration Areas, Migratory Stop-over Sites)

## 2. Threatened and Endangered Species

No Federally-listed or proposed threatened or endangered species under our jurisdiction are known to exist within the project impact area. In addition, no habitat in the project impact area is currently designated or proposed critical habitat in accordance with the provisions of the Endangered Species Act (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.). Should project plans change, or if additional information on listed or proposed species or critical habitat becomes available, this determination may be reconsidered.

New York State heritage data indicate the potential presence of six Federally-listed species which are under the jurisdiction of the National Marine Fisheries Service (NMFS) and may potentially occur within the project area. They are: the loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), Kemp's ridley sea turtle (Lepidochelys kempii), finback whale (*Balaenoptera physalus*), and the humpback whale (*Megaptera novaeangliae*). It is recommended that the Corps consult with the NMFS in accordance with Section 7 of the ESA, the Marine Mammals Act, and the Sustainable Fisheries Act.

The Service is currently in communications with the NMFS, Cornell Cooperative Extension, The Riverhead Foundation, the Town of East Hampton, New York State Office of Parks, Recreation and Historic Preservation, and the New York State Department of Environmental Conservation, to confer on the various fish and wildlife resources found at Montauk Point.

## 3. Analysis of Project Impacts

The analysis of project impacts will include consideration of the long and short-term direct, indirect, and cumulative effects of the project including:
- burial of benthic organisms;
- the alteration of the structure and availability of wildlife habitat (*e.g.* seal haul out areas, changes in depth, availability and quantity of intertidal habitat);
- impacts to finfish from alteration of habitat structure;
- impacts to public use;

- impacts of increased or decreased public use attributable to the project; and
- impacts to wintering waterfowl if construction is conducted during winter.

The analysis of project impacts will also include consideration of project alternative impacts (including direct, indirect, and cumulative effects) on staging and construction access areas. This will require coordination and consultation with, among others, New York State Office of Parks, Recreation and Historic Preservation, the Town of East Hampton, and the National Park Service. Alternative approaches to minimize impacts may include: establishing time of year construction windows; exploring alternatives for staging of equipment; and conducting pre- and post-construction activities, such as establishment of erosion and sedimentation controls and restoration, post-construction, of staging areas. Some of these discussions may result in project modifications that could affect trust resources and will need to be addressed in the Service's final FWCA report.

**Recommended Approach to Mitigation**

The Significant Habitats and Habitat Complexes of New York Bight Watershed characterizes the nearshore open waters surrounding Montauk Point as one of the most important nearshore areas for sea turtles and marine mammals in the New York Bight Region. These areas provide "regionally significant and critical waterfowl habitat and concentration areas; they also contain extensive beds of blue mussel (*Mytilis edulis*) and kelp (*Laminaria agardhii*)." This is also an exemplary site for the Christmas Bird Count, Montauk Point tallies from 125 to 135 species annually (USFWS, 1996). Among the many significant communities and ecosystems that make up the Montauk Point area, the predominant habitats encompassing the former and future revetment structure and access to the project area are the highly valuable Marine Rocky Intertidal and Coastal Sand Dune community areas.

Under the FWCA and the National Environmental Policy Act (NEPA) regulations, the Service has responsibilities to ensure that project-related losses to fish and wildlife resources are identified and mitigated. As part of our participation in the project planning, a mitigation plan will be developed and will be included in the draft FWCA. Using current available information, we have determined that the ecosystems of Marine Rocky Intertidal and Coastal Sand Dune are of greatest concern and, therefore, mitigation planning will focus on these habitats.

Although the Corps states in the Project Description that the majority of the proposed work will be an "in-kind" replacement and limited disturbance will occur in the water, the potential outward distance into the nearshore waters is not clearly defined in the Corps Planning Aid Report, therefore, all nearshore natural resources must be considered.

In conclusion, the FWCA report will address preliminary recommendations by the Service to reduce or eliminate the impacts of this project on fish and wildlife resources and related habitats in this sensitive area.

If there are any questions regarding this letter, please contact Laura Patrick of the Long Island Field Office at 631-581-2941.

Sincerely,

David A. Stilwell

David A. Stilwell
Field Supervisor

Literature Cited:

U.S. Fish and Wildlife Service. 1996. Significant Habitats of the New York Bight Watershed. U.S. Fish and Wildlife Service, Southern New England - New York Bight Coastal Program, Charlestown, RI.

cc: Town of East Hampton, East Hampton, NY (L. Penny, L. D'Andrea)
The Riverhead Foundation for Marine Research and Preservation, Riverhead, NY (R. DiGiovanni)
Cornell Cooperative Extension, Southold, NY
NMFS, Milford, CT (D. Rusanowsky)
NYSOPRHP, Montauk, NY (T. Dess, G. Lawton)
NYSDEC, Stony Brook, NY (J. Pavacic, C. Hamilton)
NYSDOS, Albany, NY (S. Resler)
NPS, Boston, MA (E. LaForest)

Faxed 03/27/03

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

March 26, 2003

Mr. Leonard Houston
Chief, Environmental Analysis Branch
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278-0090

Dear Mr. Houston:

This letter is in response to the U.S. Army Corps of Engineers (Corps) letter dated March 10, 2003, regarding the U.S Fish and Wildlife Service's (Service) delay in its submittal of the Montauk Point Storm Damage Reduction Project Draft Fish and Wildlife Coordination Act (FWCA) Report.

The Service believes three factors contributed to the delay of the report's submission: 1) lack of site-specific information with the Corps' project descriptions; 2) conflicting information sent to the Service on February 7 and February 10, 2003; and 3) genuine miscommunication between Corps and Service personnel.

The lack of site-specific information pertains to a description of staging and access route areas to be used for the Montauk Point Project. This information is critical to the Service's assessment of potential impacts to fish and wildlife resources associated with the project. Neither the project description in the Scope-of-Work (SOW) dated November 13, 2002, nor the Montauk Point Feasibility Study, dated April 2002 and received by the Service on December 3, 2002, contained information pertaining to the access roads and staging areas. On February 7 and 10, 2003, the Service received conflicting supplemental information regarding the extent of the project's impact area from the Corps. The facsimile dated February 7, 2003, documented the access roads and staging area and also stated that the area of Turtle Cove was outside the project area and that it was not to be considered as part of the project. The February 10 facsimile showed different access routes which greatly increased the project impact area and staging area to include, but not be limited to, the Town of East Hampton land known as Turtle Cove.

As a result of receiving no further documentation clearly outlining the intended staging areas and access roads and also attempting to resolve these issues verbally via telephone conversations, the Service believes misunderstandings may have occurred which ultimately led to the Corps receiving the draft report after its intended due date.

As you know, the Draft FWCA Report was sent via overnight delivery to the Corps on March 14, 2003, and receipt of delivery was confirmed on Monday, March 17, 2003. Due to the events surrounding the delay of this report, the Service has agreed with the Corps to correspond in writing in advance identifying issues that may impact our ability to meet pre-coordinated milestone due dates. The Service regrets not writing to the Corps sooner on these issues.

The Service will contact Ms. Roselle Henn this week for further coordination regarding the remaining deliverables for this project.

Thank you for your correspondence and understanding with this matter. If you have any further questions regarding this letter, please contact Ms. Laura Patrick, Project Biologist, of the Long Island Field Office at (631) 581-2941.

Sincerely,

David A. Stilwell
Field Supervisor

cc: USCOE, North Atlantic Division, City, State (S. Tosi, J. Wright)
USFWS, Region 5, Hadley, MA (M. Snyder)

**New York State Department of Environmental Conservation**
**Office of Natural Resources, Region One**
Charles T. Hamilton - Regional Supervisor of Natural Resources
Building 40 · SUNY, Stony Brook, New York 11790-2356
**Phone:** (631) 444-0270 · **FAX:** (631) 444-0272
**Website:** www.dec.state.ny.us

Erin M. Crotty
Commissioner

April 23, 2003

Steven Mars
Supervisor L I Field Office
US Fish & Wildlife Service
US Department of Interior
500 St. Marks Lane
Islip NY 11751

RE: Draft Fish & Wildlife Coordination
Act Section 2(b) Report, "Montauk Point Storm Damage Reduction Project, Suffolk County, New York"

Dear Mr. Mars:

We have completed our review of the above report. We concur with your conclusions and recommendations of this report.

Thank you for this opportunity to comment.

Very truly yours,

Charles T. Hamilton

Charles T. Hamilton

CTH:io

OPTIONAL FORM 99 (7-90)

**FAX TRANSMITTAL** # of pages ► 1

| | |
|---|---|
| To Roselle Henn | From C Zikari |
| Dept./Agency NY District | Phone # 607 753 9334 |
| Fax # 212-264-0961 | Fax # |

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

June 3, 2003

Mr. Leonard Houston
Chief, Environmental Analysis Branch
Planning Division
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

Dear Mr. Houston:

This is in regard to the U.S. Army Corps of Engineers' (Corps) project entitled, "Montauk Point Storm Damage Reduction Project" and coordination relative to the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*). Please find enclosed the U.S. Fish and Wildlife Service's (Service) comments on potential impacts to fish and wildlife resources from the staging and access road areas. These draft comments were requested by the Corps to be delivered prior to the final Fish and Wildlife Coordination Act Report (FWCAR) which is due June 30, 2003.

**Additive Effects of Construction Vehicle Activity on Beaches**

The Corps' "Montauk Point, New York-Proposed Staging and Access Areas" maps dated April and May 2003 depict two access roads, two staging areas and one alternate access road to Access Road 2. The Service recommends that in order to minimize erosion of beach and dune habitat and reduce impacts to species associated with this habitat, the Corps avoid using Access Road 2. Access Road 1 and Alternate Access Road 2 should provide adequate access while resulting in fewer impacts to beach and dune habitat and its associated natural resources.

Although the road along the north beach is currently used by off road vehicles, the Service believes that additional vehicle use, especially by heavy equipment, could exacerbate erosion in the Montauk Point area. The passage of vehicles on beaches can displace large quantities of sand seaward and may contribute to the rate of erosion. As little as one vehicle pass per week, over a two-year period, caused significant loss of vegetation and altered the profile of foredunes (Anders and Leatherman 1987a, 1987b). Driving at the foot of the dunes tends to churn up sand, making the dunes less stable. This activity interferes with the growth of dune grass (American beachgrass, *Ammophila breviligulata*). Dune grass is responsible for promoting the dune building process (National Park Service 2003). The backshore zone or area that is submerged only during storms or exceptionally high tides is very sensitive to disturbance and also supports plants that contribute to beach stabilization. This zone can support such flora as seabeach knotweed (*Polygonum glaucum*), a New York State listed species.

Driving near the water causes damage by crushing the wrack line. The wrack line and area seaward of the wrack line are areas that afford essential feeding opportunities for many species of birds and invertebrates. (National Park Service 2003). The passage of vehicles on the beach has been found to reduce the species diversity, percent vegetative cover and height of dune plants, resulting in the exposure of bare sand and creation of blowouts. Vehicular traffic also breaks up the salt-crust that normally reduces the wind-blown transport of sand, disrupts the drift line, and lowers the height of the dune (Lasiak 2002).

**Potential Impacts to State-listed Species**

There are five State-listed species of birds at Montauk Point. The threatened least bittern (*Ixobychus exilis*) and northern harrier (*Circus cyaneus*), as well as three species of concern, the osprey (*Pandion haliaetus*), red-shouldered hawk (*Buteo lineatus*), and whip-poor-will (*Caprimulgus vociferus*) nest at Montauk Point. Depending on their nest locations in relation to the access roads and staging areas, they may be highly vulnerable to disturbance. Disturbance may lead to nest abandonment and overall nest failure for the season. Some species will abandon the nest site and not return the following season.

The New York State Natural Heritage Program reports extant populations of three State-listed species at Montauk Point: salt-marsh spikerush (*Elocharis halophila*), small's knotweed (*Polygonum buxiforme*), and seabeach knotweed. Excess erosion from increased road and beach use associated with the proposed project may lead to destruction of these and other plant species. The Service recommends that the Corps proceed with Recommendation 3 from the draft FWCAR and conduct a pre-construction vegetation and breeding bird survey to document any existing State-listed species. If there are any State-listed species present, the Corps should coordinate with New York State Department of Conservation (NYSDEC) for recommended guidelines on protecting these species.

**Seals**

The Service has received the National Marine Fisheries/NOAA Fisheries (NMFS/NOAA) response to the Corps indicating that seals do not appear to utilize the Montauk Point Lighthouse revetment or the adjacent beach area. We have been further advised by NMFS that the use of Access Road 2 will not be likely to adversely affect seals.

**Conclusions**

The Service recommends that Access Road 2 not be used in order to minimize erosion of beach and dune habitats. We also recommend that a pre-construction survey be conducted for State-listed plants and birds. If any State-listed species are found, coordination with NYSDEC is recommended for project activity guidance.

If you have any questions or require further assistance, please have your staff contact Laura Patrick, of the Long Island Field Office, at 631-581-2941.

Sincerely,

Anne L. Secord

for David A. Stilwell
Field Supervisor

Literature Cited

Anders, F.J. and S.P. Leatherman. 1987a. Disturbance of beach sediment by off-road vehicles. Environmental Geology & Water Science. 9(183-189).

Anders, F.J. and S.P. Leatherman. 1987b. Effects of off-road vehicles on coastal foredunes at Fire Island, New York, USA. Environmental Management. 11(45-52).

Lasiak, T. 2002. Comment and Review - What's happening down the track? Centre for Research on Ecological Impacts of Coastal Cities. Http://www.eicc.bio.usyd.edu.au/eicc.html.

National Park Service. 2003. Beach Driving on Fire Island: Environment/Conservation Position. http://www.firei.org/site/regneg.shtml

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

16 June 2003

Environmental Analysis Branch

Mr. David Stilwell, Supervisor
New York Field Office
U.S. Department of the Interior
Fish and Wildlife Service
3817 Luker Road
Cortland, New York 13045

Dear Mr. Stilwell:

On behalf of the U.S. Army Corps of Engineers, New York District (Corps), I am writing with regard to the correspondence from the Fish and Wildlife Service (Service) about the Montauk Point Storm Damage Reduction Project's, Fish and Wildlife Coordination Report (FWCAR) submitted to the Corps by fax on June 3, 2003.

The Corps thanks the Service for their efforts with regard to the Draft FWCAR and is looking forward to receiving the completed FWCAR on the due date 31 July 2003.

At this time, the Corps concurs with the Service's suggestion that Access Road #2 not be used. Alternate Access Road #2 will become the primary access route to get to Staging Area #2 on the northern side of the revetment.

The Corps will comply with Recommendation #3 and conduct a pre-construction survey, including a review of any relevant State listings, to document any existing State-listed species within the project, access road and staging area. If any listed species be are discovered within those areas, the Corps will coordinate with the New York State Department of Environmental Conservation.

If you have any questions with regard to the Montauk Point Project please contact the Team Leader, Ms. Roselle Henn at (212) 264-2119.

Thank you very much for your time, understanding and action.

Sincerely,

L Houston

Leonard Houston
Chief, Environmental Analysis Branch

Enclosures:

c.c. Laura Patrick, Long Island Field Office
M. Snyder, U.S. Fish and Wildlife Service, Region 5, Hadley, MA
Charles Hamilton, NYS Department of Environmental Conservation – Stony Brook

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

19 August 2003

Environmental Analysis Branch

Mr. David Stilwell, Supervisor
New York Field Office
U.S. Department of the Interior
Fish and Wildlife Service
3817 Luker Road
Cortland, New York 13045

Dear Mr. Stilwell:

On behalf of the U.S. Army Corps of Engineers, New York District (Corps), I am writing with regard to the correspondence from the Fish and Wildlife Service (Service) about the Montauk Point Storm Damage Reduction Project's, Fish and Wildlife Coordination Report (FWCAR) submitted to the Corps by fax and FedEx on July 31, 2003.

The Corps thanks the Service for their efforts with regard to the completion of the FWCAR. As per the recommendations by the Service the Corps concurs with the following summations in the Executive Summary:

1. The Corps agrees with the Service's assessment that there will be no long term impacts to the project area.

2. At this time, the Corps concurs with the Service's suggestion that Access Road #2 not be used. Alternate Access Road #2 will become the primary access route to get to Staging Area #2 on the northern side of the revetment.

3. The Corps will comply with Recommendation #3 and conduct a pre-construction survey, including a review of any relevant State listings, to document any existing State-listed species within the project, access road and staging area. If any listed species be are discovered within those areas, the Corps will coordinate with the New York State Department of Environmental Conservation.

If you have any questions with regard to the Montauk Point Project please contact the Team Leader, Ms. Roselle Henn at (212) 264-2119.

Once again, thank you for sending us the final FWCAR.

Sincerely,

Roselle Henn

for Leonard Houston
Chief, Environmental Analysis Branch

Enclosures:

c.c. Laura Patrick, Long Island Field Office
M. Snyder, U.S. Fish and Wildlife Service, Region 5, Hadley, MA
Charles Hamilton, NYS Department of Environmental Conservation – Stony Brook

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

July 31, 2003

Colonel John B. O'Dowd
District Engineer
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278-0090

Dear Colonel O'Dowd:

As per the U.S. Army Corps of Engineers letter dated June 16, 2003, the final Fish and Wildlife Coordination Act Section 2 (b) Report for the Montauk Point Storm Damage Reduction Project, Suffolk County, Long Island, New York, is enclosed. Final recommendations are enclosed and comments from the New York State Department of Conservation and National Oceanic and Atmospheric Agency-National Marine Fisheries are also included, as an attachment to the report.

If you have any questions or require further information, please contact Laura Patrick of the Long Island Field Office at (631) 581-2941.

Sincerely,

David A. Stilwell

David A. Stilwell
Field Supervisor

Enclosure

cc: NYSDEC, Stony Brook, NY (C. Hamilton)
NMFS, Milford, CT (M. Ludwig)

United States Department of the Interior
NATIONAL PARK SERVICE
Boston Support Office
15 State Street
Boston, Massachusetts 02109-3572

January 30, 2003

Christopher Ricciardi, Archaeologist
U.S. Army Corps of Engineers
New York District, Planning Division
Jacob K. Javits Federal Building
26 Federal Plaza - Room 2131
New York, NY 10278-0090

Dear Mr. Ricciardi:

The Corps is currently preparing for a project entitled Montauk Point Storm Damage Reduction Project in the Town of East Hampton, Suffolk County, New York. If the Corps intends to use a parcel of land, owned by the Town of East Hampton, and referred to as Turtle Cove, for this project, even on a temporary basis, the National Park Service must be included in the project planning.

The National Park Service transferred Turtle Cove to the Town of East Hampton for park and recreational purposes. The terms of the transfer require the area to be open to the general public, utilized for park and recreational purposes in perpetuity, and managed in accordance with a program of utilization prepared by the town and approved by the National Park Service. The Town of East Hampton may have been remiss in the past by granting the Corps access to the site without first securing NPS approval. In addition, the Corps may have constructed a parking area on the property that is not in accordance with the property's use agreement.

The Corps must assure there is no impairment of the park and recreational value of the property; the general public is not unduly restricted in their use of the property, and the resource is not altered in a manner that is not in accordance with the Town's approved Program of Utilization.

The Town of East Hampton faces the possible reversion of the Turtle Cove property because they have not managed the property in accordance with our deed restrictions. It would be unfortunate if the Corps exacerbates the problems there.

Please feel free to call (617) 223-5190 or email (elyse_laforest@nps.gov) me if I can provide any additional information.

Sincerely,

Elyse R. LaForest
Program Manager
Federal Lands to Parks Program

Cc: Town of East Hampton Town Supervisor, Jay Schneiderman
Town of East Hampton Councilman Pete Hammerle
Town of East Hampton Councilman Job Potter
Town of East Hampton Councilwoman Pat Mansir
Town of East Hampton Councilwoman Diana Weir
Town of East Hampton, L. Penny
FWS, Cortland, NY (S. Mars, L. Patrick)
Supt. Tom Dess, Long Island State Park Region

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

19 March 2003

Environmental Analysis Branch

Elyse R. LaForest
U.S. Department of the Interior
National Park Service - Boston Support Office
15 State Street
Boston, Massachusetts 02109-3572

Dear Ms. LaForest:

The U.S. Army Corps of Engineers, New York District (Corps), is in receipt of your letter dated January 30, 2003, and the follow-up package of reproduced photographs, to Mr. Christopher Ricciardi, Archaeologist for the Feasibility Study of the Montauk Point Storm Damage Reduction Project. The Corps appreciates, and welcomes, any and all comments, suggestions and opinions with regard to this, and other projects. However, there are several points in your letter that I would like to clarify.

The Corps has not worked at Montauk Point since the 1940s. The Montauk Point Historical Society and the U.S. Coast Guard, in consultation and with the authorization from New York State Office of Parks, Recreation and Historic Preservation among others, constructed the current stone revetment wall that protects the Lighthouse Complex. At no time did the Corps construct a parking area/facility as part of this project. As the reproduced photographs that you sent us show, the "Parking By Resident Parking" signs indicate that the Town and not the Corps sanction this parking area.

If the plans in our Feasibility Study come to fruition, the Corps, after acquiring all necessary permits from the current land managers, New York State, the Montauk Point Historical Society and the Town of Easthampton, as well as completing an Environmental Impact Statement, due in the Spring of 2003, will use a portion of a dirt road that extends from Montauk Highway, down to the waterfront and use the area adjacent to each end of the current revetment wall as a staging area. We will be using the same access roads and staging areas that were used during the 1992 construction of the existing wall. As the Corps is required to do with any of their projects, if any unanticipated damage is done to the roadway and/or staging area, it will be remedied prior to completion of the project. However, since we are using preexisting roads and staging areas, the Corps is not obligated to restore these areas to the way they were prior to the 1992 construction and/or disturbance.

Your handwritten note sent with the photographic package states that, "Spring 2003 Town graded road – now cars can get there". The Corps understands your issues with the Town of Easthampton and this parking area. However, we feel that this issue should be referred to the Town. The implication is that the Corps is responsible for this action and that is not accurate.

We do not anticipate that the proposed project would have any adverse impact on recreational activities in the area of Turtle Cove during the construction period. Since our staging areas are located adjacent to the current revetment wall, the majority of the Turtle Cove beachfront area will remain open to the public.

If you have any further questions with regard to the Montauk Point Storm Damage Reduction Project, please contact the EIS Coordinator, Christopher Ricciardi (212-264-0204) or the Project Manager, Anthony Ciorra (212-264-1038).

Thank you very much for your time, interest and concern.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

cc:
Town of Easthampton Town Supervisor, Jay Schneiderman
Town of Easthampton Councilman Pete Hammerle
Town of Easthampton Councilwoman Pat Mansir
Town of Easthampton Councilwoman Diana Weir
Town of Easthampton, L. Penny
U.S. Fish and Wildlife Service, Cortlandt, NY (Steven Mars and Laura Patrick)
NYS Office of Parks, Recreation and Historic Preservation, Rick Teurs
NYS Office of Parks, Recreation and Historic Preservation, Thomas Dess, Long Island State Park Region

United States Department of the Interior

NATIONAL PARK SERVICE
NORTHEAST REGION
15 State Street
Boston, Massachusetts 02109-3572

IN REPLY REFER TO:

October 14, 2003

Mr. Glenn C. Rotondo, Director
Property Disposal Division
Public Buildings Service
U. S. General Services Administration
Thomas P. O'Neill, Jr. Federal Building
10 Causeway Street
Boston, MA 02222

Dear Mr. Rotondo:

Reference: N-NY-692C, Town of East Hampton,
(Former Radio Ship Positioning Base Station)
"Turtle Cove"

This letter is to inform you that the National Park Service's Federal Lands to Parks Program intends to revert the referenced property from the Town of East Hampton, New York, for not complying with the Program of Utilization (POU) for the site. On August 27, 2002, NPS directed the Town of East Hampton to revise the Program of Utilization, and submit appropriate environmental documentation. An appropriate response has still not been received and user conflicts are increasing. We request GSA's support in the reversion process and during subsequent disposal of the property.

Prior to the Town's ownership of the property, the beach access road was only utilized by vehicles on a very limited basis. Once the Town was deeded the property, the beach access road remained closed to vehicles, except on a limited basis, for approximately 14 years. Now the Town is permitting unrestricted use of the beach access road to all vehicles. The National Park Service asserts that they must prepare NEPA documents to demonstrate that this action will not damage the environment.

In addition to the NEPA issues, there are conflicting use and accessibility issues. Prior to the Town's recent opening of the beach access road, only the disabled were allowed access to the beach in 4-wheel drive vehicles. Once the Town opened the access road to all, handicapped parking restrictions could no longer be enforced. In response to unregulated use, NPS asked the town to close the access road, which completely restricted disabled use of the site. NPS has since directed the Town to give the disabled a key or combination lock to a gated access road. However, since the gate was vandalized, handicapped parking restrictions are once again being ignored. It is our understanding that a suit was filed in Federal District Court alleging the Town is in violation with the Americans Disability Act.

Attached is a chronology of the site and the actions we have taken to attempt to solve this problem. Copies of all referenced documents will be provided upon your request. Also attached are photos taken last fall when Turtle Cove was closed to vehicle traffic and photos taken last weekend. A map of the site is also included.

We look forward to your response. I can be reached at (617) 223-5190.

Sincerely,

**(sgd.) Elyse R. LaForest**

Elyse R. LaForest
Program Manager
Federal Lands to Parks Program

Enclosures

CC:

Town Supervisor Jay Schneiderman
Town of East Hampton Councilman Pete Hammerle
Town of East Hampton Councilman Job Potter
Town of East Hampton Councilwoman Pat Mansir
Town of East Hampton Councilwoman Diana Weir

Honorable Tim Bishop
United States House of Representatives
Washington, DC 20515

Anthony Conte, Regional Solicitor
U.S. Department of the Interior
Office of the Solicitor
Suite 612
One Gateway Center
Newton, MA 02458-2802

Steve Emmons
12 Hoppin Avenue
Montauk, NY 11954

Kleo J. King, Program Counsel
Eastern Paralyzed Veterans Association
75-20 Astoria Boulevard
Jackson Heights, NY 11370-1177

Robert Briglio
Nassau/Suffolk Law Services Committee, Inc.
1757 Veterans Highway, Suite 50
Islandia, NY 11749-1535

Glenn Hall, Chair
East Hampton Town/Village Disabilities Advisory Board
300 Pantigo Place, Suite 111A
East Hampton, NY 11937

Steve Mars
U.S. Fish & Wildlife Service
Long Island Field Office
500 St. Marks Lane, Box 1
Islip, NY 11751

✓ Christopher Ricciardi/Anthony Ciorra
U.S. Department of the Army
Corps of Engineers
Jacob K. Javitts Federal Building
New York, NY 10278-0090

Mr. Eugene Alper
26 Grant Avenue
East Hampton, NY 11937

| | |
|---|---|
| November, 1981 | Application submitted by the Town of East Hampton. Development plan includes a proposed parking lot away from the beach. The application does not specifically address vehicle access. |
| April, 1986 | Town of East Hampton accepts the property. Deed contains easement of 5.27 acres for access and maintenance of a federal facility, elsewhere in the deed called the Montauk Radio Beacon Site. Town is required to maintain roadway by rough grading and clearing of brush for suitable access. |
| October 22, 1986 | NPS site inspection states: "Pedestrians are able to walk to the beach to fish, etc., providing that access through state land remains open from north." |
| June, 1987 | Annual Report is received from the Town of East Hampton which states in part: "As stated in Part B in the Program of Utilization, the 17.40 acre Ship Positioning Station is being utilized as an access point for ocean fishing and hiking. Preservation of the bluffs along the ocean front if a primary concern of the Town. Therefore the existing roadway is not being utilized, and the balance of the property is being retained in a natural state." |
| June 13, 1989 | NPS site inspection states: "All comments the same as last inspection—property appears to be well used despite lack of convenient close parking facilities." |
| Unknown | Montauk Radio Beacon Site is abandoned. Time frame is somewhere in the late 80's or early 90's. |
| Late 1990's | The a US Coast Guard (alternately reported as US Army Corps of Engineers) contractor used Turtle Cove as an access point and staging area for an erosion control project at the Montauk Lighthouse. At completion of the project, a small hard packed parking lot is left on the Turtle Cove property, adjacent to the beach. The Town permitted parking by the disabled at this location. |
| Fall, 1999 | According to news reports and state officials, access road (from Rt. 27 to newly constructed parking lot) is opened to all vehicles. Access road is a narrow path through the sand, accessible only by 4-wheel drive vehicle. |
| January, 2001 | First public inquiry about vehicle access to Turtle Cove received by NPS. |

| | |
|---|---|
| Spring, 2001 | NPS calls Town Supervisor about access issue and provides a copy of the POU. |
| June 13, 2001 | Town submits first letter to NPS requesting permission to utilize parking lot at the beach end of the access road. |
| June 14, 2001 | NPS writes first letter to Town about use of "parking lot." NPS cautions Town that major changes to Program of Utilization (POU) may require environmental analysis. |
| July 31--August 1, 2001 | NPS visit to site and meeting with town officials as well as "concerned citizens" invited by the Town. Parking lot (and beach) are overrun with vehicles. Site is restricted to "residents only." |
| August 3, 2001 | Letter from NPS to Town detailing the major issues to include in an amendment to POU. These include opening the site to the general public, developing access alternatives to stem erosion at the site, handicapped access and new signage. |
| March, 2002 | NPS receives reports that the town had graded access road to the beach. Beach is now accessible by passenger vehicles as well as 4-wheel drive vehicles. |
| April, 2002 | Town Supervisor says Town graded the road to be in accordance with the deed restriction to maintain access to the Montauk Radio Beacon Site. |
| April 9, 2002 | Town Council defeats resolution to close of access to Turtle Cove until matter is resolved. |
| April 22, 2002 | Town Supervisor writes NPS requesting reconsideration of whether vehicles access can be permitted to the site "even if such access was discontinued in or about 1987 until in or about 1991 (when it was re-instituted in connection with work at the lighthouse) without any formal change to the Program." |
| April 23, 2002 | Town Supervisor suggests solar powered traffic gate. Permits will only be available between the dates of February 1 and April 1, to people who apply in person at Town Hall. Parking in lower lot, subject to environmental review (no environmental data submitted). |
| August 27, 2002 | NPS directs the Town to close the beach to all but emergency vehicles until the Town revises the POU, performs an environmental assessment documenting the impacts of their proposal and alternative actions. |

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| September 6, 2002 | Town Council passes resolution to close the access road to vehicle traffic and revise the POU. |
| October 8, 2002 | Town Council passes resolution that Director of Natural Resources and Senior Harbormaster will draft plan by December 2002 and have a final plan by January 20, 2003. A committee of stakeholders is appointed to provide input. |
| November 7, 2002 | NPS attends first meeting of the "Turtle Cove Committee" |
| December 12, 2002 | Turtle Cove Committee meets and discusses potential environmental impacts of several alternatives. Minutes reveal anticipated impacts range from none to major. |
| February 20, 2003 | Town is notified by Nassau/Suffolk Law Services Committee, Inc. that they are in violation of ADA because the disabled are the only people who are denied access to Turtle Cove and the Town has done nothing to finalize the management plan and resolve the access issue. The Committee requests a meeting. Same organization writes NPS and requests that we attend the meeting. |
| March 14, 2003 | Town writes to Nassau/Suffolk Law Services that the Turtle Cove Committee will present a management plan to the Town within a month that will address accessibility concerns. |
| April 2, 2003 | Conference call, Eastern Paralyzed Veterans, Nassau/Suffolk Law Services, NPS. During subsequent call, with NPS and DOI Solicitor, Town Councilor Peter Hammerle states the draft plan will be ready April 10. Eastern Paralyzed Veterans agree to wait for the plan. |
| June 18, 2003 | Conversation with Peter Hammerle who states a plan was approved yesterday. |
| June 20, 2003 | Nassau/Suffolk Law Services write to Town and NPS making a ADA and § 504 complaint. |
| June 26, 2003 | NPS accessibility consultant, and two other Federal Lands to Parks Program staff meet with Peter Hammerle at Turtle Cove. Two disabled citizens also attend meeting and vehemently disagree with the "ramp" East Hampton is proposing. |
| July 11, 2003 | Town of East Hampton submits their "final utilization plan" which includes beach parking and driving during the three month fishing season. For environmental documentation the Town submits a |

| | |
|---|---|
| | "Negative Declaration" stating that there are no potential significant adverse environmental impacts. The plan also includes a switchback ramp plan which crosses a state highway and is cut through a densely wooded section of the bluff. |
| July 29, 2003 | East Hampton Town and Village Disabilities Advisory Board send letter to NPS, advising that the switchback ramp plan does not meet accessibility requirements of ADA and other accessibility issues at Turtle Cove. |
| August 5, 2003 | Eastern Paralyzed Veteran's Association architect advises NPS that switchback plan is not accessible. |
| August 12, 2003 | Town of East Hampton asks NPS for expedited review of proposal because bass fishing season is about to begin. |
| September 4, 2003 | NPS faxes Town that the "final utilization plan" can not be approved and asks the Town to give the disabled access via the emergency access route. |
| Approximately September 4, 2003 | The gate which closed the access road to Turtle Cove for a year is "vandalized." Vehicles are now accessing the beach. A Marine Officer "supervises" the site from 10:00 am to 6:00 pm. The small parking area is overrun with cars and trucks. Vehicles are permitted to park in handicapped spaces, against the bluff and on vegetation. |
| Ongoing | Concerned citizens continue to call and ask NPS to enforce closure of the access road until a public environmental analysis is done. |
| October 7, 2003 | NPS received calls from the public saying there had been an emergency at Turtle Cove (which turned out not to be one) on October 5, but the beach and road was so congested three emergency vehicles could not reach the site. |
| October 8, 2003 | NPS called Town Supervisor to ask if the Town would voluntarily revert the property. Supervisor will refer the matter to the Town Council. The Town's intention is to replace the gate after the fishing season ends December 1. |

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

21 April 2003

Environmental Analysis Branch

John Fritz, Director
New York Sportfishing Federation
1549 Montauk Highway - Suite 2
Oakdale, New York 11769-1322

Dear Mr. Fritz:

I am writing with regard to the U.S Army Corps of Engineers, New York District's (Corps) Feasibility Study for the Montauk Point Storm Damage Reduction Project. . As you are aware the Corps has been authorized by Congress to investigate various alternatives for preserving the Montauk Point Lighthouse Complex. With our partner, the New York State Department of Environmental Conservation (DEC), the Corps is completing work in preparation for the release of the Draft Environmental Impact Statement (DEIS). During the Public Scoping Meeting of November 2001 the Corps stated that we would like to meet with your organization prior to the release of this document to discuss specific issues and concerns that your organization raised at that time.

As per the phone messages left by Mr. Chris Ricciardi, the Project's Environmental Coordinator, a meeting has been scheduled for Thursday, May 8, 2003 at 11am at the Montauk Point Lighthouse. We request that you and another member of your organization attend this meeting. Only two representatives from each of the interested organization invited will be allowed to attend since this will be a small, informal meeting. Two representatives from the Montauk Surfcasters Association and the Long Island Surfrider Foundation have been invited as well.

Please RSVP to Chris Ricciardi at (212) 264-0204 as soon as possible and inform of us of the names of the representatives from your organization who will attend. Thank you very much.

Sincerely,

Josephine R. Ott

Leonard Houston
Chief, Environmental Analysis Branch

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

**DEPARTMENT OF THE ARMY**
**NEW YORK DISTRICT, CORPS OF ENGINEERS**
**JACOB K. JAVITS FEDERAL BUILDING**
**NEW YORK, N.Y. 10278-0090**

REPLY TO
ATTENTION OF

21 April 2003

Environmental Analysis Branch

Willie Young, President
Montauk Surfcasters Association
P. O. Box 497
Montauk, New York 11954

Dear Mr. Young:

I am writing with regard to the U.S Army Corps of Engineers, New York District's (Corps) Feasibility Study for the Montauk Point Storm Damage Reduction Project. As you are aware the Corps has been authorized by Congress to investigate various alternatives for preserving the Montauk Point Lighthouse Complex. With our partner, the New York State Department of Environmental Conservation (DEC), the Corps is completing work in preparation for the release of the Draft Environmental Impact Statement (DEIS). During the Public Scoping Meeting of November 2001 the Corps stated that we would like to meet with your organization prior to the release of this document to discuss specific issues and concerns that your organization raised at that time.

As per your conversation with Mr. Chris Ricciardi, the Project's Environmental Coordinator, a meeting has been scheduled for Thursday, May 8, 2003 at 11am at the Montauk Point Lighthouse. We request that you and another member of your organization, attend this meeting. Only two representatives from each of the interested organization invited will be allowed to attend since this will be a small, informal meeting. Two representatives from the Long Island Surfrider Foundation and the New York Sport Fishing Federation have been invited as well.

Please RSVP to Chris Ricciardi at (212) 264-0204 as soon as possible and inform of us of the names of the representatives from your organization who will attend. Thank you very much.

Sincerely,

Leonard Houston
Chief, Environmental Analysis Branch

DEPARTMENT OF DEFENSE UNITED STATES OF AMERICA

**DEPARTMENT OF THE ARMY**
**NEW YORK DISTRICT, CORPS OF ENGINEERS**
**JACOB K. JAVITS FEDERAL BUILDING**
**NEW YORK, N.Y. 10278-0090**

REPLY TO
ATTENTION OF

21 April 2003

Environmental Analysis Branch

Mr. Kevin Ahearn, Chairperson
Long Island Surfrider Foundation
P. O. Box 2681
Amagansett, New York 11930

Dear Mr. Ahearn:

I am writing with regard to the U.S Army Corps of Engineers, New York District's (Corps) Feasibility Study for the Montauk Point Storm Damage Reduction Project. As you are aware the Corps has been authorized by Congress to investigate various alternatives for preserving the Montauk Point Lighthouse Complex. With our partner, the New York State Department of Environmental Conservation (DEC), the Corps is completing work in preparation for the release of the Draft Environmental Impact Statement (DEIS). During the Public Scoping Meeting of November 2001 the Corps stated that we would like to meet with your organization prior to the release of this document to discuss specific issues and concerns that your organization raised at that time.

As per your conversation with Mr. Chris Ricciardi, the Project's Environmental Coordinator, a meeting has been scheduled for Thursday, May 8, 2003 at 11am at the Montauk Point Lighthouse. We request that you and another member of your organization attend this meeting. Only two representatives from each of the interested organization invited will be allowed to attend since this will be a small, informal meeting. Two representatives from the Montauk Surfcasters Association and the New York Sport Fishing Federation have been invited as well.

Please RSVP to Chris Ricciardi at (212) 264-0204 as soon as possible and inform of us of the names of the representatives from your organization who will attend. Thank you very much.

Sincerely,

for Leonard Houston
Chief, Environmental Analysis Branch

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

February 5, 2004

Environmental Analysis Branch

Mr. Eugene Alper, Chairman
Long Island Surfrider Foundation
P. O. Box 2681
Amagansett, New York 11930

Dear Mr. Alper:

The U.S. Army Corps of Engineers, New York District (District) appreciates your continued involvement in the Montauk Point Storm Damage Reduction Project. Attached are written responses to your emails from our Engineering Division. As you can ascertain from the responses, we do not agree with the opinions provided by Tim Maddux, Research Associate at Oregon State University, with regard to the specific conditions at Montauk Point or of the Project. The District has presented scientific and engineering data to support our current position that there will be no marked change in surfing conditions at Montauk Point as a result of the in-kind replacement of the revetment wall. If you or your colleagues have other data that might bear on this issue, we would appreciate the reference so that we may evaluate them as well.

Under the guidance of the National Environmental Policy Act (NEPA), the District will take your concerns into account as the Draft Environmental Impact Statement (DEIS) is being prepared. There will be no recommendation for the project or conclusion on the nature of impacts, until the NEPA process is complete. The District is committed to an open and fair exchange of concerns and data, and towards that end we have met in person to address your concerns, albeit not with you but with the former President and Vice-President of the Surfrider's Foundation (SF), held conference calls, and answered telephone calls and e-mail questions. As part of the study process, the SF will have two additional opportunities for further comment in the form of written comments on the DEIS and also as verbal comments at the Public Informational Meeting (which is tentatively scheduled for late Spring) with regard to the DEIS. The District welcomes any and all to comment both verbally and in the written form.

We hope that the SF will continue to work with the District with regard to our Long Island Projects. If you have any questions, please contact the Environmental Impact Statement Coordinator, Chris Ricciardi, at (212) 264-0204.

Sincerely,

Nancy J Brighton

for Leonard Houston
Chief, Environmental Analysis Branch

Enclosures

Responses to Tim Maddux/Surfrider's Association's concerns

(a) The slope of the existing revetment averages approximately 1V:1.5H based on the contract drawings. The section of revetment slope where waves hit the structure, i.e. between elevations +5 to +15 NGVD, is very close to 1V:2H. Adjacent cross sections, outside of 50 ft. in either direction of the displayed Station 5+00, have 1V:1.5H slopes. Together with the fact that Station 5+00 is the flattest sloped segment of revetment for only around 50 ft. to 80 ft. in length out of the approximate 800 ft. total length, any significant reflected wave reduction is negated when compared with the proposed 1V:2H slope. Sections of existing slope that are flatter than 1V:2H are just landward of, and at the same or lower elevation of, fronting dispersed toe stone, also negating direct wave reflection reduction from the flatter existing slopes.

Reflected waves should be virtually identical with new wall and old wall. Measures existing slopes between elevation +15 and +5 from the topo range from 1V:1.4H to 1V:2.7H, which averages to 1V:2H - the same as the new wall. Both are rubblemound structures, with similar roughness. Both are fronted by remnant stone from the 1944 wall. Both walls front the bluff, with similar alignment to incoming waves.

(b) The slopes are not contradictory. The existing slope, as stated above, flattens out below the wave impact zone and thus leads to a difference in the offset of the proposed slope to the existing slope at the top and bottom.

Energy or height changes caused by displacement of 20 ft. will be minor, and are well landward of the actual surfing location, and will not affect conditions at the surfing location.

(c) Waves do not transform or become breaking over short distanced, flat bathymetry. Breaking waves dissipate their energy over a distance that is approximately 4 times the breaker height, for slightly sloped bathymetry, or approximately 20 to 30 ft. for a 6 ft. breaker wave height. Since the bathymetry fronting the existing revetment is virtually flat for at least 50 ft., broken waves near the toe of the revetment would have initiated their breaking and energy disipation well offshore of the 20 ft. of offset between the existing and proposed seaward extents of the revetment. Therefore, broken waves would not be intercepted any differently from the existing revetment than by the proposed revetment, during energy dissipation. In addition, as long as the fronting bathymetry is flat, unbroken waves would have no difference in impact between the existing and proposed conditions.

(d) Regions of revetment slope where waves predominantly break are subjected to the downrush of wave water towards the structure toe. Since the proposed revetment would be constructed with a similar seaward toe stone arrangement as the existing, reflected wave energy just offshore of the proposed structure would be substantially unaffected, not increased.

Christopher Ricciardi, Archaeologist
U.S. Army Corps of Engineers - Planning Division
Jacob K. Javits Federal Building
26 Federal Plaza – Room 2131
New York, New York 10278-0090
Phone: (212) 264-0204
Fax: (212) 264-0961
E-mail: christopher.g.ricciardi@usace.army.mil

**United States Army Corps of Engineers - New York District**

# Fax

|  |  |  |  |
|---|---|---|---|
| **To:** | Eugene Albert | **From:** | Chris Ricciardi |
| **Fax:** | (631) 725-6048 | **Pages:** | 9 (including cover sheet) |
| **Phone:** | (631) 725-1100 | **Date:** | Thursday, October 16, 2003 |
| **Re:** | Montauk Point Project | **CC:** |  |

☑ **Urgent** ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

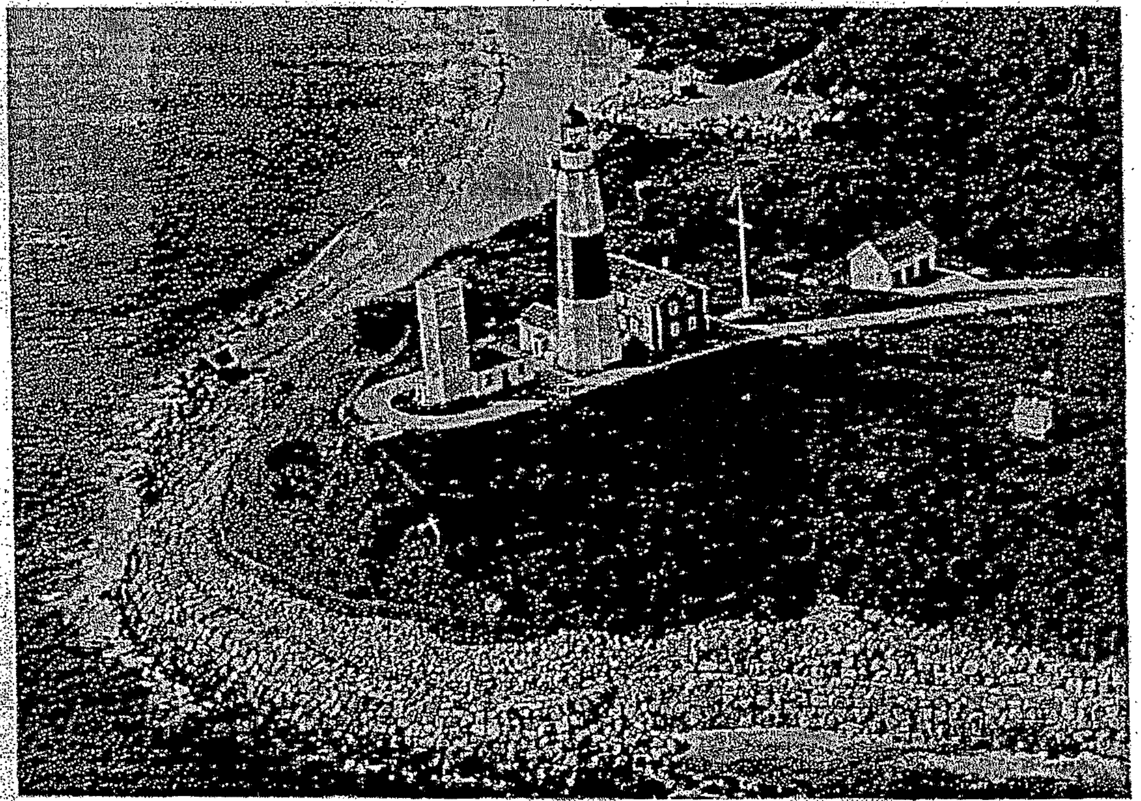
● **Comments:**

Gene,

Frank Verga, Stu Chase and I will be calling at 4:30pm today. Here are some stuff that I've been able to find for you.

Chris.

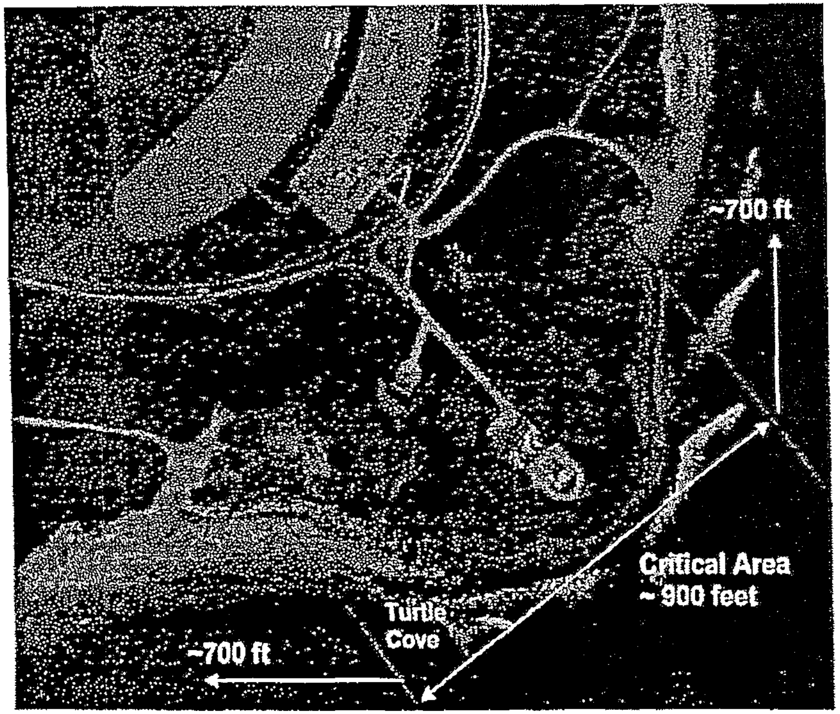
**1992** - after severe erosion due to Hurricane Bob and the Halloween Storm of 1991, a new revetment is constructed by the U.S. Coast Guard landward of the old revetment.



The same camera angle thirty years later shows a stabilized toe and bluff face. The cooperative efforts of the U.S.A.C.O.E., the U.S.C.G. the N.Y.S.D.E.C., the Long Island Office of Parks, Recreation and Historic Preservation and the Montauk Historical Society have improved the erosion control protection at Montauk Point. (c 1995 Peter Paul Muller Jr.)

# Study Area

- Includes the historic Montauk Point Lighthouse Complex that sits on a high bluff, approximately 70-feet above Mean Sea Level.
- The area surrounding the lighthouse is operated as a State park and is used primarily by fishermen and sightseers.



Study Area

## Previous Reports

The New York District Reconnaissance Report for Montauk Point, New York was completed in February 1993. Headquarters certified the Reconnaissance Report in May 1993. This report recommended a further cost-shared feasibility study. The potential recommended plan of improvement identified in the reconnaissance phase entailed the placement of a 770-foot long stone revetment to cover the most critically eroding area of Montauk Point.

## Study Area

The study area is located in Suffolk County, New York, between the Atlantic Ocean and Block Island Sound at the easternmost end of the south fork of Long Island (Figure-1). Montauk is in the Town of East Hampton. The study area includes the historic Montauk Point Lighthouse Complex that sits on a high bluff underlain with glacial till, approximately 70-feet above Mean Sea Level (MSL).

The lighthouse is the focal point of the facilities of the Montauk Point Coast Guard Station and acts as a junction marker for ships headed for New York Harbor or Long Island Sound. The area surrounding the lighthouse is operated as a State park and is used primarily by fishermen and sightseers.

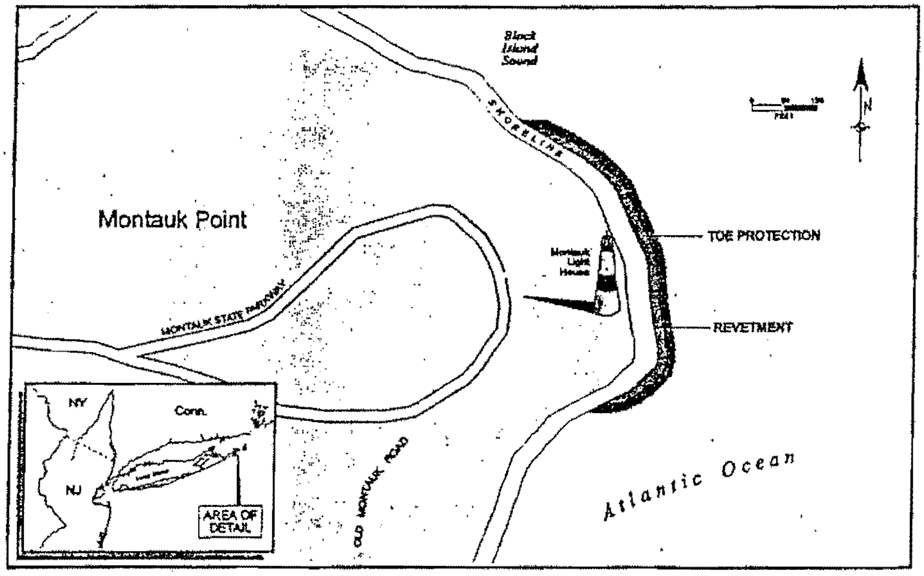
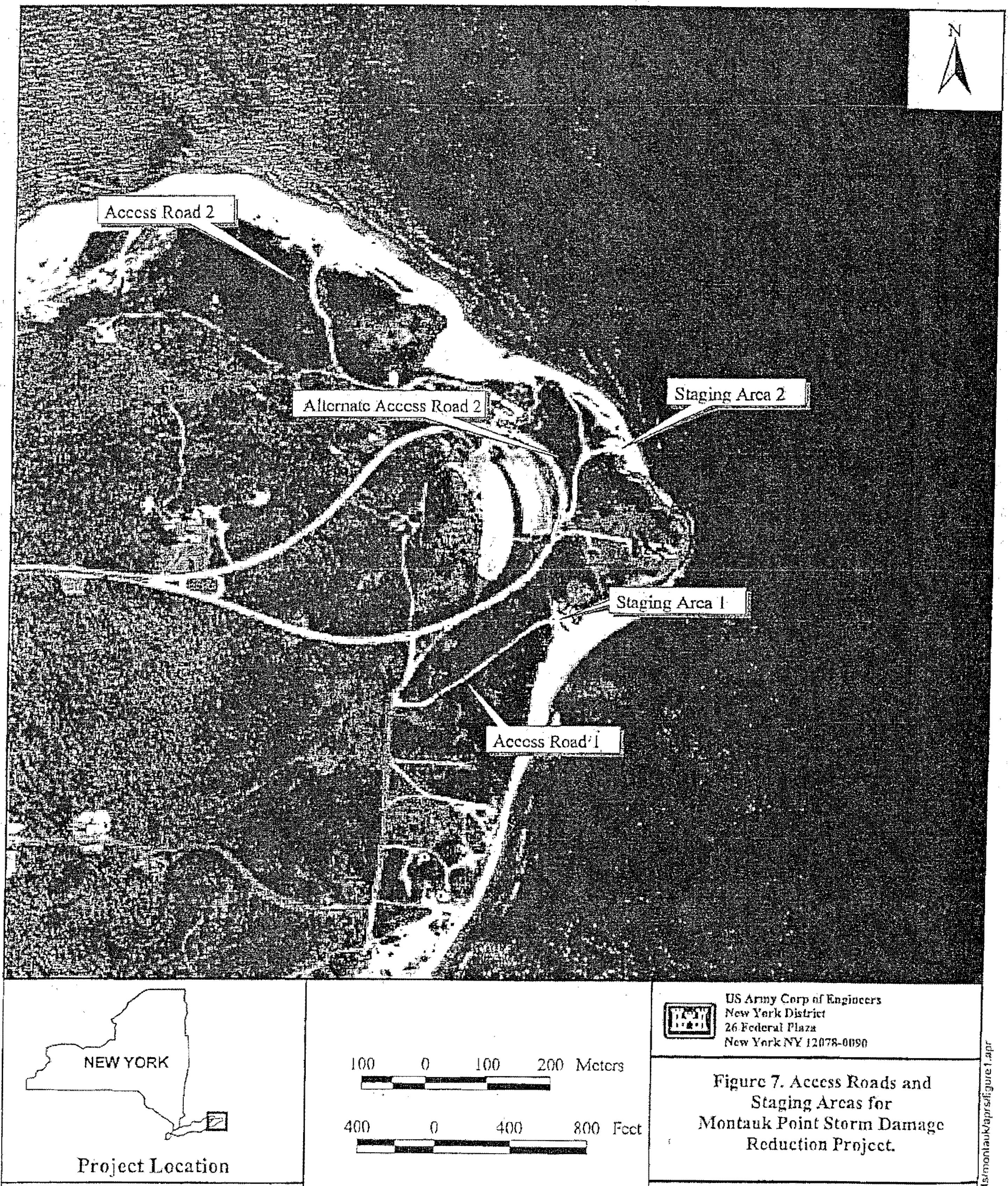


Figure-1



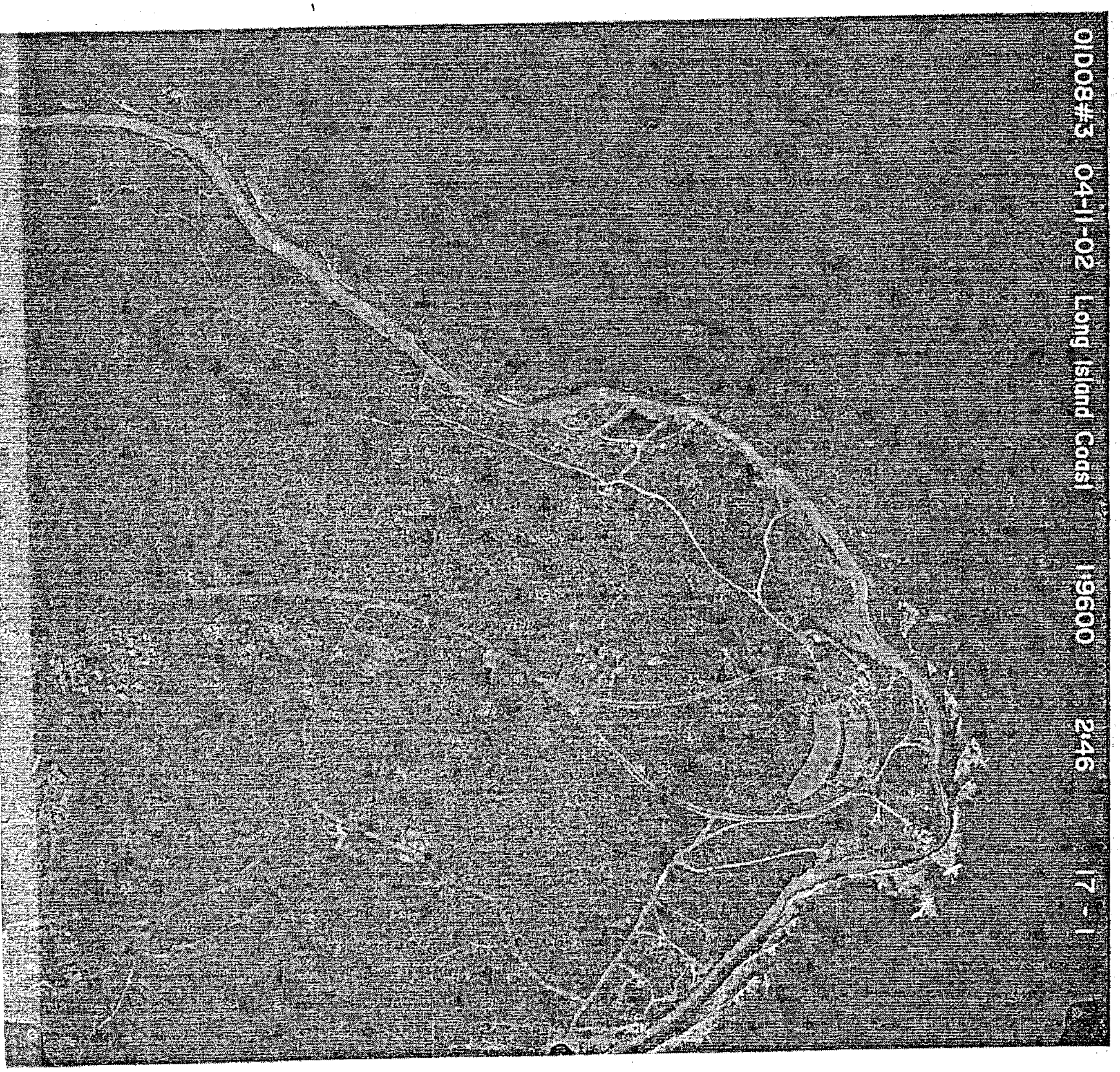
Source: New York State Department of State
1 meter orthoimagery 1994-1999.
www.nysgis.state.ny.us/gateway/mg/interactive main.html

US Army Corp of Engineers
New York District
26 Federal Plaza
New York NY 12078-0090

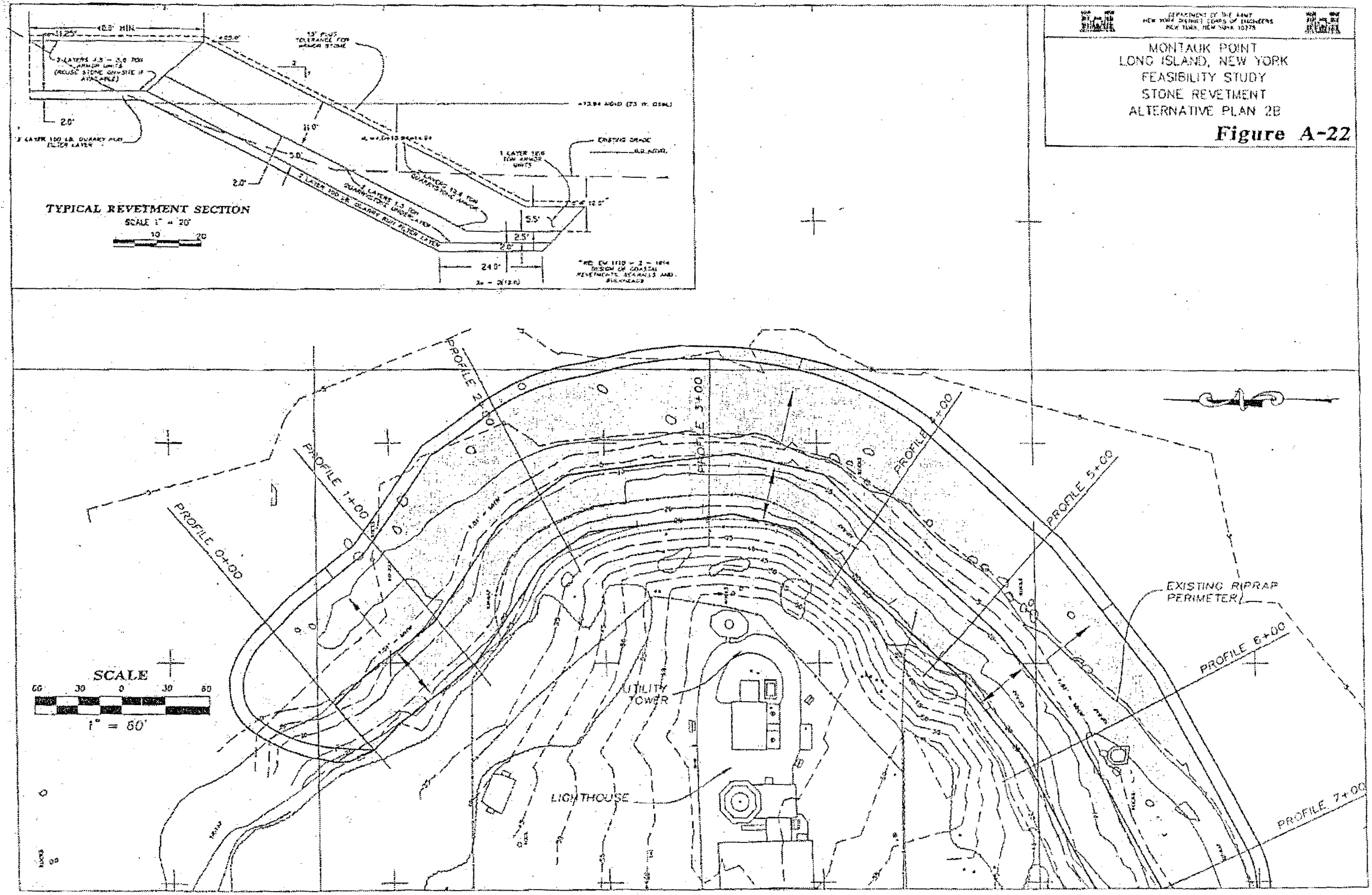
Figure 7. Access Roads and Staging Areas for Montauk Point Storm Damage Reduction Project.

Date: 07/26/02

z:/projects/montauk/aprs/figure1.apr



OID08#3 04-11-02 Long Island Coast 1:9600 246 17-1

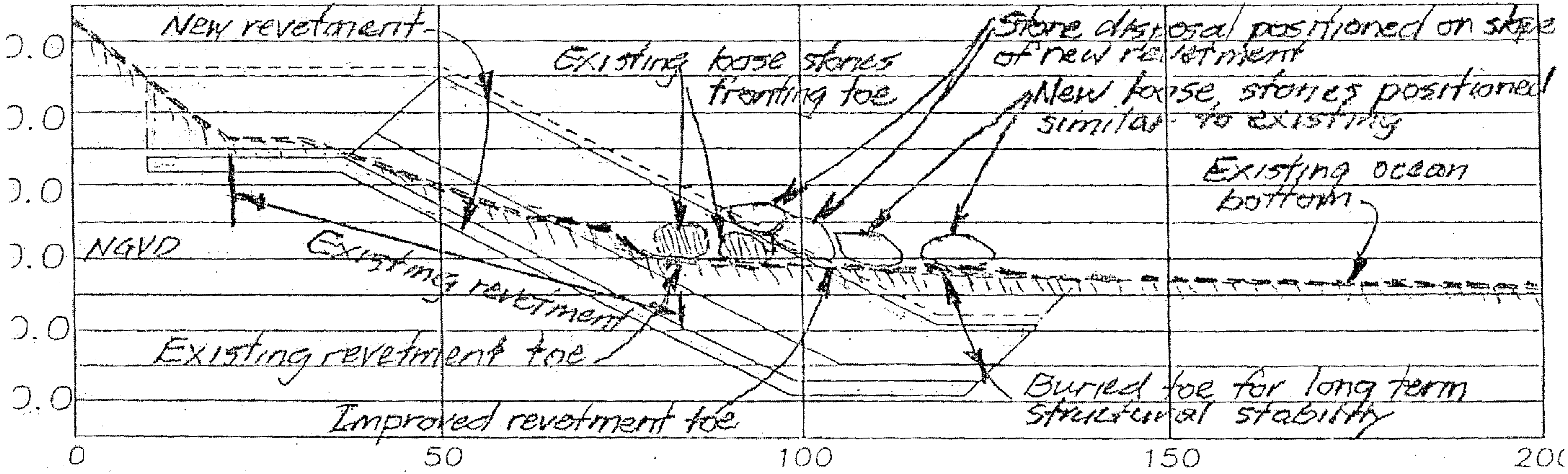


DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS
NEW YORK, NEW YORK 10278

MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
STONE REVETMENT
ALTERNATIVE PLAN 2B

**Figure A-22**

## Profile @ 5+00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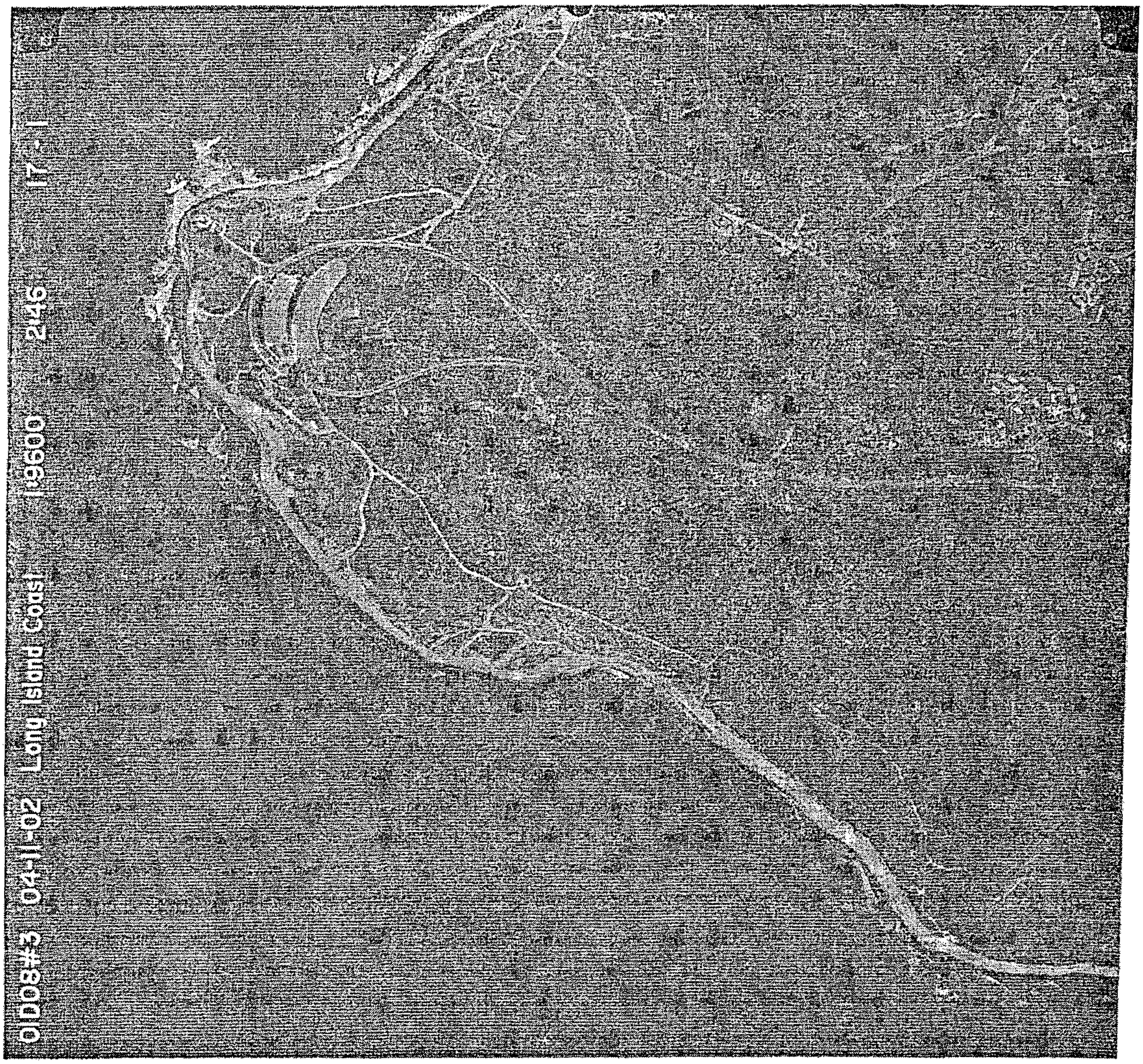
50
100
150
200
NGVD
New revetment
Existing loose stones fronting toe
Stone disposal positioned on slope of new revetment
New loose, stones positioned similar to existing
Existing ocean bottom
Existing revetment
Existing revetment toe
Improved revetment toe
Buried toe for long term structural stability


01D08#3 04-11-02 Long Island Coast 19600 2146 17-1

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

**DEPARTMENT OF THE ARMY**
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

18 July 2005

Environmental Analysis Branch

Jim Ralston
Bureau of Air Quality Planning
New York Department of Environmental Conservation
625 Broadway
Albany, NY 12233-3251

Dear Mr. Ralston:

The U.S. Army Corps of Engineers, New York District (Corps), is pleased to furnish you with a draft copy of the Air Quality Appendix, part of the Draft Environmental Impact Statement for the Montauk Point Storm Damage Reduction Project.

Although the overall project falls under the set guidelines for Air Conformity, we wanted to make this information to you prior to the release of the DEIS.

If you have any comments or questions, please contact the Project Archaeologist, Dr. Christopher Ricciardi at (917) 790-8630 or christopher.g.ricciardi@usace.army.mil.

Thank you very much for your time and your continued efforts in working with the District.

Sincerely,

L. Houston

Leonard Houston
Chief, Environmental Analysis Branch

Enclosure

**DEPARTMENT OF THE ARMY**
**NEW YORK DISTRICT, CORPS OF ENGINEERS**
**JACOB K. JAVITS FEDERAL BUILDING**
**NEW YORK, N.Y. 10278-0090**

REPLY TO
ATTENTION OF

August 19, 2005

Environmental Analysis Branch

Dear Interested Party;

The U.S. Army Corps of Engineers, New York District, is pleased to provide for your review a copy of the Draft Environmental Impact Statement (DEIS) for the Montauk Point Storm Damage Reduction Project. The 45 days review period is from August 19, 2005 to October 04, 2005.

You comments and concerns are greatly appreciated. Should you have any, please send them to:

Dr. Christopher Ricciardi, EIS Coordinator
U.S. Army Corps of Engineers – NY District
Planning Division – Environmental Branch
26 Federal Plaza, Room 2151
New York, NY 10278-0090

Copies of this document can also be found on the District's web site at www.nan.usace.army.mil and navigate to the News/Event section.

Current Federal guidelines require that the transmission of various NEPA documents (including D/F-EIS) in digital format, as well continuing the placement of copies in public locations, such as your regional library. However, if you require a printed copy, you may obtain one by contacting Dr. Ricciardi at (917) 790-8630. Please note, the review period will still end on October 04, 2005.

Thank you for your participation in this project.

Sincerely,

Leonard Houston, Chief
Environmental Analysis Branch

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

**DEPARTMENT OF THE ARMY**
**NEW YORK DISTRICT, CORPS OF ENGINEERS**
**JACOB K. JAVITS FEDERAL BUILDING**
**NEW YORK, N.Y. 10278-0090**

REPLY TO
ATTENTION OF

August 19, 2005

Environmental Analysis Branch

Pamela Otis, Associate Environmental Analyst
NYS Office of Parks, Recreation & Historic Preservation
The Governor Nelson A. Rockefeller – Empire State Plaza
Agency Building Number 1
Albany, New York 12238-0001

Dear Ms. Otis:

The U.S. Army Corps of Engineers, New York District (District), thanks you for sending comments based on the Preliminary Draft Environmental Impact Statement (PDEIS) for the Montauk Point Storm Damage Reduction Project.

As per your request, attached are our responses to your comments.

Since your comments arrived after pre-production of the formal Draft Environmental Impact Statement (DEIS) began, you will note that the additional suggestions that you made, that were agreed to by the District, were not included. Due to timing issues, this could not be helped, but they will be made for the final document.

We appreciate your office taking the time to review the PDEIS. The DEIS should be arriving to your office some time around the third week of August. As required by law, any comments from your office will be addressed in the final version of the document.

Should you have any, please send them to:

Dr. Christopher Ricciardi, EIS Coordinator
U.S. Army Corps of Engineers – NY District
Planning Division – Environmental Branch
26 Federal Plaza, Room 2151
New York, NY 10278-0090

Sincerely,

L. Houston

Leonard Houston, Chief
Environmental Analysis Branch

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

**DEPARTMENT OF THE ARMY**
**NEW YORK DISTRICT, CORPS OF ENGINEERS**
**JACOB K. JAVITS FEDERAL BUILDING**
**NEW YORK, N.Y. 10278-0090**

REPLY TO
ATTENTION OF

August 25 2005

Environmental Analysis Branch

Dear Interested Party;

As you are aware, the U.S. Army Corps of Engineers, New York District, has recently released the Draft Environmental Impact Statement (DEIS) for the Montauk Point Storm Damage Reduction Project. The 45 day public review period started August 19, 2005 and will officially close on October 04, 2005.

As part of the DEIS process, a public information session has been scheduled for Monday, September 19, 2005 at the Montauk Fire House, 12 Flamingo Avenue in Montauk, New York, from 7:00pm to 9:00pm. We hope that you will be able to attend.

If you have any questions with regard to the public information session or the project, please contact the EIS Coordinator, Dr. Christopher Ricciardi at (917) 790-8630 or christopher.g.ricciardi@usace.army.mil.

Thank you for your participation in this project.

Sincerely,

Nancy Brighton

Leonard Houston,
for Chief, Environmental Analysis Branch

**BILLING CODE: 3710-06**

**DEPARTMENT OF DEFENSE**

**Department of the Army; Corps of Engineers**

# Notice of Availability (NOA) of the Draft Environmental Impact Statement (DEIS) for the Montauk Point Storm Damage Reduction Project, Suffolk County, New York

**AGENCY:** Department of the Army, U.S. Army Corps of Engineers, DoD.

**ACTION:** Notice of Availability.

**SUMMARY:** This announces the availability of the DEIS which assesses the potential environmental impacts of the proposed reinforcement of an existing stone revetment wall at Montauk Point, Suffolk County, New York. This Draft Environmental Impact Statement (DEIS) has been prepared in accordance with the National Environmental Policy Act (NEPA), and U.S. Army Corps of Engineers (USACE) regulations for implementing NEPA.

**DATES:** The comment period for the DEIS will end 45 days after publication of the NOA in the Federal Register by the U.S. Environmental Protection Agency. The end date falls within the first week of October 2005.

**ADDRESSES:** To obtain copies of the DEIS or submit comments, contact Dr. Christopher Ricciardi, Environmental Coordinator, U.S. Army Corps of Engineers, New York District, Planning Division – Environmental Analysis Branch, 26 Federal Plaza, Room 2151, New York, NY 10278-0090.

**FOR FURTHER INFORMATION CONTACT:** Dr. Christopher Ricciardi, Planning Division – Environmental Analysis Branch, at (917) 790-8630 or christopher.g.ricciardi@usace.army.mil.

**SUPPLEMENTARY INFORMATION:** The purpose of this DEIS is to analyze significant issues and information relevant to environmental concerns regarding the proposed reinforcement of an existing stone revetment wall at Montauk Point, New York. The U.S. Coast Guard and the Montauk Historical Society constructed the current revetment wall between 1990 and 1992. The project study was conducted under the authority of resolution adopted by the Committee on Environment and Public Works of the U.S. Senate on May 15, 1991.

> *"Resolved by the Committee on Environment and Public Works of the United States Senate, that the Secretary of the Army is hereby requested to review the report of the Chief of Engineers on Fire Island to Montauk Point, New York, published as House Document Number 86-425, 86th Congress, 2nd session, and other pertinent reports, to determine whether modifications of the recommendations contained therein are advisable at the present time, with a view to preserving, restoring, and protecting Montauk Point and vicinity, including the historic Montauk Lighthouse and associated facilities, from erosion, environmental degradation, and coastal storm damage."*

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The purpose of this DEIS is to analyze significant issues and information relevant to environmental concerns bearing on the proposed action or its anticipated impacts. The analysis indicates that short-term adverse environmental impacts, such as removal of benthic invertebrates in the revetment wall area, would be balanced by long-term beneficial impacts. Monitoring for Cultural and Biological resources will be coordinated with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the New York State Office of Parks, Recreation and Historic Preservation. All activity associated with the project would be undertaken in a way to minimize adverse impacts to sensitive habitats and threatened and endangered species, and adjacent shorelines, as well as to minimize cumulative impacts.

A 404(b)(I) evaluation has been prepared for the project and is included in the DEIS. The proposed action and alternatives do not represent a significant threat of degradation to the aquatic environment, and are in compliance with the 404(b)(1) Guidelines.

The Notice of Intent (NOI) was filed in May of 2002. A Public Scoping Meeting was held in November 2001 and the results were collected in a Public Scoping Document. Results from public and agency scoping coordination are addressed in the DEIS. Copies of the DEIS are also available at the East Hampton Library and the Montauk Point Library.

Peter Weppler, Acting Chief
Environmental Analysis Branch

# APPENDIX C

# ESSENTIAL FISH HABITAT ASSESSMENT

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# 1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), New York District (District) is evaluating alternatives to reduce storm damage at Montauk Point. Montauk Point is located 125 miles east of New York City in the Township of East Hampton, Suffolk County, New York. Montauk Point is located on the extreme eastern tip of Long Island and separates the Atlantic Ocean to the south and Block Island Sound to the north. (Project Area, Figure 1).

Montauk Point is noted for its beauty and historic lighthouse. The Montauk Point Lighthouse, which President Washington commissioned in 1797, is included in the U.S. Department of the Interior's National Register of Historic Places. Despite previous protection projects at Montauk Point, the existing shoreline continues to erode. If there is no intervention, continued erosion will result in the continued loss of the bluff and the eventual loss of the lighthouse and adjacent historic structures.

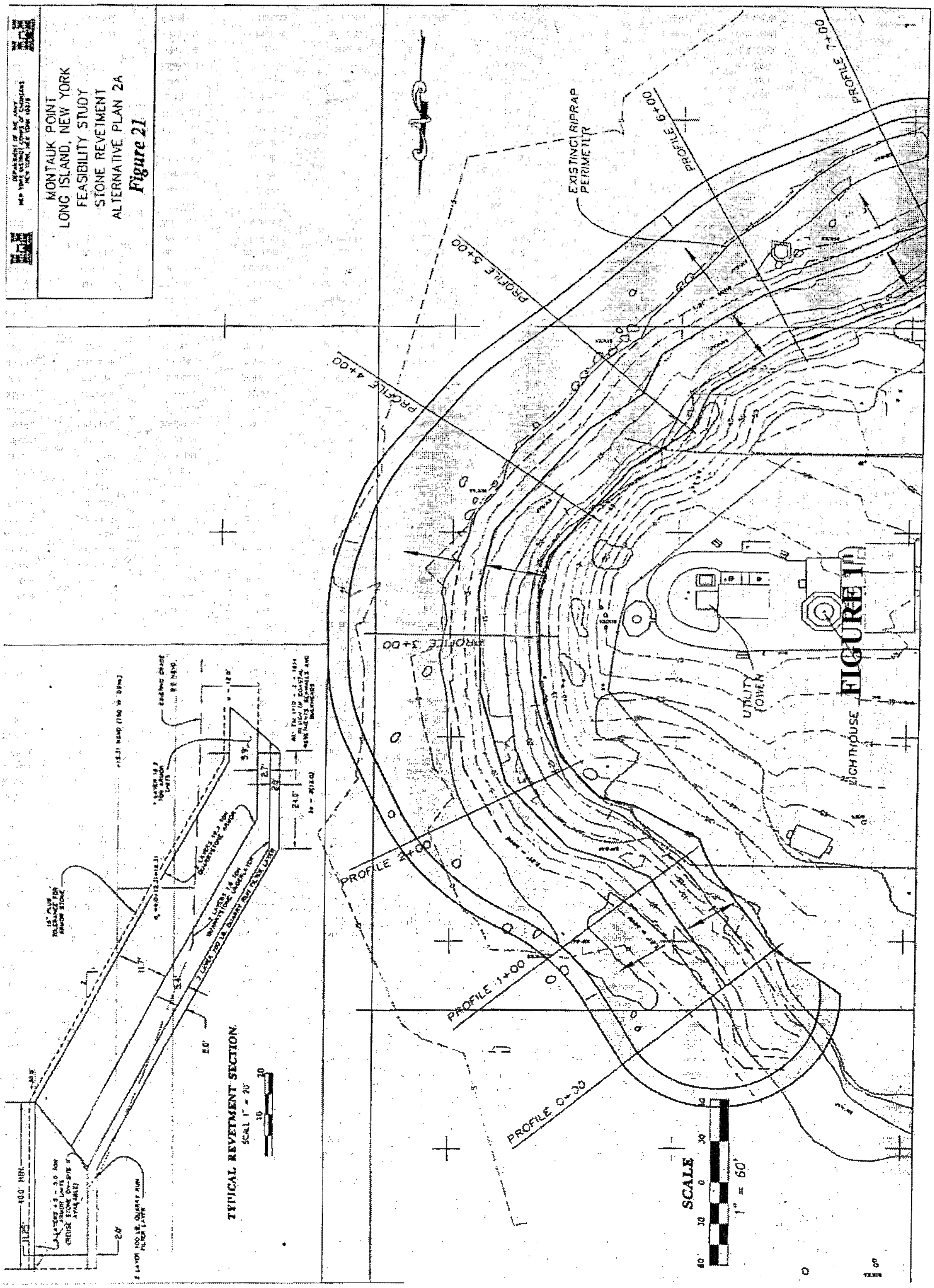
The New York District of the Army Corps of Engineers (the District) analyzed various project alternatives and planning constraints and selected construction of a stone revetment wall as the most effective. This would entail constructing an 840-foot riprap revetment wall, incorporating stones from the existing revetment and strengthening the toe to protect against breaking waves and scour at the base of the revetment.

In accordance with section 305 (b) (2) of the Magnuson-Stevens Fishery Conservation and Management Act (1996 amendments), this assessment identifies the potential impacts on designated essential fish habitats (EFH) during and following those proposed structural modifications designed to protect and support the Turtle Cove Plateau, the lighthouse and surrounding bluffs. The Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), set forth a number of new mandates for the U.S. Department of Commerce (USDOC) National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), regional fishery management councils (councils), and other Federal agencies to identify and protect important marine and anadromous fish habitat.

Federal agencies that fund, permit, or carry out activities that may adversely impact EFH are required to consult with NMFS regarding the potential effects of their actions on EFH. However, measures recommended to protect EFH are advisory, rather than prescriptive.

According to NMFS, the contents of an EFH assessment should include:

- A description of the proposed action;
- Analysis of the effects of the proposed action on EFH, the managed fish species, and major prey species;
- The Federal agency's views regarding the effects of the action on EFH; and,
- Proposed mitigation, if applicable.



MONTAUK POINT
LONG ISLAND, NEW YORK
FEASIBILITY STUDY
STONE REVETMENT
ALTERNATIVE PLAN 2A

*Figure 21*

The following section includes: a brief description of the District's proposed revetment wall; identification of the existing environment of Montauk Point area; a listing of EFH–designated species identified in and around the Montauk Point area. It also includes an analysis of the potential impacts of, and mitigation for, construction activities of EFH in the near-shore habitats.

## 2.0 PROPOSED PROJECT ACTIVITIES

### 2.1 Authority and Purpose

The project was authorized by a resolution of the U.S. House of Representatives Committee on Environment and Public Works, adopted May 1991 to provide storm damage protection at Montauk Point.

### 2.2 Description of Proposed Plan of Improvement

The recommended plan will protect Montauk Point lighthouse and bluff complex by building an 840 feet riprap stone revetment. Some stone already on site will be reused. Revetments are proven methods of shore protection in the area and have historically been accepted by local and state agencies. The cross-section of the preliminary revetment has a crest width of 40-feet at elevation +25 feet NGVD, 1V:2H side slopes and 12.6 ton quarry stone armor units extending from the crest down to the embedded toe. A heavily embedded toe is incorporated to protect against breaking waves and scour at the toe of the structure. Three layers of 4-5 ton armor units are used atop the splash apron (Figure 2).

### 2.3 Construction Methods

The recommended plan proposes construction over a two-year period. Two cranes working from opposite ends will be employed to move existing revetment rock and newly quarried rock to construct the revetment. A temporary access road will be built to get from the road at the top of the bluff down to the shoreline staging areas just east and west of the revetment limits. From there the road will be extended to the construction berms starting at the eastern and western limits of the new revetment. The new revetment will be built within the footprint of the existing (1990) revetment. During construction there will be a temporary impact and habitat loss of 800 by 40 feet. The permanent impact and habitat loss will be 600 by 20 feet, due to the embedded toe. The habitat that will be lost is eroding rock and substrate, which will be exchanged with rocky intertidal habitat created by the new revetment.

# 3.0 ENVIRONMENT

## 3.1 History

In 1792 President George Washington authorized the construction of the Montauk Point Light Station for navigation purposes. When the lighthouse was completed it was 300 feet from the cliff's edge. Today the lighthouse is less than 120-feet from the edge of the bluff and other structures are within 50 feet of the edge. Throughout the years various efforts have been made to stabilize the shoreline from the effects of erosion. USACE built a 700-feet stone revetment that later failed in the 1940's, DOT placed rubble in the 1960's, local terracing and planting efforts were constructed in the 1970's and 1980's, and in 1990 another revetment was constructed (MHS, 2000 and NYS P&R, 2002). The 1990 revetment settled during the 1991 storm and is no longer adequate as a shore protection measure. Finally, in 1992 an emergency construction effort was made by the USCG and a new revetment was constructed landward of the old revetment. This revetment and the terracing efforts are currently providing shoreline protection. In 1993, a reconnaissance study was executed by the District, which determined that unless further protection efforts are made, upper bluff areas, the Turtle Cove Plateau and associated structures would be in danger of erosion by the year 2016.

## 3.2 Description

Montauk Point is located 125 miles east of New York City, in the Township of East Hampton, Suffolk County, New York. Montauk Point Lighthouse sits on a high bluff underlain with glacial till at 70 feet above MSL (Mean Sea Level). The lighthouse and surrounding Montauk Point State Park are one of the most highly visited recreational and tourist areas in Eastern Long Island. The shoreline of Long Island in the vicinity of Montauk Point is rugged, rocky and steep surrounding the bluffs that Montauk Point is known for. The project area is located in the Atlantic coastal plain province, which consists of loose, unconsolidated Cretaceous to Recent sediments resting on a deeply buried crystalline rock base. In the past 125 years the bluffs have retreated 150 feet and the beach has retreated 305 feet. The erosion of the bluff is a result of the combined effect of storm waves, ground water flow, wind and rain. Hurricanes or large storms can result in a combined storm surge and wave crest level approximately 30 feet above MSL.

## 3.3 Vegetation

Beaches to the north and south of the lighthouse are narrow and sparsely vegetated. The dunes are covered with American Beach grass *(Ammophila breviliqulata)* and wooly beach heather (*Hudsonia tomentosa*). The composition of dune vegetation varies depending on stability. Additionally, beach grass and salt-spray rose were added during terracing of the bluff face. .

## 3.4 Water Quality

The project area has good water quality. The waters are used for recreational and commercial fishing and contact recreation. The waters are also part of the extreme eastern extent of the Peconic Bay Estuary, which has excellent overall water quality.

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### 3.5 Aquatic Resource

The quality of habitats in the project area is suited for a diverse group of species. The bottom composition is mainly rock along the revetment surrounded by intertidal gravel/sand beaches to the north and south of Montauk Point. The area is habitat for many benthic invertebrates' species, such as bee chitins, mussels, oysters, anemone, isopods, periwinkles, bryozoans, clams, barnacles, sea urchins, scuds, sea stars, lobsters, and crabs. In the sandy reaches are amphipods, horseshoe crabs, wedge-shaped clams, ghost crabs, isopods, and burrowing worms.

### 3.6 Finfish

Commercial and recreational finfish species found near the project area include: the American sandlance *Ammodytes americanus*, American shad *Alosa sapidissima*, Atlantic croaker *Micropogonias undulates*, Atlantic mackerel *Scomber scombrus*, Atlantic menhaden *Brevoortia tyrannus*, black sea bass *Centropristis striata*, bluefish *Pomatomus saltatrix*, butter fish *Porohotus triacanthos*, scup *Stenotomus chrysops*, spot *Leiostomas xanthurus*, winter flounder *Pseudopleuronectes americanus*, summer flounder *Paralichthys dentatus*, weakfish *Cynosion regalis*, and striped bass *Morone saxatilis*.

### 3.7 Migratory Finfish

Migratory finfish (alewife, American shad, Atlantic menhaden, Atlantic silverside, blueback herring, and striped bass) occur in seasonal abundance at Montauk Point.

## 4.0 EFH SPECIES

### 4.1 EFH-Designated Species

EFH is defined in the Magnuson-Stevens Act as: "waters" to include aquatic areas and their associated physical, chemical, and biological properties that are used by fish which may include areas historically used by fish where appropriate; "substrate" to include sediment, hard bottom and structures underlying the water, and associated biological contribution to a healthy ecosystem; and areas used for "spawning, breeding, and growth to maturity" to cover a specie's full life cycle. Prey species are defined as being a forage source for one or more designated fish species, and the presence of adequate prey can classify a habitat as essential.

As required by the Magnuson-Stevens Act, the National Marine Fisheries Service promulgated regulation to provide guidance to the regional fishery management council for EFH designation. EFH designation were based on the presence or absence, and, in some cases, on the relative abundance of eggs, larvae, juvenile, and adults fish in long-term survey datasets, and on information compiled by the National Oceanic Atmosphere Administration (NOAA)/National Ocean Services (NOS) Estuarine Living Marine Resource Program, from the U.S. Atlantic coast from the Gulf of Maine to Cape Hatteras, North Carolina per the New England Fisheries Management Council (NOAA, 1999). EFH designations for the 10' square of latitude and longitude (Figure 2) that include the coastal waters of Montauk Point, New York, Table 1, are identified by species and life history stages in Table 2.

| Table 1. 10' x 10' Square Coordinates | | | | |
|---|---|---|---|---|
| Boundary | North | East | South | West |
| Coordinate | 41° 10.0' N | 71° 50.0' W | 41° 00.0' N | 72° 00.0' W |

Grid Description (i.e. habitat, landmarks, coastline markers): Atlantic Ocean waters within the square affecting the northeast tip of Long Island from just west of Rocky Point on the north side around Fort Pond Bay, past Lake Montauk, Shagwong Pt., False Pt., Montauk Pt., and Montauk, NY, to just east of Hither Hills State Park.

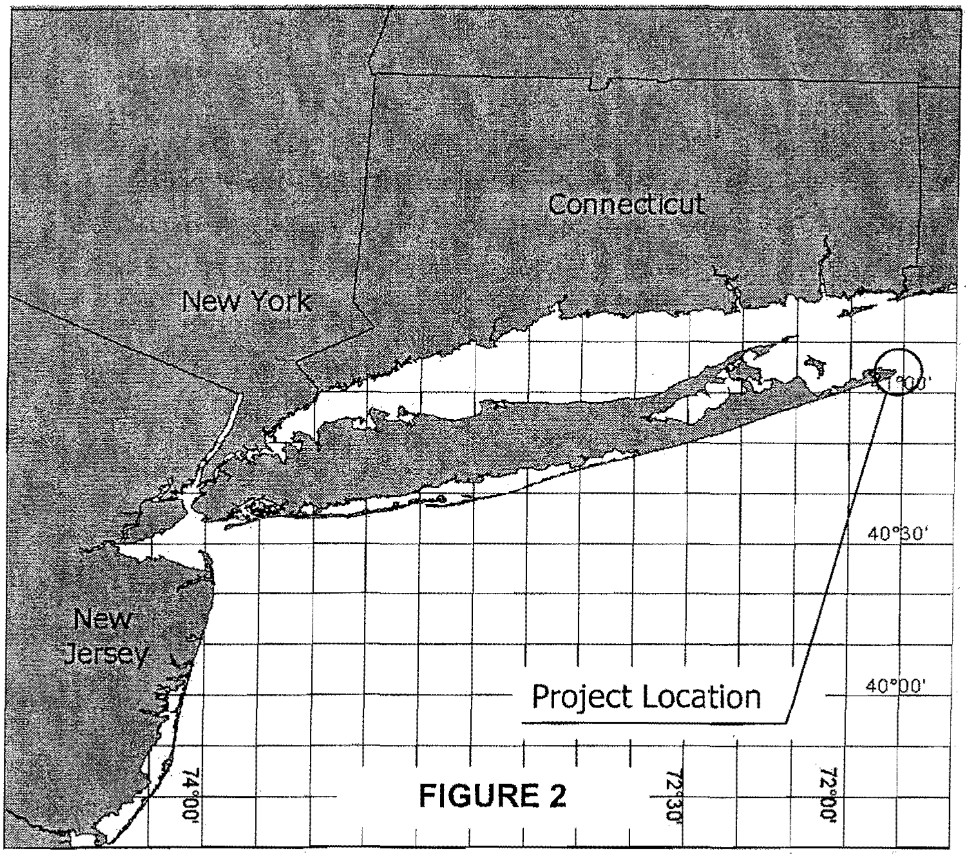

FIGURE 2

**Table 2. EFH-Designated Species Reported for the Montauk Point Area.**

| Species | Eggs | Larvae | Juveniles | Adults |
|---|---|---|---|---|
| Whiting (*Merluccius bilinearis*) | X | X | X |  |
| Winter flounder *Pleuronectes americanus* | X | X | X | X |
| Windowpane flounder *Scopthalmus aquosus* |  |  | X | X |
| Atlantic sea herring *Clupea harengu* | X | X | X | X |
| Bluefish *Pomatomus saltatrix* |  |  | X | X |
| Atlantic butterfish *Peprilus triacanthu* |  |  | X | X |
| Atlantic mackerel *Scomber scombrus* |  | X | X | X |
| Summer flounder *Paralicthys dentatus* |  |  | X | X |
| Scup *Stenotomus chrysop* |  |  | X | X |
| Black sea bass *Centropristus striata* |  |  | X |  |
| King mackerel *Scomberomorus cavalla* | X | X | X | X |
| Spanish mackerel *Scomberomorus maculates* | X | X | X | X |
| Cobia *Rachycentron canadum* | X | X | X | X |
| Sand tiger shark *Odontaspis taurus* |  | X |  |  |
| Ocean pout *Macrozoacres americanus* | X | X |  | X |
| Long finned squid *Loligo pealei* |  |  | X |  |
| Spiny dogfish *Squalus acanthias* |  |  | X | X |
| Blue shark *Prionace glauca* |  |  | X | X |
| Dusky shark *Charcharinus obscurus* |  | X | X |  |
| Shortfin mako shark *Isurus oxyrhyncus* |  |  | X |  |
| Sandbar shark *Charcharinus plumbeus* |  | X | X | X |
| Bluefin tuna *Thunnus thynnus* |  |  | X | X |

Source: NOAA 1999

Most habitat data was retrieved from NOAA habitat characteristic table found in the guide to essential fish habitat descriptions at http://www.nero.noaa.gov/hcd/list.htm. Otherwise data is referenced appropriately.

**Table 5. Habitat utilization of identified EFH species for representative life stages in the SBOBA.**

| MANAGED SPECIES | EGGS | LARVAE | JUVENILES | ADULTS |
|---|---|---|---|---|
| Whiting<br>(*Merluccius bilinearis*)<br>(Morse et al. 1998) | **Habitat**: Pelagic continental shelf waters in preferred depths from 50-150 m. | **Habitat:** Pelagic continental shelf waters in preferred depths from 50-130 m. | **Habitat:** Bottom (silt-sand) nearshore waters in preferred depths from 150-270 m in spring and 25-75 m in fall.<br>**Prey:** Fish, crustaceans (euphausids, shrimp), and squids |  |

**Table 5. Habitat utilization of identified EFH species for representative life stages in the SBOBA.**

| MANAGED SPECIES | EGGS | LARVAE | JUVENILES | ADULTS |
|---|---|---|---|---|
| Winter Flounder (*Pseudopleuronectes americanus*) (Pereira et. al., 1998) | **Habitat:** Pelagic and bottom water at depths of less than 5 meters with a broad range of salinity, abundant February through July | **Habitat:** Pelagic and bottom water at depths less than 5 meters with a broad range of salinity, abundant February through July | **Habitat:** Young of the year (YOY) are demersal, nearshore low energy shallows with sand, muddy sand, mud and gravel bottoms (primarily inlets and coves).<br>**Prey:** YOY -- Amphipods and annelids<br>JUV – Sand dollars, bivalves siphons, annelids, amphipods | **Habitat:** Demersal offshore waters (in spring) except when spawning, where they are in shallow inshore waters (fall).<br>**Prey:** Amphipods, polychaetes, bivalves or siphons, Capelin eggs, crustaceans |
| Windowpane (*Scopthalmus aquosus*) (Chang, 1998) | **Habitat:** Surface waters <70 m, Feb-July; Sept-Nov. | **Habitat:** Initially in pelagic waters, then bottom <70m, May-July and Oct-Nov<br>**Prey:** Copepods and other zooplankton | **Habitat:** Bottom (fine sands) 5-125 m in depth, in nearshore bays and estuaries less than 75 m<br>**Prey:** Small crustaceans (mysids and decapod shrimp), polychaetes and various fish larvae | **Habitat:** Bottom (fine sands), peak spawning in May, in nearshore bays and estuaries less than 75 m<br>**Prey:** Small crustaceans (mysids and decapod shrimp), polychaetes and various fish larvae |
| Atlantic sea herring (*Clupea harengus)* (Reid et al., 1998) | | **Habitat:** Pelagic waters and bottom habitats, < 10 C and 15-130 m depths. | **Habitat:** Pelagic waters and bottom, < 10 C and 15-130 m depths<br>**Prey:** Zooplankton (copepods, decapod larvae, cirriped larvae, cladocerans, and pelecypod larvae) | **Habitat:** Pelagic waters and bottom habitats<br>**Prey:** Chaetognath, euphausids, pteropods and copepods. |
| Bluefish (*Pomatomus saltatrix*) (USACE 2001) | | | **Habitat:** Pelagic waters of continental shelf and in Mid Atlantic estuaries and intertidal and nearshore zones May-Nov. Mixed and saline waters.<br>**Prey:** Atlantic silversides, clupeids, striped bass, bay anchovy, others. | **Habitat:** Pelagic waters; found in Mid Atlantic estuaries April – Oct. Highly migratory and distribution varies greatly according to season and fish size. S < 25 ppt. Spawning occurs offshore in open waters.<br>**Prey:** Sight feeders; prey on other fishes almost exclusively. |
| Atlantic butterfish (*Peprilus tricanthus*) | | | **Habitat:** 10 – 360 m in pelagic waters over the continental shelf<br>**Prey:** Feed mainly on planktonic prey, including thaliaceans, squids, copepods, amphipods, decapods, coelenterates, polychaetes, small fishes, and ctenophores. | **Habitat:** 10 – 360 m in pelagic waters over the continental shelf<br>**Prey:** Feed mainly on planktonic prey including thaliaceans, squids, copepods, amphipods, decapods, coelenterates, polychaetes, small fishes, and ctenophores. |

**Table 5. Habitat utilization of identified EFH species for representative life stages in the SBOBA.**

| MANAGED SPECIES | EGGS | LARVAE | JUVENILES | ADULTS |
|---|---|---|---|---|
| Atlantic mackerel (*Scomber scombrus*) | | **Habitat:** Pelagic waters over the Continental Shelf | **Habitat:** Schooling in pelagic waters over the Continental Shelf, >25 ppt, 0-320 m. Not typically associated with bottom or nearshore habitats.<br>**Prey:** Principal prey include small crustaceans. Also small pelagic mollusks, chaetognaths, nematodes, ammodytes, other larval fish. | **Habitat** Schooling in pelagic waters over the Continental Shelf, >25 ppt, 0-320 m. Not typically associated with bottom or nearshore habitats.<br>**Prey:** Includes euphausids, pandalid, and crangonid shrimps; chaetognaths, larvaceans, pelagic polychaetes, squids. Calanus and other copepods, amphipods, other planktonic organisms. Fishes: sand lances, herring, silver and other hakes, sculpins. |
| Summer flounder (Paralicthys dentatus) | | | **Habitat:** Demersal waters over Continental Shelf including estuaries, mud to sand substrates S 10-30 Ppt<br>**Prey:** Primarily infaunal crustaceans, polychaetes | **Habitat:** Demersal waters (mud and sand substrates). Shallow coastal areas in warm months, deep (500 ft) offshore waters in cold months.<br>**Prey:** Shrimp, weakfish, mysids, anchovies, squids, Atlantic silversides, herrings, hermit crabs, isopods. |
| Scup (Stenotomus chrysops) | | | **Habitat:** Demersal waters over Continental Shelf and estuary habitats; >15 ppt, 12o-22oC<br>**Prey:** Small benthic invertebrates, fish eggs and larvae. | **Habitat:** Demersal waters over Continental Shelf from Nov – April, estuary habitats, >15 ppt<br>**Prey:** Benthic and near bottom invertebrates, and small fish |
| Black sea bass (*Centropristus striata*) | | | **Habitat:** Demersal waters over rough bottom, shellfish and eelgrass beds, man-made structures in sandy-shelly areas and winter off shore at depths of 1-38 m in shell beds and shell patches<br>**Prey:** Small Epibenthic invertebrates, especially crustaceans and mollusks. | **Habitat:** Demersal waters over structured habitats (natural and man-made), and sand and shell areas and winters off shore at depths of 25-50 m in shell beds and shell patches.<br>**Prey:** Benthic and near-bottom Invertebrates and small fish |

**Table 5. Habitat utilization of identified EFH species for representative life stages in the SBOBA.**

| MANAGED SPECIES | EGGS | LARVAE | JUVENILES | ADULTS |
|---|---|---|---|---|
| King mackerel (*Scomberomorus cavalla*) | **Habitat:** Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. | **Habitat:** Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone | **Habitat:** Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone<br>**Prey:** Small epibenthic invertebrates, especially crustaceans and mollusks. | **Habitat:** Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone<br>**Prey:** Benthic and near-bottom invertebrates and small fish |
| Spanish mackerel (*Scomberomorus maculates*) | **Habitat:** Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory | **Habitat:** Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory | **Habitat:** Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory<br>**Prey:** Small epibenthic invertebrates, especially crustaceans and mollusks. | **Habitat:** Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory<br>**Prey:** Benthic and near-bottom invertebrates and small fish |
| Cobia (*Rachycentron canadum*)<br>Cobia (*Rachycentron canadum*) (continued) | **Habitat:** Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory | **Habitat:** Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory | **Habitat:** Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory<br>**Prey:** Small epibenthic invertebrates, especially crustaceans and mollusks. | **Habitat:** Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory<br>**Prey:** Benthic and near-bottom invertebrates and small fish |
| Sand tiger shark (*Odontaspis taurus*) | | **Habitat:** Shallow coastal waters from Barnegat Inlet, NJ to Cape Canaveral, FL out to the 25-meter isobath, entirely outside of the project area<br>**Prey:** herring, eels, mackerels or other fish, and in rare cases, some smaller shark species | | |

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**Table 5. Habitat utilization of identified EFH species for representative life stages in the SBOBA.**

| MANAGED SPECIES | EGGS | LARVAE | JUVENILES | ADULTS |
|---|---|---|---|---|
| Ocean pout (*Macrozoacres americanus*) | **Habitat**: Bottom habitats. Eggs are laid in gelatinous masses, generally in hard bottom sheltered nests. T <10 C, < 50 meters, and S 32-34 ppt. | **Habitat**: Bottom habitats Sea surface T < 10 degrees C, depths < 50 meters, and S > 25 ppt.<br>**Prey:** Harpacticoid copepods | | **Habitat**: Bottom habitats, <15 C, <110 meters, S 32-34 ppt.<br>**Prey:** Benthic organisms, especially shelled, e.g., mollusks, crustaceans, echinoderms, especially sand dollars. |
| Long finned squid (*Loligo pealei*) | | | **Habitat:** Pelagic waters over the Continental Shelf from Maine to North Carolina from shore to 700 feet and T 39 - 91 degrees F.<br>**Prey:** Fish prey includes silver hake, mackerel, herring, menhaden, sand lance, bay anchovy, menhaden, weakfish and silversides. Invertebrate prey includes crustaceans and squid. | |
| Spiny Dogfish (*Squalus acanthias*)<br>Spiny Dogfish (*Squalus acanthias*) (continued) | | | Continental shelf from Maine to North Carolina. Inshore, EFH is the seawater portions of estuaries from Maine to Massachusetts. Depths of 33 to 1280 feet in water temperatures ranging between 37 to 82 F.<br>**Prey:** mainly herring, Atlantic mackerel, squids, and to a lesser extent, haddock and cod. | Continental shelf from the Maine to North Carolina. Inshore, EFH is the seawater portions of estuaries from Maine to Massachusetts. Generally, dogfish are found at depths to 1476 feet in water temperatures ranging between 37 to 82 F.<br>**Prey:** mainly herring, Atlantic mackerel, squids, and to a lesser extent, haddock and cod. |
| Blue Shark (*Prionace glauca*) | | | **Habitat:** Epipelagic in warm seas worldwide. Most wide-ranging of all sharks<br>**Prey:** fish including hake, dogfish, mackerel, squid and pelagic crustaceans. | **Habitat:** Epipelagic in warm seas worldwide. Most wide-ranging of all sharks<br>**Prey:** fish including hake, dogfish, mackerel, squid and pelagic crustaceans. |

## Table 5: Habitat utilization of identified EFH species for representative life stages in the SBOBA.

| MANAGED SPECIES | EGGS | LARVAE | JUVENILES | ADULTS |
|---|---|---|---|---|
| Dusky shark (*Charcharinus obscurus*) | | **Habitat:** Shallow coastal waters, inlets, and estuaries to the 25-meter isobath. However life stages are primarily found in waters south of Long Island. | **Habitat:** Juveniles found in coastal and pelagic waters between the 25- and 200-meter isobath. However life stages are primarily found in waters south of Long Island. | |
| Sandbar shark (*Charcharinus plumbeus*) | | **Habitat:** Shallow coastal waters from Barnegat Inlet, NJ to Cape Canaveral, FL out to the 25-meter isobath, e outside of the project area.<br>**Prey:** Opportunistic bottom-feeder, relatively small fishes, mollusks and crustaceans. Include various bony fishes, eels, skates, rays, dogfish, octopus, squid, bivalves, shrimp and crabs. | **Habitat:** Found in coastal and pelagic waters north of 40°N and at the shelf break in the mid-Atl during winter. S >22 ppt and T > 70 F°<br>**Prey:** Opportunistic bottom-feeder, relatively small fishes, mollusks and crustaceans. Include various bony fishes, eels, skates, rays, dogfish, octopus, squid, bivalves, shrimp and crabs. | **Habitat:** Demersal shallow coastal waters from the coast to the 50-meter isobath.<br>**Prey:** Opportunistic bottom-feeder, relatively small fishes, mollusks and crustaceans. Include various bony fishes, eels, skates, rays, dogfish, octopus, squid, bivalves, shrimp and crabs. |
| Shortfin mako shark (*Isurus oxyrhyncus*)<br>Shortfin mako shark (*Isurus oxyrhyncus*) (continued) | | **Habitat:** Found offshore between the 25- and 50-meter isobath.<br>**Prey:** mackerel, tuna, marine mammals, squid and other sharks | | |
| Bluefin tuna (*Thunnus thynnus*) | | | **Habitat:** Primarily surface waters, also found in inshore and pelagic waters between the 25 and 200-meter isobath.<br>**Prey:** Smaller fishes such as mackerel, herring, whiting, flying fish, and mullet as well as squid, eels, and crustaceans | |

## Table 5: Habitat utilization of identified EFH species for representative life stages in the SBOBA.

| MANAGED SPECIES | EGGS | LARVAE | JUVENILES | ADULTS |
|---|---|---|---|---|
| Clearnose skate<br>(*Raja eglanteria*)<br>(NEFMC 2004), (Packer *et al.* 2003a) | | | **Habitat**: Soft bottom habitats along the continental shelf and rocky or gravelly bottom, from shore to 500 meters, most abundant at depths < 111 meters. T 9-30 □C, S 22-36 ppt.<br>**Prey:** Polychaetes, amphipods, mysid shrimp, shrimp, crabs including bivalves, squid, and small fishes such as soles, weakfish, butterfish, and scup. | **Habitat**: Both soft bottom and rocky or gravelly bottom habitats, from the shore to 400 meters, most abundant at depths <111 meters.<br>**Prey:** Polychaetes, amphipods, mysid shrimp, shrimp, crabs, bivalves, squid, and small fishes such as soles, weakfish, butterfish, and scup. |
| Little skate<br>(*Leucoraja erinacea*)<br>(NEFMC 2004), (Packer *et al.* 2003b) | | | **Habitat**: Sandy or gravelly substrate or mud, found from the shore to 137 meters, highest abundance from 73-91 meters, 4-15□C, S preferred 31-34ppt.<br>**Prey:** opportunistic predator although inshore skates generally depend more on a few major prey species. Decapod crustaceans and amphipods are the most important prey items | **Habitat**: Similar to juvenile habitat.<br>**Prey:** Similar to juvenile prey. |
| Winter skate<br>(*Leucoraja ocellata*)<br>(NEFMC 2004), (Packer *et al.* 2003c)<br>Winter skate<br>(*Leucoraja ocellata*) | | | **Habitat**: Primarily sand and gravel bottom but also found in mud bottoms, from shoreline to about 400 meters and are most abundant at depths less than 111 meters, most found from 4-16 □C, salinities as low as 23 ppt but prefer a salinity range of 32-34ppt.<br>**Prey:** Polychaetes and amphipods most important prey in terms of numbers or occurrence, followed by decapods, isopods, bivalves, fishes. | **Habitat**: Similar to juvenile habitat.<br>**Prey:** Same as for juveniles; however, note that larger skates consume more polychaetes and fish while crustaceans decline in the diet. |

## 4.3 Analysis Of Effects On EFH Species

As discussed above, there are a number of Federally managed fish species where EFH was identified for one or more life stages within the project area. Fish occupation of waters within the impact area is highly variable both spatially and temporally. Some of the species are strictly offshore, while others may occupy both nearshore and offshore waters. In addition, some species may be suited for the open ocean or pelagic waters, while other species may be more oriented to bottom or demersal waters. This can also vary between life stages of Federally managed species. Also, seasonal abundances are highly variable, as many species are highly migratory.

In general, adverse impacts to Federally managed fish species may stem from alterations of the bottom habitat, which results from removing and replacing the revetment EFH can be adversely impacted temporarily through water quality impacts such as increased turbidity and decreased dissolved oxygen content. These impacts would subside upon cessation of construction activities. More long-term impacts to EFH typically involve physical changes to the bottom habitat, which involve changes to bathymetry, sediment substrate, and benthic community as a food source. Table 6 below discusses the direct and indirect impacts on identified EFH species for representative life stages

**Table 3. Direct and indirect impacts on identified EFH species for representative life stages**

| SPECIES | EGGS | LARVAE | JUVENILES | ADULTS |
|---|---|---|---|---|
| Whiting (Merluccius bilinearis) | Eggs are pelagic and are concentrated in depth of 50 –150 meters; therefore no direct or indirect effects are expected. | Larvae are pelagic and are concentrated in depth of 50 –130 meters; therefore no direct or indirect effects are expected. | **Direct:** Physical habitat offshore of point should remain basically similar to pre-construction conditions. .<br>**Indirect:** Temporary disruption of feeding due to disturbance caused by construction | |
| Winter flounder (Pseudopleuronectes americanus) | **Direct:** Placement of stone and the increased footprint of the project *may result in a small number of eggs being crushed* although strong currents in the area may sweep eggs from the area. | **Direct:** Larvae are initially planktonic, but become more bottom-oriented as they develop. There is potential for some to *become crushed during construction.* | The physical characteristic are not favorable to habit because of the high-energy environment habitat in borrow site | **Direct:** Typically habitat is offshore except when spawning when the possibility of being crushed is possible. However, high motility and disturbance caused by construction should result in flight.<br>**Indirect:** Temporary disruption of feeding due to disturbance caused by construction. |
| Windowpane (Scopthalmus aquosus) | Eggs occur in surface waters; therefore, no direct or indirect effects are expected. | Larvae occur in pelagic waters; therefore, no direct or indirect effects are expected. | **Direct:** Physical habitat will typically remain the same, plus substrate is not preferred fine-grained sediments.<br>**Indirect:** Temporary disruption of feeding due to disturbance caused by construction. | **Direct:** Physical habitat will typically remain the same, plus substrate is not preferred fine-grained sediments.<br>**Indirect:** Temporary disruption of feeding due to disturbance caused by construction. |

## Table 3. Direct and indirect impacts on identified EFH species for representative life stages

| SPECIES | EGGS | LARVAE | JUVENILES | ADULTS |
|---|---|---|---|---|
| Atlantic sea herring (Clupea harengus) | | | **Direct**: Occur in pelagic and near bottom waters. Physical habitat is not preferred habitat, additional high motility allows for prompt escape.<br>**Indirect:** None, prey are planktonic | **Direct**: Occur in pelagic and near bottom waters. Physical habitat is not preferred habitat, additional high motility allows for prompt escape.<br>**Indirect:** None, prey are planktonic |
| Bluefish (Pomatomus saltatrix) | Eggs occur in pelagic waters over the Continental Shelf. **No direct or indirect impact is expected.** | Larvae occur in pelagic waters over the Continental Shelf. **No direct or indirect impact is expected.** | **Direct**: Juvenile bluefish are pelagic species. No significant direct effects anticipated.<br>**Indirect:** Temporary disruption of feeding due to disturbance caused by construction. | **Direct:** Adult bluefish are pelagic species. No significant direct effects anticipated.<br>**Indirect:** Temporary disruption of feeding due to disturbance caused by construction. |
| Atlantic butterfish (Peprilus tricanthus) | | | **Direct:** Juvenile butterfish are pelagic species. No significant direct effects anticipated.<br>**Indirect:** Temporary disruption of feeding due to disturbance caused by construction. | **Direct:** Adult butterfish are pelagic species. No significant direct effects anticipated.<br>**Indirect:** Temporary disruption of feeding due to disturbance caused by construction. |
| Atlantic mackerel (*Scomber scombrus*) | | | **Direct**: Juvenile Atlantic mackerel are pelagic species. No significant direct effects anticipated.<br>**Indirect:** Temporary disruption of feeding due to disturbance caused by construction. | **Direct**: Adult Atlantic mackerel are pelagic species. No significant direct effects anticipated.<br>**Indirect:** Temporary disruption of feeding due to disturbance caused by construction. |
| Summer flounder (Paralicthys dentatus) Summer flounder (Paralicthys dentatus) (continued) | | | **Direct:** Physical habitat will typically remain the same, plus substrate is not preferred fine-grained sediments.<br>**Indirect:** Temporary disruption of feeding due to disturbance caused by construction. | **Direct:** Physical habitat will typically remain the same, plus substrate is not preferred fine-grained sediments.<br>**Indirect:** Temporary disruption of feeding due to disturbance caused by construction. |
| Scup (Stenotomus chrysops) | | | **Direct**: Occur in demersal waters, but high motility should allow for prompt escape.<br>**Indirect:** Temporary disruption of benthic prey within site. | **Direct**: Occur in demersal waters, but high motility should allow for prompt escape.<br>**Indirect:** Temporary disruption of benthic prey within site. |

**Table 3. Direct and indirect impacts on identified EFH species for representative life stages**

| SPECIES | EGGS | LARVAE | JUVENILES | ADULTS |
|---|---|---|---|---|
| Black sea bass (Centropristus striata) | | | **Direct:** Physical habitat will be dismantled and rebuilt sequentially which allows habitat to remain basically similar to pre-construction conditions. Some mortality of juveniles could be expected but high motility should allow for prompt escape. **Indirect:** Temporary disruption of feeding. | **Direct:** Physical habitat will be dismantled and rebuilt sequentially which allows habitat to remain basically similar to pre-construction conditions. Some mortality of juveniles could be expected but high motility should allow for prompt escape. **Indirect:** Temporary disruption of feeding. |
| King mackerel (Scomberomorus cavalla) | **Direct Impacts:** Eggs are pelagic; therefore no adverse impacts are anticipated. **Indirect Impacts:** None anticipated. | **Direct Impacts:** Larvae are pelagic; therefore no adverse impacts are anticipated. **Indirect Impacts:** None anticipated. | **Direct Impacts:** Adults are pelagic and highly motile, therefore no adverse impacts are anticipated. **Indirect Impacts:** Temporary disruption of feeding. | **Direct Impacts:** Adults are pelagic and highly motile, therefore no adverse impacts are anticipated. **Indirect Impacts:** Temporary disruption of feeding |
| Spanish mackerel (Scomberomorus maculatus) | **Direct Impacts:** Eggs are pelagic; therefore no adverse impacts are anticipated. **Indirect Impacts:** None anticipated. | **Direct Impacts:** Larvae are pelagic; therefore no adverse impacts are anticipated. **Indirect Impacts:** None anticipated. | **Direct Impacts:** Juveniles are pelagic; therefore no adverse impacts are anticipated. **Indirect Impacts:** Minor indirect adverse effects on food chain through disruption of benthic community, however, mackerel are highly motile. | **Direct Impacts:** Adults are pelagic and highly motile, therefore no adverse impacts are anticipated. **Indirect Impacts:** Minor indirect adverse effects on food chain through disruption of benthic community, however, mackerel are highly motile. |
| Cobia (Rachycentron canadum) | **Direct Impacts:** Eggs are pelagic; therefore no adverse impacts are anticipated. **Indirect Impacts:** None anticipated. | **Direct Impacts:** Larvae are pelagic; therefore no adverse impacts are anticipated. **Indirect Impacts:** None anticipated. | **Direct Impacts:** Juveniles are pelagic; therefore no adverse impacts are anticipated. **Indirect Impacts:** Minor indirect adverse effects on prey, however cobia are highly motile. | **Direct Impacts:** Adults are pelagic and highly motile, therefore no adverse impacts are anticipated. **Indirect Impacts:** Minor indirect adverse effects on prey, however cobia are highly motile. |
| Sand tiger shark (*Odontaspis taurus)*<br>Sand tiger shark (*Odontaspis taurus)*(cont.) | | No direct of indirect effects are expected because they live and feed outside of the study area. | | |
| Ocean pout (M*acrozoacres americanus*) | **Direct Impacts:** Eggs may be in crevices in the crumbling revetment and bluffs The project site is on the northern border of life stage habitat, lessening chance of any impact. . | The project site is on the northern border of life stage habitat, lessening chance of any impact. | **Direct Impacts:** Adults are highly motile, therefore no adverse impacts are anticipated. **Indirect Impacts:** Temporary feeding disruption due to commotion from construction. | |
| Long finned squid (*Loligo pealei*) | | | **Direct Impacts:** Adults are pelagic and highly motile, therefore no adverse impacts are | |

| Table 3. Direct and indirect impacts on identified EFH species for representative life stages | | | | |
|---|---|---|---|---|
| **SPECIES** | **EGGS** | **LARVAE** | **JUVENILES** | **ADULTS** |
| | | | anticipated.<br>**Indirect Impacts:** Temporary feeding disruption due to commotion from construction. | |
| Spiny Dogfish (*Squalus acanthias*) | | | **Direct**: Site physical habitat is not preferred habitat, additionally high motility allows for prompt escape.<br>**Indirect:** Temporary disruption of feeding | |
| Blue Shark (*Prionace glauca*) | | | Occur in pelagic waters; therefore, *no direct or indirect effects are expected*. | Occur in pelagic waters; therefore, *no direct or indirect effects are expected*. |
| Dusky shark (Charcharinus obscurus) | | | Primarily found in waters south of Long Island, therefore, *no direct or indirect effects are expected.* | Primarily found in waters south of Long Island, therefore, *no direct or indirect effects are expected.* |
| Sandbar shark (Charcharinus plumbeus) | | **No Direct**<br>**Indirect** Temporary disruption of feeding. | **No Direct**<br>**Indirect** Temporary disruption of feeding. | **No Direct**<br>**Indirect** Temporary disruption of feeding. |
| Shortfin mako shark (*Isurus oxyrhyncus*) | | **No Direct**<br>**Indirect** Temporary disruption of feeding. | | |
| Bluefin tuna (*Thunnus thynnus*) | | | No more than minimal direct or indirect impact is expected because their vertical distribution (surface waters) and high motility would help this species avoid impact. | |
| Clearnose skate (*Raja eglanteria*) | | | **Direct:** Some skates may get crushed, but high motility would help this species avoid impact. Temporary disruption of feeding | **Direct:** Some skates may get crushed, but high motility would help this species avoid impact. Temporary disruption of feeding |
| Little skate (*Leucoraja erinacea*) | | | **Direct:** Some skates may get crushed, but high motility would help this species avoid impact. Temporary disruption of feeding | **Direct:** Some skates may get crushed, but high motility would help this species avoid impact. Temporary disruption of feeding |
| Winter skate (*Leucoraja ocellata*) | | | **Direct:** Some skates may get crushed, but high motility would help this species avoid impact. Temporary disruption of feeding | **Direct:** Some skates may get crushed, but high motility would help this species avoid impact. Temporary disruption of feeding |

# 5.0 IMPACTS ON EFH

## 5.1 Direct Impacts

The proposed project will have no more than minimal impact on certain species due to preferred depths. These species include whiting, Atlantic sea herring, Atlantic butterfish, spiny dogfish, blue shark, shortfin mako shark and bluefin tuna. As a result, direct impacts should be no more than minimal.

The most obvious direct impact will be the potential for certain target species (bluefish, windowpane, Atlantic mackerel, summer flounder, migratory species (king mackerel, Spanish mackerel and cobia), ocean pout and long-finned squid to be crushed by quarry rock during the construction of the revetment. However, due to the slow nature of the work, this intrusion into potential habitat would forewarn designated species, allowing them to flee the area. Burial of the benthic community will have an immediate, albeit temporary, minimal effect on the feeding success of those species dependent upon benthic invertebrates. Once again, by sequentially rebuilding the revetment, impact will be minimized spatially and temporally. The District has determined that direct burial of EFH species is possible yet improbable and, therefore, will have no more than minimal impact on target species or their EFH.

Furthermore, recolonization of a healthier benthic community may occur through; 1) benthic infauna that are able to unbury themselves when rubble is removed, 2) migration of juvenile and adult sessile organisms from contiguous areas, and 3) larval sessile organisms that settle on the new substrate. Accordingly, direct impacts should be no more than minimal.

Other species with EFH-designated habitats (e.g. winter flounder) may find that the currents in the locale excessive for habitation or spawning. Furthermore, should winter flounder be present in the area during construction they are motile and should escape the activities. Consequently, direct impacts should be no more than minimal.

Black sea bass will most likely be found at the construction site. The District anticipates that this cryptic species will flee the revetment and rubble for concealment nearby. For this reason, direct impacts should be no more than minimal.

Some species may be included in the 10' by 10' grid which determines species for this report, however, several species including the sand tiger shark and, dusky shark need no further evaluation and direct impacts should be no more than minimal.

## 5.2 Indirect Impacts

The indirect impact of removal and replacement of stone and rubble from the point would be the loss of sessile invertebrate prey species. Small motile and sessile organisms would be most vulnerable to burial or removal. This would be a temporary condition, lasting only as long as it takes for recolonization of revetment by pioneering organisms. Moreover, winter flounder and windowpane may feed opportunistically, minimizing the impact. Scup and black sea bass may also be indirectly impacted by the reduction of prey. However, they would most likely relocate to adjacent waters with adequate prey. Therefore, construction operations at Montauk Point should result in no more than minimal indirect impacts.

### 5.3 Cumulative Impacts

Over time, a stable revetment would provide the following:

- A hard substrate for benthic and sessile organisms to colonize, providing prey for many of the designated species,
- Nooks and crevices for species such as the ocean pout to lay their eggs in, or for cryptic species (e.g., black sea bass) to use for concealment.
- A stable environment for designated species due to the projected long-term durability of the proposed revetment.

Given the minimal impact to EFH-designated species and the expected recolonization rates of prey species, there would be no cumulative impacts from reconstruction of the revetment.

## 6.0 EFFECTS ON ENDANGERED SPECIES

### 6.1 Marine Mammals

Three endangered marine mammals have been identified by NMFS as occurring proximate to the construction site. These include the northern right whale, the humpback whale, and the finback whale. Due to the shallow nature of the inlet and the disturbance create by dredging operations, no direct or indirect impacts to marine mammals are expected as a result of maintenance dredging operations.

### 6.2 Marine Turtles

The disturbance of macroinvertebrate habitat in the area would indirectly impact marine turtles, since they feed on organisms such as crabs and some mollusks that inhabit these areas. However, these effects would be only temporary since the habitat is expected to return to pre-existing conditions over time. In the interim, marine turtles would tend to leave or avoid these less desirable areas. The very low occurrence of marine turtles will result in a very low impact potential related to maintenance dredging operations.

### 6.3 Fish

The shortnose sturgeon prefers deep channels and has been documented in the Hudson Raritan Estuary , but is not likely to be found in the project area. Its preference for less saline waters typically keeps the species clear of high salinity areas. Therefore, no direct impacts to shortnose sturgeon are projected as a result of scheduled operations.

## 7.0 CONCLUSIONS

The Corps of Engineers, New York District, concludes that there would be no more than minimal impact to Essential Fish Habitat for the species and life stages listed in Table 1 as a result of the Montauk Point Storm Damage reduction Project. Impact to winter flounder eggs is expected to be minimal, in essence those eggs that may drift under stones as they are emplaced. Those species with a designated EFH are overwhelmingly motile and thus able to move to contiguous waters for safety, feeding or shelter. The loss of benthic organisms in the area will be balanced by the following recolonization, which may result in a decreased but more diverse population.

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## 8.0 REFERENCES

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# APPENDIX D

# CLEAN WATER ACT SECTION 404(B)(1) GUIDELINES EVALUATION

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# DRAFT SECTION 404(b)(1) GUIDELINES EVALUATION
# Montauk Point Storm Damage Reduction Project

## INTRODUCTION

This document presents a Section 404(b)(1) guidelines evaluation for the construction of a stone revetment to protect against shoreline and bluff erosion along the Atlantic coast of Long Island's Montauk Point. The evaluation is based on the regulations presented in 40 CFR 230, Section 404(b)(1): Guidelines for Specification of Disposal Sites for Dredged or Fill Material. The regulations implement sections 404(b) and 401(1) of the Clean Water Act, which govern disposal of dredged and fill material inside the territorial sea baseline [§230.2(b)].

## DRAFT 404(b)(1) EVALUATION

The following Section 404(b)(1) evaluation is presented in a format consistent with typical evaluations in the New York/New Jersey Harbor area and addresses all required elements of the evaluation.

Project Description

a. Location - The United States Army Corps of Engineers (USACE), New York District (District), is the lead Federal agency for the Montauk Point Storm Damage Reduction Project (Project). The Project area is located at Montauk Point in the Township of East Hampton, Suffolk County, New York. Montauk Point is located on the extreme eastern tip of Long Island and separates the Atlantic Ocean to the south and Block Island Sound to the north

b. General Description - The Project is intended to reduce the rate of erosion of the bluff and Turtle Hill plateau at Montauk Point due to storm events and continual wave action. The Project primarily consists of upgrading and expanding the existing revetment to provide protection to the toe of the bluff by absorbing the force of breaking waves, blocking storm overwash, and preventing the loss of fine material during storm surge. The area of shoreline protection by the revetment includes the expansion of the existing 320-foot-long revetment by 150 feet to the north and 300 feet to the south for a total of 840 linear feet of revetment protection.

b. Authority and Purpose – The Project was originally authorized by a resolution of the United States Senate Committee on Environment and Public Works, adopted May 15, 1991, to provide storm damage protection at Montauk Point, New York. The District is the lead Federal agency for the Project, and the New York State Department of Environmental Conservation (NYSDEC) is the non-Federal cooperating agency. This Environmental Impact Statement (EIS) was initiated pursuant to the National Environmental Policy Act (NEPA) for the purpose of providing storm damage reduction alternatives that provide protection from wave attack, recession, and long-term erosion.

c. General Description of Fill Material - Construction of the stone revetment structure would require the placement of large boulders and sublayers as specified in the standard design procedures.

(1) General Characteristics of Material – The stone revetment was developed for long-term erosion control. The plan consists of 840 linear feet of revetment protection. The protection covers the most vulnerable bluff area that would directly endanger the lighthouse complex due to bluff failure without the project.

The revetment design was based on the EM 1110-2-1614 "Design of Coastal Revetments, Seawalls, and Bulkheads." A heavily embedded toe shall be employed to stand against breaking waves at the structure. The revetment section features a 40 foot wide crest at ±25 feet NGVD, a 1V:2H side slope, 12.6-ton quarry stone armor units extending from the crest down to the embedded toe. Three layers of 4.5-ton armor units are used to construct the splash apron. Sublayers are specified in accordance with standard USACE design procedures.

(2) Quantity of Material – Construction of the revetment would require the following quantities of materials (estimated):

51,000 tons of new 12.6-ton armor stone;
18,500 tons of rehandled 4.5-ton armor stone;
20,300 tons of new 1.3-ton underlayer stone; and,
12,200 tons of bedding stone.

d. Proposed Discharge Site -

(1) Location – N/A.

(2) Size – N/A.

(3) Type of Sites/Habitat – N/A.

(4) Time and Duration of Disposal – N/A.

e. Disposal Method – N/A.

## II. Factual Determinations

### a. Physical Substrate Determination -

(1) Substrate Elevation and Slope – The revetment would permanently impact the slope and topography of the bluff and shoreline. However, this action would result in preserving the existing bluff and shoreline from ensuing erosion. Additionally, this action would protect the historic lighthouse that sits 120 feet from the edge of the bluff.

(2) Sediment Type – N/A.

(3) Dredged Material Movement – N/A.

(4) Physical Effects on Benthos - Some benthic invertebrates may be buried/smothered by revetment construction. However, long-term adverse effects to benthic communities are not anticipated.

(5) Other Effects - N/A.

(6) Action to Minimize Impacts - N/A.

### b. Water Circulation, Fluctuations, and Salinity Determinations -

(1) Water - consider effects on:

(a) Salinity – No impacts.

(b) Water Chemistry - No impacts.

(c) Clarity - Temporary increases in suspended sediment during revetment construction. No long-term impacts are predicted because strong tidal currents in the project area would rapidly disperse suspended materials.

(d) Color - Minor short-term changes are possible due to the generation of suspended solids during revetment construction.

(e) Odor - Not measurable.

(f) Taste - N/A.

(g) Dissolved Gas Levels – Potential short-term localized decrease in dissolved oxygen could occur if organic material is suspended into the water column.

(h) Nutrients – No major impacts.

(i) Eutrophication – No impacts.

(j) Other - N/A.

(2) Current Pattern and Circulation -

(a) Current Pattern and Flow – Currents in the Project area are primarily tidally driven. The construction of the revetment may have an impact on current pattern and flow immediately adjacent to the Project. However, the revetment would not have any significant impacts on the general currents off of Montauk Point.

(b) Velocity – The tidal currents around Montauk Point are generally strong and can reach velocities of 3 knots according to USACE study. Immediately adjacent to the structures there is anticipated to be a reduction in current speed due to the dissipation of energy. However, the revetment would have minimal influence on the strong tidal currents that occur off of Montauk Point.

(c) Stratification - N/A.

(3) Normal Water Level Fluctuations - N/A.

(4) Salinity Gradients - No impact.

(5) Actions that would be Taken to Minimize Impacts - N/A.

c. Suspended Particulate/Turbidity Determination -

(1) Expected Changes – Short-term, localized increases during revetment construction.

(2) Effects on Chemical and Physical Properties of the Water Column -

(a) Light Penetration - Minor, temporary impacts are anticipated from sediment that may enter the water column during construction.

(b) Dissolved Oxygen - No adverse effects.

(c) Toxic Metals and Organics - No adverse effects.

(d) Pathogens - N/A.

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(e) Aesthetics - Temporary increase in turbidity affecting water clarity.

(f) Others as Appropriate - N/A.

(3) Effects on Biota -

(a) Primary Production, Photosynthesis - Potential short-term disruption. No major impacts.

(b) Suspension/Filter Feeders – Short-term insignificant effects.

(c) Sight Feeders - Fishes and motile invertebrates are generally capable of avoiding areas of degraded water quality. Therefore, significant effects are not anticipated. However, suspended sediments that settle out of the water column could smother eggs of demersal egg-laying fish that may spawn in the work area during the construction period.

(4) Action to Minimize Impacts - N/A.

d. Contaminant Determination –

No major pollution or contaminant concerns have been noted.

e. Aquatic Ecosystems and Organisms Determination -

(1) Effects on Plankton/Nekton – Plankton in the nearby water may be temporarily impacted by increases in sediment concentrations at the time of construction. However, no long-term impacts are expected. Nekton that does not leave the project during construction area might experience periods where their gills become blocked or irritated by suspended sediment.

(2) Effects on Benthos - Some benthic species and some embryonic/juvenile nekton could be buried during revetment construction.

(3) Effects on Aquatic Food Web - Long-term adverse effects are not anticipated.

(4) Effects on Special Aquatic Sites -

(a) Sanctuaries and Refuges – The waters around Montauk Point are part of the Peconic Estuary System, which is a USEPA designated National Estuary. The revetment construction would not have any long-term adverse impacts on the Peconic Estuary water quality.

(b) Wetlands – No impacts

(c) Mud Flat – N/A.

(d) Vegetated Shallows - N/A.

(e) Bay Shoreline – N/A.

(f) Riffle and Pool Complexes - N/A.

Threatened and Endangered Species - There are no significant coastal fish species listed in the New York State Department of State Public Notice. The project is not expected to have a significant impact on marine fisheries. The District is currently coordinating with National Marine Fisheries Service (NMFS) to assess impacts to designated Essential Fish Habitat (EFH) as a result of the project. The NMFS is evaluating the existing resources and anticipated project impacts to EFH in conjunction with the public and agency review period for the Draft Environmental Impact Statement.

The federally-listed endangered Atlantic ridley (*Lepidochelys kempii*) and leatherback (*Dermochelys coriacea*) sea turtles and the threatened loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) sea turtles have been identified as transient species through the Project area (Beach 1992). Recent studies indicate that the nearshore waters within Peconic Bay, Gardiners Bay, Block Island Sound, and Long Island Sound are critical developmental habitat for juveniles of the Atlantic ridley sea turtle and a major feeding area for the Loggerhead sea turtle (USFWS 1997, Bortman and Niedowski 1998, PEP 2001). Juvenile Atlantic ridley sea turtles recorded in Long Island waters represent the largest concentrations ever documented outside the Gulf of Mexico (Morreale *et al.* 1992). In the Northeast, during the summer months, juveniles (approximately 2 to 5 years of age) of the Atlantic ridley, loggerhead, leatherback, and green sea turtles migrate from the open ocean to inshore waters including areas along the coast of Long Island (Bortman and Niedowski 1998).

Federally-listed endangered Northern right whales (*Eubalaena glacialis*) (usually individuals) are regularly sighted migrating through the nearshore waters off Montauk Point, usually from March through June (USFWS 1997) and have been identified as a transient species by the NMFS (Beach 1992). Small aggregations of federally-listed endangered finback whales (*Balaenoptera physalus*) feed close to shore from Shinnecock Inlet to Montauk Point from January to March, and federally-listed endangered humpback whales (*Megaptera novaengliae*) feed all around Montauk Point, primarily between June and September (USFWS 1997).

One federally-listed and state-listed endangered plant, the sandplain gerardia (*Agalinis acuta*), has been historically known to have occurred at several locations within the Project area (USACE 1993), and there are two extant areas containing this plant within two miles of the Project area (USFWS 1992). However, according to the NYSDEC Wildlife Resources Center, this plant has not been identified in the Project area since 1927 (USACE 1993 and USFWS 2003). Several site visits by District personnel along with local naturalists and town biologists have concluded that the sandplain gerardia is not present in the Project area.

The Fish and Wildlife Coordination Act Report concluded that no Federally-listed or proposed endangered or threatened species under the jurisdiction of the USFWS are known to exist within the Project impact area and that no habitat in the Project area is currently designated or proposed critical habitat in accordance with the provisions of the ESA (USFWS 2003).

Impacts to the state-listed rare seabeach knotweed, endangered Small's knotweed, and threatened saltmarsh spike rush and southern arrowwood, which may be present within the Project area (USACE 1993, USFWS 2003, NYSOPRHP 2003), are not expected because construction activities would not impact vegetated areas (see Section 4.3). To further minimize the potential impacts to those species potentially occurring along the northern shoreline of the Project area (i.e., seabeach knotweed, saltmarsh spike rush, Small's knotweed), the District has agreed not to use Access Road 2, but will use Alternate Access Road 2 (Figure 7) as recommended by the USFWS (USFWS 2003). In addition, the District would implement soil and water protection measures and monitoring along access roads and staging areas to protect adjacent vegetated habitats from excess erosion caused by equipment use.

The state-listed threatened northern harrier may breed in the general vicinity of the Project area. The northern harrier nests on the ground, usually in dense vegetation. This species is more commonly associated with vegetated tidal wetlands and marshes. Because implementation of the selected Project alternative would not impact vegetated habitats (see Section 4.3), impacts to individual northern harriers or their habitat are unlikely due to the Project.

The state-listed threatened least bittern usually breeds in freshwater marshes. The nest, which is constructed by both adults out of dead and live plant stems, is a platform with a shallow hollow. It is placed about one foot above water, usually on the base of dried plants. Because the Project would not impact vegetated habitats (see Section 4.3), impacts to individual least bitterns or their habitat are unlikely.

The red-shouldered hawk may breed in the general vicinity of the Project area. Red-shouldered hawk nests are large, constructed of sticks, bark, leaves, and mosses, and built in large trees, usually 20 – 60 feet high (USFWS 2003). Because implementation of the Project would not impact vegetated habitats (see Section 4.3), impacts to individual red-shouldered hawks and their habitat are unlikely. Similarly, the osprey builds large nest platforms in large diameter trees or on artificial nest structures, therefore impacts to individual ospreys and their habitat due to the Project are unlikely.

The whip-poor-will prefers open hardwood or mixed woodlands of pine, oak, and beech, particularly younger stands in fairly dry habitats (USFWS 2003). Because implementation of the Project would not impact vegetated habitats (see Section 4.3), and because the whip-poor-will prefers forested habitats more inland than the Project area, impacts to individual whip-poor-wills or their habitat are unlikely.

Although many of the animal and plant species discussed above are unlikely to be impacted by the proposed Project, the District would conduct pre-construction surveys for state-listed plants and birds and would coordinate with the NYSDEC regarding proper survey protocols as recommended in the USFWS's FWCAR. Further coordination with the NYSDEC would be initiated regarding recommendations to minimize and avoid disturbance if listed species are encountered.

(6) Other Wildlife - No impacts.

(7) Actions to Minimize Impacts - N/A.

f. Proposed Disposal Site Determination -

(1) Mixing Zone Determination - Because of the short-term duration of the effects, the vertical and horizontal mixing zones are negligible.

(2) Determination of Compliance with Applicable Water Quality Standards – State water quality standards should not be exceeded by the proposed action.

(3) Potential Effects on Human Use Characteristic -

(a) Municipal and Private Water Supply - N/A.

(b) Recreational and Commercial Fisheries - No commercial fisheries are located within the Project area. Minimal adverse impacts to sport fishery would occur during construction.

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(c) Water-Related Recreation - Short-term degradation of quality of experience due to turbidity. Increased long-term opportunities due to protection of useable shoreline area. Potential minor impact to wave characteristics off of Montauk Point that could impact surfing.

(d) Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves – The construction of the revetment would provide significant long-term benefit to the Lighthouse, which is listed on the United States Department of Interior's National Register of Historic Places.

g. Determination of Cumulative Effects on the Aquatic Ecosystem - None anticipated. Construction of revetment would provide additional habitat for nekton, and sessile aquatic vegetation and invertebrates. All construction work would be along a coastal bluff and associated shoreline.

h. Determination of Secondary Effects on the Aquatic Ecosystem - No major impacts are anticipated.

III. Findings of Compliance or Noncompliance

a. No significant adaptations of the guidelines were made relative to this evaluation.

b. Several alternatives to the alleviation of the bluff and shoreline erosion problem in the Project area were considered.

c. The proposed action does not appear to violate applicable state water quality standards or effluent standards.

d. The proposed revetment material placement would not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

e. The proposal would have no significant adverse impact on endangered species or their critical habitats. (Endangered Species Act of 1973).

f. The proposal would have no impact on marine sanctuaries designated by the Marine Protection, Research, and Sanctuaries Act of 1972.

g. The proposed discharge of fill material would not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreational and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. Significant adverse effects on aquatic ecosystem diversity productivity and stability, and recreational, aesthetic and economic values would not occur.

h. Appropriate steps to minimize potential adverse impacts of the discharge on aquatic systems include good engineering practices.

i. On the basis of the guidelines, the proposed discharge site fill material is specified as complying with the requirements of these guidelines.

## IV. Conclusions

Based on all of the above, the proposed action is determined to be in compliance with the Section 404(b)(1) Guidelines, subject to appropriate and reasonable conditions, to be determined on a case-by-case basis, to protect the public interest.

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# APPENDIX E

# FISH AND WILDLIFE COORDINATION ACT REPORT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

July 31, 2003

Colonel John B. O'Dowd
District Engineer
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278-0090

Dear Colonel O'Dowd:

As per the U.S. Army Corps of Engineers letter dated June 16, 2003, the final Fish and Wildlife Coordination Act Section 2 (b) Report for the Montauk Point Storm Damage Reduction Project, Suffolk County, Long Island, New York, is enclosed. Final recommendations are enclosed and comments from the New York State Department of Conservation and National Oceanic and Atmospheric Agency-National Marine Fisheries are also included, as an attachment to the report.

If you have any questions or require further information, please contact Laura Patrick of the Long Island Field Office at (631) 581-2941.

Sincerely,

David A. Stilwell

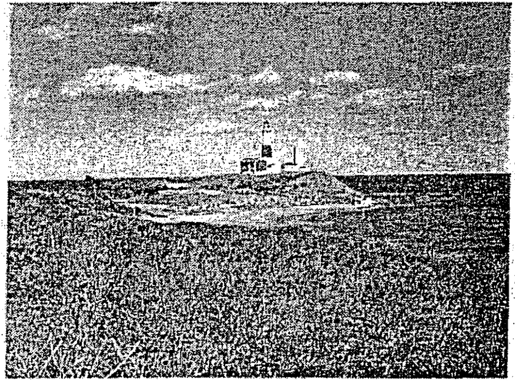
David A. Stilwell
Field Supervisor

Enclosure

cc: NYSDEC, Stony Brook, NY (C. Hamilton)
NMFS, Milford, CT (M. Ludwig)

# FISH AND WILDLIFE COORDINATION ACT
# SECTION 2(b) REPORT

## Montauk Point
## Storm Damage Reduction Project
## Suffolk County, New York



Prepared for:
Department of the Army
U.S. Army Corps of Engineers
New York District
New York, New York

Prepared by:
Department of the Interior
U.S. Fish and Wildlife Service
Long Island Field Office
Islip, New York

Preparer: Laura Patrick
Field Supervisor: David A. Stilwell

July 2003

# EXECUTIVE SUMMARY

This U.S. Fish and Wildlife Coordination Act (FWCA) Report has been prepared at the request of the U.S. Army Corps of Engineers (Corps) in fulfillment of Section 2(b) of the FWCA (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The purpose of the FWCA Report is to assure equal consideration and coordination of fish and wildlife conservation with other project purposes.

The New York District, U.S. Army Corps of Engineers, was authorized by a U.S. House of Representatives Resolution adopted May 15, 1991, to evaluate storm damage protection for the bluff and lighthouse at Montauk Point, Suffolk County, Long Island, New York. The Corps and the non-Federal sponsor, NYSDEC, are currently conducting a Feasibility Study to evaluate all reasonable solutions to the problems identified during the reconnaissance phase of the Montauk Point Storm Damage Reduction Project (Project). The Corps is studying the feasibility of "...preserving, restoring, and protecting Montauk Point and vicinity, including the historic Montauk Lighthouse and associated facilities, from erosion, environmental degradation, and coastal storm damage."

Montauk Point is located in Suffolk County, on the extreme eastern tip of the south shore of the Atlantic Coast of New York, approximately 125 miles east of New York City. The study area consists of the existing stone revetment wall area, approximately 700 feet around the bluff that the lighthouse and structures rest on, and Turtle Hill Plateau, which encompasses approximately 2,200 linear feet of shoreline surrounding Montauk Point. Project lands are under the ownership and/or management of the National Park Service, Town of East Hampton, New York State, and the Montauk Historical Society. The Corps identified six preliminary alternative project solutions provided in the Corps P7 Preliminary Alternatives Report dated April 2002. The Draft Environmental Impact Statement identifies Alternative #2-Stone Revetment solution to repair and protect the Montauk Lighthouse and associated structures by reinforcing and strengthening the existing wall with similar material of greater size as the preferred alternative.

This FWCA Report evaluates the effects of the proposed project on the existing fish and wildlife resources. The Service has concluded that the proposed project will not have significant impacts on the wildlife resources in the proposed project area including the access roads and staging areas. Most impacts are anticipated to be minor and short-term due to the existing developed/disturbed condition of the project construction area. Impacts to the nearshore and shoreline habitat will be temporary in nature.

This determination is based in part upon the following:

1. Potential impacts to marine mammals are highly unlikely to occur from the activities of the proposed project as determined by NMFS through written informal consultation dated April 23, 2003, to the Corps (Appendix A).

2. The Corps has agreed with the Service's recommendation that the proposed Access Road #2 not be used and that the proposed Alternate Access Road #2 will be the primary access route

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to get to Staging Area #2 on the northern side of the revetment. These roads are illustrated in a map provided by the Corps to the Service (Appendix A).

3. There are no Federally-listed species within or near the footprint of the proposed construction area. Potential impacts to State-listed species can be avoided by implementing a pre-construction program recommended by the Service. Specifically, the Corps has agreed to conduct a pre-construction vegetation and breeding bird survey of the entire project area, including the access roads and staging areas to document any existing New York State-listed species. NYSDEC should be contacted for survey protocols including a minimum buffer distance around the project area that should also be surveyed. If any State-listed species are discovered, the Corps has agreed to contact NYSDEC for any necessary permits and protocols for avoiding and/or minimizing impacts (Appendix A).

The Service believes that there will be temporary changes to some of the ecological communities of this study area. However, because these surf and intertidal zone areas are dynamic and unstable by nature and are colonized by benthic organisms which have rapid natural rates for recovery after disturbances, and because the proposed storm protection alternative is in-kind, the Service believes that the impacts to the fish and wildlife resources by the proposed project within the footprint of the proposed construction area will be minimal.

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# I. INTRODUCTION

Pursuant to the authority of resolutions adopted by the Committee on Environment and Public Works of the U.S. Senate on May 15, 1991, the U.S. Army Corps of Engineers, New York District (Corps), initiated a Feasibility Study on the Montauk Point Storm Damage Reduction Project (Project). The Corps, as a result, identified six preliminary alternatives to address the existing problems of erosion at Montauk Point. The Draft Feasibility Report/Environmental Impact Statement (EIS) identified Alternative #2 as the preferred Alternative.

The U.S. Fish and Wildlife Service (Service) prepared a Draft FWCA Report and distributed the document for comment to the Corps, the New York State Department of Environmental Conservation (NYSDEC), and the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) in March 2003. Correspondence commenting on the draft document are enclosed in Appendix A. The Service responses to the Corps comments on the Draft FWCA Report are also enclosed in Appendix A.

This Fish and Wildlife Coordination Act (FWCA) Report describes the existing fish and wildlife resources within and near the study area and addresses the potential impacts that the Corps project may have on these resources. This report evaluates direct, indirect, and cumulative impacts of the preferred alternative and provides recommendations to avoid, minimize, or mpensate for these impacts. This FWCA Report is organized to: (1) provide a description of the fish and wildlife resources in the study area; (2) list the sources of information presented in this report; (3) describe existing conditions; (4) determine potential impacts, and provide recommendations to avoid, minimize, or compensate for the impacts and recommend habitat restoration methods; and (5) provide a discussion and conclusion section to evaluate affected communities and species.

Montauk Point is located in Suffolk County on the extreme eastern tip of the south shore of the Atlantic Coast of New York, approximately 201 kilometers ([km] or 125 miles [mi]) east of New York City, 71° 52' W, 41° 03' N (Figure 1). The study area consists of the existing stone revetment wall area, approximately 256 meters ([m] or 840 feet [ft]) around the bluff that the lighthouse and associated structures rest upon, and Turtle Hill Plateau, which encompasses approximately 670 m (2,200 linear ft) of shoreline surrounding Montauk Point (Figure 2).

There are six preliminary alternative project solutions provided in the Corps P7 Preliminary Alternatives Report (PAR) dated April 2002. The New York District Corps has recommended to the North Atlantic Division that Alternative #2 - Stone Revetment solution is the best preferred alternative to meet project purposes, to repair and protect the Montauk Lighthouse foundation and associated structures. This alternative will involve reinforcing and strengthening the existing wall with similar material of greater size.

The main objective of this Corps project is to "Preserve and restore Montauk Point and vicinity, including the historic Lighthouse and associated facilities from erosion, environmental gradation and coastal storm damage." Other objectives include: reducing the threat of future bluff instability, preventing the aggravation of erosion in adjacent areas, maintaining proper stone interlocking for bluff protection, and providing a cost effective approach.

There have been several prior attempts at stabilizing the bluff area at Montauk Point beginning in 1946 (Table 1). Various agencies such as the Department of Transportation and the U.S. Coast Guard (USCG) have used numerous methods to control erosion; however, impacts over time from major storm events have ultimately caused the failure of each attempt. In 1993, a Reconnaissance Study by the Corps, determined that there was sufficient economic justification and Federal interest to conduct a feasibility study (U.S. Army Corps of Engineers 2002).

## II. PROJECT AREA AND DESCRIPTION

The proposed project is located at the eastern tip of Montauk Point as described in the April 2002 Corps Feasibility Study (Figure 2).

The preferred alternative: Alternative #2 - Stone Revetment is based on the earlier developed riprap stone revetment of 1992. As described in the Corps feasibility study, "A heavily embedded toe shall be employed to stand against breaking waves at the toe of the structure. The revetment section features a 40-ft wide crest at +25 ft National Geodetic Vertical Datum, a 1 vertical:2 horizontal side slope, 12.6 ton quarry stone armor units extending from the crest down to the embedded toe. Three layers of 4-5 ton armor units are used to construct the splash apron. Filter cloth and sub-layers are specified in accordance with standard Corps of Engineers design procedures."

## III. METHODS AND MATERIALS

This FWCA Report incorporates information compiled from searches of the Service's Long Island Field Office library and the National Conservation Training Center's Conservation Library online databases; from interviews and correspondence with local government, conservation agencies, academia; and from information compiled from the Corps, the New York State Department of Environmental Conservation (NYSDEC), and National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS). NMFS' comments regarding the Draft FWCA Report were received in March 2003. A site visit was performed on January 22, 2003, by a Service biologist.

Identification of the local flora and fauna was aided by consulting the following sources: U.S. Fish and Wildlife Service (1997), Springer-Rushia and Stewart (1996), Edinger *et al.* (2002), and the New York Natural Heritage Program (2003). Additional information on Montauk Point flora and fauna was acquired from the National Audubon Society of New York State (Audubon) (2002).

## IV. FEDERALLY AND STATE-LISTED THREATENED AND ENDANGERED SPECIES

No Federally-listed or proposed threatened or endangered species under jurisdiction of the Service are known to exist within the project impact area. In addition, no habitat in the project impact area is currently designated or proposed critical habitat in accordance with the provisions of the Endangered Species Act (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*). Should project plans change, or if additional information on listed or proposed species or critical habitat becomes available, this determination may be reconsidered.

New York State Natural Heritage Program data (Appendix A) indicates the potential for the presence of several State-listed species near the study area – salt-marsh spikerush (*Elocharis halophila*), Small's knotweed (*Polygonum buxiforme*), and seabeach knotweed (*Polygonum glaucum*). The State-listed threatened least bittern (*Ixobychus exilis*) and northern harrier (*Circus cyaneus*); and three species of concern, osprey (*Pandion haliaetus*), red-shouldered hawk (*Buteo lineatus*), and whip-poor-will (*Caprimulgus vociferus*), are known to breed at Montauk Point (National Audubon Society of New York State 2002). Additional information will follow under the Vegetation and Avian Communities Sections. There are also six Federally-listed species which are under the jurisdiction of NMFS that may potentially occur within the nearshore zone of the project area. They are the loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), Kemp's ridley sea turtle (*Lepidochelys kempii*), finback whale (*Balaenoptera physalus*), and the humpback whale (*Megaptera novaeangliae*). The Service believes it is highly unlikely for one of these marine species to be impacted by the proposed construction project.

## V. EXISTING CONDITIONS

### A. Ecological Communities and Habitats

The current study area consists of marine rocky intertidal, beach strand, and nearshore open water habitats.

#### 1. Marine Rocky Intertidal Habitat

The marine rocky intertidal habitat at Montauk Point developed from a glacial moraine of Pleistocene sediments left by the last glacier (U.S. Fish and Wildlife Service 1981a). Much of the marine rocky intertidal habitat at Montauk Point is classified as boulder beach (Figure 3). Boulder beaches are partially exposed beaches primarily composed of round boulders between 25.4 centimeters ([cm] or 10 inches [in]) and 3.05 m (10 ft) in diameter. Underneath each boulder lies a thick layer of coarse and fine sediments that typically support infaunal communities. Larsen and Doggett (1981) describe boulder beaches as one of the most diverse intertidal habitats. Boulder fields function as a stable environment for the attachment of algae and organisms (Ward 1999), and there are several functions and values of intertidal boulder habitats summarized in Table 2.

Marine rocky intertidal habitat is generally classified into three different zones, low intertidal, mid-intertidal, and high intertidal zone. The organisms generally associated with this community are distributed within the zones characterized by a few dominant species of animals and plants. There are physical and biological factors affecting the abundance of species (Chavanich and Wilson 2000). The ability to survive physical factors such as air exposure and water pressures, and biological factors such as competition for space, play a role in the species' ability to survive in the zone. Raffaelli and Hawkins (1996) describe the physical factors affecting the abundance and ability of species to survive as salinity, wave force (frequency and power), and time spent in water. Probably the most important physical factor affecting populations in East Coast rocky shore communities is the continuous change of seasons (Lerman 1986). Seasonal variations such as icy winters and hot summers can place organisms under severe hardships, often shortening their lives (Lerman 1986). The biological factors include competition, grazing, and predation. Generally, physical factors dominate survival in the upper tidal zone and biological factors are more important in the lower zone (Chiba and Noda 2000).

The low intertidal zone is an area only exposed during the lowest tides and is underwater most of the time. Seaweeds and several species of benthic organisms are found here and compared to the upper parts of the rocky shore, there is tremendous diversity with many more species inhabiting this zone (Lerman 1986). Southern kelp (*Laminaria saccharina*) and purple urchin (*Urbica pustulate*) are two species typically found in a northeastern rocky shore, low intertidal zone. Hydroids, bryozoans, sea slugs, worms, crabs, and tunicates are among the invertebrates that live on the seaweeds in this zone (Lerman 1986).

The mid-intertidal zone is briefly exposed to air once or twice a day at low tide. Sessile invertebrates such as barnacles (*Balanus*), mussels (*Mytilus*), and chitons (*Tonically*), can be found throughout this zone, as well as mobile species such as green crab (*Cacicus menus*) and common sister starfish (*Asterias forbesi*), which feed upon sessile invertebrates. Rockweed (*Fucus*) is the dominant submerged aquatic vegetation; it provides cover and substrate for many plants and animals (Lerman 1986).

Thirdly, the high or upper intertidal zone is exposed to air for long periods twice a day (DeVogelaere 1996). Because this zone extends above the highest point wetted by the tide, some of the permanently attached organisms are only moistened by salt spray and splash from breaking waves (Lerman 1986). The animals and plants living here are able to withstand long periods exposed to the air. Snails of the genus *Littorina*, commonly called periwinkles, are the dominant animals. They are mobile and will graze on the algal film that covers the substrate. During exposure to air, they retreat into their shells and seal the opening with mucous secretions. This allows them to retain moisture and avoid dessication. Limpets (*Notoacmaea* spp.) are also found among the periwinkles, grazing on microscopic blue-green algae (*Calothrix*) and lichen (*Verrucaria)* (Lerman 1986).

A professor of Biology and Marine Science at Southampton College of Long Island University described the geologic and biological importance of this habitat as "The Montauk Lighthouse sits on a bluff that overlooks the only natural rocky intertidal area in Long Island. Directly in front of the lighthouse and north of it is the richest part of that zone, a small stretch of approximately 200 ft of rocky intertidal. It is a unique area because of the particular geographical location of Long Island with respect to the impact of the glacier, latitude and the impact of the Gulf Stream. This rocky intertidal is exposed to colder waters, more active currents and higher wave action than other habitats on Long Island. The unique topography of boulder-sized rocks which create tide pools, supports a marine flora and fauna characteristic of a more northern habitat such as seen on the north side of Cape Cod, Massachusetts, on up to Maine. To the south there is little natural rocky intertidal anywhere all the way to Florida. The biota at Montauk, however, is unique because it includes both northern species, such as the rock weed *Ascophyllum nodosum* with lesser abundance, and southern species such as *Sargassum filidipendula*, not seen above Southern Connecticut. All the organisms in this dynamic habitat are maintained by active recruitment of stages that are capable of attaching to the rocks under high wave conditions. It is well known that the spawn of many intertidal organisms is released at low tide with a lunar periodicity in order to effectively establish populations during periods when wave action doesn't wash the new individuals out to sea away from their preferred substrate" (Liddle, pers. comm. 2003).

### Beach Strand

Beach strand is the transitional sandy shoreline area between the land and the ocean (U.S. Fish and Wildlife Service 1997). This ecosystem is also characterized by four zones: the nearshore bottom which includes submerged areas below mean low water (mlw) to 9 m; the foreshore which are intertidal areas between mean low water to the high tide zone; the backshore which are exposed sandflats above high tide lines to dunes, but occasionally submerged during storms or exceptionally high tides; and the dunes, areas of wind-blown sand ridges or mounds above the highest tide line and exposed to wind action.

Examples of nearshore bottom species include the spider crab (*Libinia emarginata*), sand dollar (*Echinarachnius parma*), and winter flounder (*Pseudopleuronectes americanus*). The foreshore includes species like the Atlantic surf clam (*Spisula solidissima*), coquina shell (*Donax variabilis*), and sinistral spiral tube worm (*Spirorbis borealis*). Backshore representative species at Montauk Point include herring gull (*Larus argentatus*), sea rocket (*Cakile edentula*), and dusty miller (*Artemisia stelleriana*). Lastly, some species found in the dunes include American beachgrass (*Ammophila breviligulata*), salt spray rose (*Rosa rugosa*), and beach pea (*Lathyrus maritimus*).

The beach strand community is composed of two principal faunal trophic levels. In a beach strand community undisturbed by humans, top predators include migratory and resident shorebirds and scavengers (e.g., crabs). On disturbed sites, visitors such as raccoons, skunks, foxes, and domestic cats and dogs are important predators. Forage consists of beach-dwelling

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invertebrates or organisms associated with beach wrack, the material that washes ashore in each tide cycle and creates habitat for various invertebrates such as earwigs, beetles, and amphipods (Lerman 1986). Beach wrack is generally composed of organic materials like seaweed and dead clams which are often consumed by scavengers. At high tides, the beach wrack is wetted supporting decomposition which releases essential nitrate and phosphate to the primary producers such as phytoplankton and macroscopic seaweeds that inhabit coastal waters (Lerman 1986).

### 3. Nearshore Zone

The nearshore zone of the New York Bight is the area of marine waters between Cape May, New Jersey, and Montauk Point, New York, from the mlw line offshore to the 20-m (66-ft) depth contour, excluding the Harbor core area. This zone varies in width from 3 to 13 km (2 to 8 mi) and is strongly influenced by continental meteorological events. The February water temperatures can be less than 3°Centigrade ([C] or 37°Fahrenheit [F]), while the August temperatures often exceed 25°C (77°F). Average salinities in this zone are 32 parts per thousand but again, vary with meteorological events on the continent, especially during periods of high fresh water runoff. The periodic tidal currents that accompany the semidiurnal (twice daily) rising and falling tides influence the horizontal water movements and transport. Figure 4 illustrates the nearshone open water, boulder beach, and beach strand habitat within the project area.

## B. Wildlife

### 1. Mammalian Communities

### a. Terrestrial Mammals

Montauk Point is a mixture of municipal, county, Federal, and State-owned lands and is heavily used by the public in the summer and fall. As such, the species found in the terrestrial portion of the project and surrounding areas are mainly species adapted to human disturbance. The following list summarizes the common terrestrial mammals that can occur in or near the study area of the rocky intertidal habitat, beach strand, and upland areas (U.S. Army Corps of Engineers Planning Aid Report 1993; Penny, pers. comm. 2003):

muskrat (*Ondatra zibethica*)
mink (*Mustela vision*)
little brown bat (*Myotis lucifugus*)
meadow jumping mouse (*Zapus hudsonius*)
house mouse (*Mus musculus*)
raccoon (*Procyon lotor*)
white-footed mouse (*Peromyscus leucopus*)
eastern cottontail (*Sylvilagus floridanus*)
least shrew (*Cryptotis parva*)
big brown bat (*Eptesicus fuscus*)
Norway rat (*Rattus norvegicus*)
opossum (*Didelphis virginiana*)
white-tailed deer (*Odocoileus virginianus*)

## b. Marine Mammals

The nearshore waters off Montauk Point provide important habitat for several species of marine mammals. There are five species of pinnipeds found in Long Island waters, all of which are in the Family Phocidae. They are the harp, harbor, gray, hooded, and ringed seals (Riverhead Foundation for Marine Research & Preservation 2003). Significant Habitats and Habitat Complexes of the New York Bight Watershed describe gray and harbor seals (*Halichoerus grypus* and *Phoca vitulina*) using the rocks around Montauk Point and other shoreline areas as haul out sites during the winter (U.S. Fish and Wildlife Service 1997). The Riverhead Foundation for Marine Research & Preservation conducts annual surveys for seals hauled out, and reported that a gray and harbor seal haul out site is approximately 1 mi east of the east end of the proposed study area (Appendix A). They have also documented sightings of hooded seals (*Cystophora cristata*) during these surveys. NMFS states that the likelihood of any seal take as defined under the Endangered Species Act (ESA) or impact from noise or physical harassment resulting from the proposed construction is minimal. NMFS also suggested that the Corps obtain an ESA incidental take permit to be on the safe side (Appendix A). Dolphins, porpoises, and several whale species can be found inshore or near the study area throughout the year (Table 3).

## 2. Avian Communities

ntauk Point is listed as an Important Birding Area (IBA) by the National Audubon Society. An IBA is defined as a site providing essential habitat to one or more species of breeding or non-breeding birds (National Audubon Society of New York State 2002). The Service and Audubon describe Montauk Point and its nearshore open waters as being very important waterfowl wintering and concentration areas. A January 18, 1997, wintering waterfowl count yielded the following: 17,514 common eiders (*Somateria mollissima*), 120 long-tailed ducks (*Clangula hyemalis*), 1,000 black scoters (*Melanitta nigra*), 1,900 surf scoters (*Melanitta perspicillata*), 2,402 white-winged scoters (*Melanitta fusca*), and 320 red-breasted mergansers (*Mergus serrator*) (National Audubon Society of New York State 2002). Harlequin duck (*Histrionicus histrionicus*) and king eider (*Somateria spectabilis*) occur here regularly in winter, and this is the southernmost regular wintering population of the harlequin ducks and common eiders on the East Coast (U.S. Fish and Wildlife Service 1997; National Audubon Society of New York State 2002). Harlequin ducks are also seen regularly foraging off the rocky substrate at Montauk Point (Penny, pers. comm. 2003). The study area at Montauk Point is also located within the path of the Atlantic Flyway, a major route used by migratory birds in April, May, September, and October (Andrle and Carroll 1988).

Audubon has documented five State-listed species of birds at Montauk Point. The threatened least bittern (*Ixobychus exilis*) and northern harrier (*Circus cyaneus*), and three species of concern, osprey (*Pandion haliaetus*), red-shouldered hawk (*Buteo lineatus*), and whip-poor-will (*Caprimulgus vociferus*), are known to breed at Montauk Point (National Audubon Society of New York State 2002). The following life history information is from Sibley (2001), Alsop III (002), and Bull (1998):

## Least Bittern

The least bittern is in the Ardeidae family which includes herons, egrets, and bitterns. The nests are usually a platform of sticks or reeds, built in trees, bushes, or reeds and located near the water. They breed between May and September having 1 or 2 broods per season. The Atlas of Breeding Birds in New York State (Atlas) (Andrle and Carroll 1988) reports the nesting abundance as only uncommon to rare, but Bull (1998) believes that the least bittern was under reported during the Atlas period because of the bird's secretive nature and the difficulty of surveying the interiors of some considerable marshlands.

## Northern Harriers

Northern harriers (formerly known as marsh hawks) are in the family Accipitridae with kites, eagles, and hawks. Harriers have yellow eyes, bill, and feet and a distinctive white rump spot on the back. They are almost 2 ft in length and have an owl-like facial disk which gives the head a hooded appearance (Eastman 2000). Their nest is built of sticks and lined with other vegetation and found usually in a tree, bush, cliff, or the ground. Northern harriers arrive on the breeding grounds between late March and early April, and nest from April through July. They leave for wintering grounds between August and November. Harriers produce only one brood per breeding season; however, re-nesting may occur if the nest is destroyed or deserted during egg laying (Bildstein and Gollop 1988; MacWhirter and Bildstein 1996). MacWhirter and Bildstein (1996) found in their study that of nine nests that failed during egg laying, 44 percent of pairs re-nested elsewhere in their territory. In another study, one pair out of eight re-nested after nest destruction (Bildstein and Gollop 1988). Harrier territory varies with habitat quality and nest density. Typical territories seem to average about 1 square mi (Eastman 2000).

There is variable data with regard to the effects of human disturbance on northern harriers. One study looked at the behavior of several raptors on a military facility during training and non-training days. Training consisted of firing artillery, small arms, and machine guns on tanks. Northern harriers did not alter their behavior during the entire breeding season (Schueck *et al.* 2001).

## Osprey

Ospreys are identifiable by the presence of a black band through the eye separating the white crown and white throat along with a strongly hooked bill and long narrow wings. They generally arrive on their breeding grounds in late March or early April. Osprey nests can be up to 200 ft above the ground, weigh up to 400 pounds and may be built with such materials as sticks, sod, cow dung, seaweed, and rubbish. An osprey nest can weigh up to 400 pounds. Pair bonding persists from one year to the next, and the same nest site may be used for many years. Most ospreys lay two to four eggs from late April to early May and incubate them for 5 to 6 weeks. An average of 1.1 to 1.3 young per active nest are fledged per year (Burns 1974). Young fledge when they are about 2 months old. They return to the nest for feeding and roosting for another week and can be found nearby for some time after that. Human disturbance during the critical periods of incubation and early nesting stages can be fatal to embryos and nestlings if adults are kept from their nests. Until an osprey pair becomes habituated to human activities, which varies among individual birds, human disturbance will jeopardize their nesting success (Van Daele and Van Daele 1982).

Rogers, Jr., and Schwikert (2002) studied buffer-zone distances to protect foraging and loafing waterbirds from human disturbance with various types of boats. They concluded that a distance of 150 m would minimize disturbance to ospreys. In Richardson and Miller (1997) "Recommendations for the protection of raptors from human disturbance," the suggested excursion zones for ospreys include 1,000 m during recreational disturbance and 1,500 m during human activity. Since Montauk Point is a highly used recreational area, it is assumed that the returning ospreys nesting there are tolerant of some human disturbance.

### Red-shouldered Hawk

Red-shouldered hawks have a dark back, dark wings with translucent patch near the primary wings, and rufous "shoulders." The tail is black with narrow white bars. Courtship begins in February through March during which pairs are noisy, calling much (call may be imitated by blue jays), and soaring high in circles. Most calling and soaring is limited to courtship time (Brown and Amadon 1968). Pairs perhaps mate for life and may return (as well as their offspring) to the same woods to breed. New nest building or repairing old ones begins in March, taking as long as 4-5 weeks (Brown and Amadon 1968). Nests are large, sturdily constructed of sticks, bark, leaves, and mosses, lined with softer material, and built in large trees close against the trunk, usually 20-60 ft high (Terres 1980). A clutch averages three eggs. Incubation lasts for 33 days and the young fledge in 39-45 days. A high proportion of nest failures may be due to human disturbance, but the species is often tolerant of human presence (Crocoll 1994). Armstrong and Euler (1982) found more red-shouldered hawks nesting in localities without shore-front habitation and paved roads were not an apparent limitation.

### Whip-poor-will

The whip-poor-will is approximately 9-10 in long, mostly brown with a very large mouth and eyes. It breeds from May through July laying two eggs on alternate days with only one brood per season. There is no nest constructed; the eggs are laid on dead leaves usually in areas of partial shade where there is no undergrowth. They often nest among trees at the edge of a clearing or path, and like the least bittern, these birds are very difficult to locate. It prefers to nest where light and shade filter through to the forest floor and conceals the nest. The whip-poor-will can be heard giving its call in the spring and summer. In the East, this bird prefers open hardwood or mixed woodlands of pine, oak, and beech, particularly younger stands in fairly dry habitats; it also favors stands with scattered clearings (DeGraaf *et al.* 1980). NYSDEC states that, "trail maintenance and removal of vegetation during breeding season (May - July) could disturb these nesting birds, high levels of use and disturbance could affect breeding success, and public access to some areas may need to be closed during critical breeding periods."

Seabirds

Sea duck concentrations around Montauk Point are the largest nearshore winter concentrations in New York and notable concentrations of pelagic seabirds occur in the spring, summer, and fall. Harlequins, common loon (*Gavia immer*), red-throated loon (*Gavia stellata*), herring gull, great black-backed gull (*Larus marinus*), king eider, surf scoter, white-winged scoter, oldsquaw (*Clangula hyemalis*), common goldeneye (*Bucephala clangula*), razorbill (*Alca torda*), sanderling (*Calidris alba*), and bank swallow (*Riparia riparia*), which nest in the bluff areas, can be found in the study area.

Seabird diets vary. Common and red-throated loons are both pelagic and nearshore inhabitants and mainly forage on small fish such as herring. The eider and scoter species are often pelagic but more typically feed in the coastal nearshore zone for benthic invertebrates and mollusks (Howe *et al.* 1978). Montauk Point is not the only area for these species to rely on nearshore feeding, since they are typically seen throughout the New York Bight. Harlequin ducks are commonly found in the intertidal area at high tide foraging the rocky substrate during the winters they are present. They forage in shallow water and rest, preen, and loaf in deeper water (U.S. Fish and Wildlife Service 1998). Some seasons, harlequins are not found at Montauk Point (DiCostanzo, pers. comm. 2003). This suggests that there are alternative feeding areas for this concentration of birds.

Montauk Point is an exemplary site for the Audubon Christmas Bird Count (CBC): Montauk Point tallies an average of 125 to 135 species annually (U.S. Fish and Wildlife Service 1997). The 103rd CBC yielded a preliminary count of 133 species for Montauk Point on December 14, 2002 (Audubon Society of New York 2003).

A list of bird species from the Audubon Society of New York, combining the CBC's from 1990 through 2001, and a winter waterfowl survey from 1991, can be found in Appendix B.

## C. Reptiles

The Significant Habitats and Habitat Complexes of the New York Bight Watershed characterizes the nearshore waters off Montauk Point as one of the most important nearshore areas for sea turtles and marine mammals in the New York Bight Region. Four Federally-listed sea turtles are found in the nearshore waters off Montauk Point: loggerhead, green, leatherback, and Kemp's ridley sea turtles. The general populations of these turtles can be found in the nearshore waters of Montauk Point and Long Island from June through September (Durham, pers. comm. 2003).

These nearshore waters have been found to be critical developmental habitat for juvenile Kemp's ridley sea turtles which feed heavily on slow moving crabs such as spider crabs (*Libani* *emarginate*) and rock crabs (*Cancer irroratus*) (Bortman and Niedowski 2002). This habitat is also a major feeding area for the loggerhead and leatherback sea turtles (U.S. Fish and Wildlife Service 1997). The loggerhead sea turtle diet consists of hard-shelled prey, such as crabs and other crustaceans, mollusks, jellyfish, and sometimes fish and eelgrass. Leatherbacks prefer softer prey such as jellyfish and tunicates (Riverhead Foundation for Marine Research and Preservation 2003).

Morreale *et al.* (1992) reported that the number of Kemp's ridley turtles recorded in Long Island waters represents the largest concentrations ever documented outside the Gulf of Mexico. Morreale and Standora (1993) discovered a direct link between juvenile sea turtles in Long Island waters and populations found off the southern coasts of the United States. Morreale and Standora's work supports that juvenile turtles are strong swimmers and control their movements rather than being moved passively by currents and eddies (Morreale and Standora 1993). Until their work, there was a common belief among scientists that small turtles were carried beyond their control to distant northern waters such as Long Island and New England by eddies and meanders of the Gulf Stream (Bortman and Niedowski 2002). Therefore, it is assumed that this area is actively sought out by this species.

## D. Benthic Communities

Benthos are animals that live on or within the bottom sediments. Benthic organisms are extremely diversified and include species from several phyla. They can be classified by size, by their location on or in the sediments, by the type of bottom where they live (sand, mud, gravel, rock, etc.), by feeding type, and by the type of community with which they are associated (New England Fishery Management Council 2000).

Some examples of benthic organisms include annelid worms, small crustaceans (amphipods, isopods, copepods, juvenile decapods), and molluscs. They provide the nutritional base for the developing stages of many finfish and shellfish, therefore, affecting all of the trophic levels in the marine system (Texas General Land Office *et al.* 2000).

The sediment type at Montauk Point is classified as "gravel, sandy gravel, and gravelly sand," and the median grain size is from 1.0 to 4.0 mm (very coarse sand to granule gravel) (Freeland and Swift 1978). This type of sediment is characteristic of high energy wave climates creating wave scour, resulting in nearshore sediments being coarse (Lerman 1986). Ambrogio (1983) studied animal-sediment relationships along the south shore of Long Island, New York, and categorized taxonomically diverse benthic invertebrates into 17 distinct functional groups based on similar habitat requirements. An example of a functional group is "Epifaunal Tubiculous (whether a species inhabits a tube) Motile Surface Deposit Feeder (ETMDs). Ambrogio (1983) found 5 functional groups totaling 31 species using the course sediment substrate, and ETMDs comprised one of the 5 groups. This group includes some amphipods such as *Unicola irrorata* and *Photis macrocoxa*. The other four groups were dominated by other amphipods and polychaete species such as the bamboo worm (*Clymenella torquata*) and the trumpet worm (*Pectinaria gouldi*).

The benthos may be sessile, motile, or burrowing. Benthic organisms that live on the substrate are known as epifauna, while those living within the substrate are infauna (Lerman 1986). Some of the sessile epifauna that may inhabit the benthos of the general project area range include Northern rock barnacle (*Balanus balanoides*), Northern horse mussel (*Modiolus modiolus*), and blue mussel (*Mytilus edulis*). Some motile epifauna found in the study area include Atlantic rock crab (*Cancer irroratus*), green crab (*Cacicus menus*), and Northern lobster (*Homarus americanus*). Several infaunal clams including soft shell clam (*Mya arenaria*) and common jingle shell (*Anomia simples*) are found in the study area. Large commercially harvestable quantities of Atlantic surf clam (*Spisula solidissima*), a burrowing benthic invertebrate, inhabit the nearshore benthos (U.S. Fish and Wildlife Service 1991).

## E. Vegetation

The vegetative community profile at Montauk Point is variable. In general, the dune areas are dominated by American beachgrass (*Ammophila breviligulata*) and beach heather (*Hudsonia tomentosa*). Because of flooding at high tide, the backshore does not support macroflora. The New York State Natural Heritage Program reports extant populations of three State-listed species: salt-marsh spikerush, Small's knotweed, and seabeach knotweed at Montauk Point (Appendix A).

The upland habitat of Montauk Point which surrounds or borders the proposed Access Road 1, Alternative Access Road 2, Staging Area 1, and Staging Area 2 is referred to as moorlands (U.S. Fish and Wildlife Service 1997). Grassland, shrubland, and heathland maritime plant communities make up the moorlands in this area. Table 5 lists the upland plant species that can be found in or near the vicinity of the footprint of the proposed project.

Common reed (*Phragmites australis*) was also observed in the project area, although it is unknown whether this community is a native or an introduced haplotype. It could also be mixed. The population explosion throughout fresh and brackish wetlands in North America of *P. australis* is thought to have been brought about by changes in land patterns and hydrologic regimes, increased disturbance, urbanization, and eutrophication (Marks *et al.* 1994). The proposed project has the potential for causing an increase in the population of *P. australis*.

## F. Wetlands

The National Wetlands Inventory mapped the Montauk Point area using a base map from 1956 and updated digital data from the photo interpretation of 1994 aerial photography. The area is classified (see Figure 5) using definitions derived from Cowardin *et al.* (1979).

## G. Finfish

There are a high number of finfish species within the study area, many of which are important in the recreational and commercial fishing industries. Some examples of commercially and recreational important species in the nearshore zone are Atlantic menhaden (*Menidia menidia*), weakfish (*Cynoscion regalis*), striped bass (*Morone saxatilis*), winter flounder (*Pleuronectes americanus*), summer flounder (*Paralichthys dentatus*), bluefish (*Pomatomus saltatrix*), tautog (*Tautoga onitis*), Atlantic mackerel (*Scomber scombrus*), black sea bass (*Centropristis striata*), Atlantic croaker (*Micropogonias undulatus*), northern kingfish (*Menticirrhus saxatilis*), and American sand lance (*Ammodytes americanus*) (U.S. Fish and Wildlife Service 1997). American sand lance are abundant and are an important prey species for many predatory fishes important to commercial and recreational fisheries and are also important prey for marine mammals (Auster and Stewart 1986).

## VI. RECREATIONAL, HISTORICAL, AND SCENIC IMPORTANCE OF STUDY AREA

The wildlife habitats at Montauk Point and its surrounding areas are valuable for terrestrial and marine fauna, wildlife, and scenic-centered tourism, and support recreational and commercial heries. Property ownership is a mosaic of proprietorship including the National Park Service PS), Town of East Hampton, New York State, and the Montauk Historical Society. All are property owners of various parcels within the park area and have a significant interest in this project. NPS (Appendix A) and the Town of East Hampton have specifically requested to be involved in project planning.

The Montauk Point Lighthouse was commissioned by George Washington in 1792. It is included in the National Register of Historic Places and is still used for navigational purposes and, therefore, would have to be replaced if it were lost (U.S. Army Corps of Engineers 2002).

The scenic habitat value at Montauk Point is important to the Town of East Hampton and to the State of New York. NYSDEC stated in their draft Open Space Plan in 2001 that, "Open land, scenic and historic sites and the availability of recreation are important to the state's quality of life and thus are a primary factor in attracting and retaining economic investment." Montauk Point attracts thousands of tourists each year for the scenic quality of the habitat, coastal views, geologic processes, and historical structures associated with the lighthouse and adjacent Camp Hero Air Force Base, a formerly active defense site no longer under ownership by the Department of Defense.

The New York and New Jersey Legislature finds and declares that, "The Atlantic coastline of New Jersey and New York is a major natural and scenic resource providing innumerable recreational, commercial, and aesthetic benefits central to the welfare of the citizens of, and visitors.... The Legislature therefore determines that there is a need for a bi-state cooperative ort to help ensure that the natural and scenic resources and the environmental integrity of the

Hudson - Raritan Estuary and the New York - New Jersey Bight area from Cape May Point, New Jersey, to Montauk Point, New York, are preserved, protected, maintained, and restored, and that the coastal tourism industry of the two states is enhanced to the maximum extent practicable and feasible...." (Clean Ocean and Shore Trust 2003).

The New Jersey - New York Clean Ocean and Shore Trust Committee (COAST) established an Act in 1993 known as the "New Jersey - New York Clean Ocean and Shore Trust Committee Act." COAST is a bipartisan, bi-state Legislative Committee for the maximization of the ecological, economic, and scenic resources of the Hudson-Raritan Estuary and New York Bight, from Montauk Point, Long Island, New York, to Cape May, New Jersey.

## VII. DISCUSSION OF IMPACTS TO BIOLOGICAL RESOURCES AND RECOMMENDATIONS

The proposed project has the potential to result in limited impacts to State-listed plants, State-listed breeding birds, beach strand habitat, wintering seabirds, and benthic communities. These limited impacts are anticipated to be minor and short-term due to the existing developed and disturbed condition of habitat in the project construction area.

The Service previously expressed concerns regarding the potential impacts to seals. Potential impacts to seals and other marine mammals were addressed by NMFS. They have informed the Corps that it is highly unlikely that the proposed construction project will impact marine mammals (Appendix A).

### A. Effects of Vehicle Use on Beaches

Although the road along the north beach is currently used by off road vehicles, the Service believes that additional vehicle use, especially by heavy equipment, could exacerbate erosion in the Montauk Point area. The passage of vehicles on beaches can displace large quantities of sand seaward and may contribute to the rate of erosion. As little as one vehicle pass per week, over a two-year period, caused significant loss of vegetation and altered the profile of foredunes (Anders and Leatherman 1987a and 1987b). Driving at the foot of the dunes tends to churn up sand, making the dunes less stable. This activity interferes with the growth of dune grass (American beachgrass). Dune grass is responsible for promoting the dune building process (National Park Service 2003). The backshore zone or area that is submerged only during storms or exceptionally high tides is very sensitive to disturbance and also supports plants that contribute to beach stabilization. This zone can support such flora as seabeach knotweed, a New York State-listed species.

Driving near the water causes damage by crushing the wrack line. The wrack line and area seaward of the wrack line are areas that afford essential feeding opportunities for many species of birds and invertebrates (National Park Service 2003). The passage of vehicles on the beach has been found to reduce the species diversity, percent vegetative cover, and height of dune plants, resulting in the exposure of bare sand and creation of blowouts. Vehicular traffic also breaks up the salt-crust that normally reduces the wind-blown transport of sand, disrupts the drift line, and lowers the height of the dune (Lasiak 2002).

Heavy machinery-related short-term impacts to fish and wildlife resources are directly associated with noise and potential petroleum product releases. Since seals will avoid areas of human disturbance and noise, the wildlife that could most likely be affected would be the breeding birds. These impacts will be minimized with the Corps' coordination with NYSDEC regarding the State-listed species. Recommendation: An oil-spill contingency plan should be developed and coordinated among the USCG, Corps, NYSDEC, and the contractor prior to any construction.

The Corps' "Montauk Point, New York-Proposed Staging and Access Areas" map dated April and May 2003 depicts two access roads, two staging areas, and one alternate access road to Access Road 2. The Service recommended in a letter dated June 3, 2003 (Appendix A), that in order to minimize erosion of beach and dune habitat and reduce impacts to species associated with this habitat, the Corps avoid using Access Road 2. Access Road 1 and Alternate Access Road 2 should provide adequate access while resulting in fewer impacts to natural resources associated with the beach and dune habitat. The Corps has agreed with this recommendation in a letter dated June 16, 2003 (Appendix A).

### Wintering Seabirds

Every winter, thousands of seabirds concentrate off the Point at Montauk. In particular, harlequin, surf scoter, white-winged scoter, and black scoter can be seen foraging in the high tide area of the rocky intertidal zone off the Point. DiCostanzo from the Great Gull Islands Project observes these birds every winter and the majority of the birds congregate a couple of hundred yards out from the Point. This is a key area for feeding and thus, the reason for thousands of birds congregating. The tide and currents of these congregation areas makes it optimal foraging for the birds, therefore, it does not appear that the proposed project will have a major impact on feeding for these birds (DiCostanzo, pers. comm. 2003).

## C. State-listed Plants

Since the New York State Natural Heritage Program reports extant populations of three State-listed species at Montauk Point, salt-marsh spikerush, Small's knotweed, and seabeach knotweed, the Corps' use of staging areas and access roads could potentially affect these individual species or entire populations. Although these are existing roads, excess erosion from heavy use, or overuse from equipment can lead to damaging effects on these and other plant species. NYSDEC should be contacted for survey protocols including a minimum buffer distance around the project area that should also be surveyed. Recommendations: As agreed upon by the Corps, if any State-listed species are discovered, NYSDEC should be further contacted for any necessary permits and determinations as how to avoid and/or minimize acts. The Corps should also inform the appropriate landowners of the potential of

*P. australis* to spread due to the activities of the proposed project. This will allow the landowner(s) to plan for short- and long-term monitoring and/or restoration plan if needed.

## D. State-listed Breeding Birds

There are five State-listed birds that are known to breed in Montauk State Park, the threatened least bittern and northern harrier, and three species of concern, osprey, red-shouldered hawk, and whip-poor-will. Depending on their nest locations in relation to the Corps staging areas, access roads, and construction area, they may be highly vulnerable to disturbance. Disturbance may lead to nest abandonment and overall nest failure for the season. Some species will abandon the nest site all together and not return the following season. Recommendation: The above-listed recommendation in Section C for State-listed plants should also be followed for survey guidelines and follow-up protocol if any State-listed birds are present.

## E. Benthic Communities

There is a gap in available scientific data that focuses specifically on benthic recovery following a stone revetment installation and or repair. There are, however, several studies focusing on the recovery of benthic organisms following beach nourishment, dredging, and other shoreline modifications using hard structures such as bulkheads, groins, and ramps, many of which occurred in fresh water ecosystems.

When surface sediments are removed, very few organisms and little organic matter are left in tact during dredging (Culter and Mahadevan 1982). Studies along the East, Gulf, and West Coasts document a similar decrease of 84 to 90 percent in the number of organisms following a dredge event (Deis *et al.* 1992).

Following these losses, many studies show the complete recovery of a dredge site within one year of post-construction (Greene 2002). Newell *et al.* (1998) reviewed several dredging projects in various habitats and summarized the recovery rates of benthic communities (Table 4). They found that recovery times increase in stable gravel and sand habitats with complex biological interactions controlling community structure (Newell *et al.* 1998). Other studies suggest that dredging impacts are relatively short-term in areas of high sediment mobility (Hall *et al.* 1991).

Due to the amount of data supporting the rapid recovery of benthic organisms, the Service believes there will be a limited impact to the subtidal benthic community except in areas of direct stone placement where infaunal communities will be replaced by epifaunal communities.

The Service does not expect impacts to finfish. Studies indicate that their ability to move about freely have led some researchers to believe that finfish will simply leave the area because of noise and vibrations (Van Dolah *et al.* 1992). The Cornell Cooperative Extension Marine Program stated that overall, there would not be a serious adverse affect on fish populations. Although certain times of the year are more significant than others regarding impact, the project area is not critical habitat and, therefore, will not impact the life cycle of most fish populations (Hasbrouk, pers. comm. 2002).

The Service previously expressed concern regarding potential impacts to beachstrand habitat. The Corps has since adopted the Service's recommendation to not use Access Road #2 and to use Alternate Access Road #2 as the primary road for accessing Staging Area #2 on the northern side of the revetment.

Human-made structures to counter coastal erosion can increase or decrease rocky intertidal habitat (DeVogelaere 1996). The Service understands that the repair work is "in-kind" and that there does not appear to be any net loss of habitat. The Service also expects that current velocity, tidal flows, wave energy, and water clarity should return to near current state. Since the last revetment project in the early 1990's at Montauk Point, there have not been any negative impacts in terms of increased down gradient erosion (Penny, pers. comm. 2003).

Under the FWCA and the National Environmental Policy Act (NEPA) regulations, the Service has responsibilities to ensure that project-related losses to fish and wildlife resources are identified and mitigated. The views and recommendations of the Service on this project are guided by the Service's Mitigation Policy (U.S. Fish and Wildlife Service 1981b). This policy ks to mitigate losses of fish, wildlife, and their habitats, and uses thereof, from land and water elopments. The Service's definition of mitigation is consistent with the Council on Environmental Quality's (CEQ) NEPA regulations (40 CFR 1508.20) (*i.e.*, mitigation consists of avoidance, minimization, then compensation). The Service recommends mitigation relative to four habitat-based resource categories, and the project area at Montauk Point is considered Resource Category 2: High habitat value and scarce or becoming scarce in the region. The goal of mitigating a Resource Category 2 is: "No net loss of in-kind habitat value." The Service believes that the habitat developed following project construction will be approximately the same quantity and quality of the habitat that the project construction replaces – thus we anticipate no net loss of in-kind habitat values.

## VIII. MONTAUK POINT CUMULATIVE IMPACTS

As described in the Service's Mitigation Policy, the Service must consider project impacts as part of its review, including: (1) the total long-term biological impact of the project, including any secondary or indirect impacts regardless of location; and (2) any cumulative effects when viewed in the context of existing or anticipated projects. The CEQ defined cumulative impact (40 CFR 1508.7) as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions...."

The Corps is currently conducting the planning phase of the Atlantic Coast of Long Island Fire Island Inlet to Montauk Point, New York, Storm Damage Reduction Reformulation Study (FIMP). The FIMP project area overlaps the Montauk Point Storm Damage Reduction Project a. The FIMP Environmental Impact Statement is scheduled for completion in 2005. Until the

Corps has completed its analysis and has selected a preferred alternative, the Service will be unable to complete a comprehensive assessment of the cumulative impacts of the proposed action and the FIMP. Accordingly, the Corps should include the FIMP in its cumulative impact assessment of the Montauk Point Storm Damage Protection Project and likewise, the FIMP analysis should include the Montauk Point Storm Damage Protection Project.

Although it is not known what the final FIMP design will be, the Corps had indicated (Couch, pers. comm. 2003) that the FIMP will likely incorporate the Montauk Point Storm Damage Reduction Project's design as part of the final comprehensive plan. The Corps' FIMP Draft Alternative Screening document (URS Consultants and Moffatt & Nichol Engineers 1999) does not identify Montauk Point as being within one of the areas having the greatest need for storm protection within the Montauk Point to Hook Pond reach (since the subject project addresses Montauk Point itself). The areas having the greatest need for storm damage protection (Ditch Plains, Montauk Beach, East Hampton Beach, and Beach Hampton) all occur west of Montauk Point. Since the predominant long-shore/shoreline current runs east to west, and the areas needing protection are down-drift of Montauk Point, it is not likely that the FIMP will significantly affect the fish and wildlife resources present within the Montauk Point Storm Damage Reduction project area, provided that the FIMP storm damage protection activities in this reach are limited to the areas identified in the Corps' document.

In conclusion, it does not appear that the cumulative fish and wildlife resource impacts of the FIMP and the subject project will be significant. However, since the Corps does not have a final FIMP design, the Corps should include a comprehensive cumulative fish and wildlife resource impact assessment in the FIMP impact analyses once a final project design is determined.

The Corps responded to the Service's determination of "Montauk Point Cumulative Impacts" in their Draft FWCA Report response letter dated April 10, 2003 (Appendix A). The Corps stated that "The Cumulative Impacts section in the FIMP Reformulation EIS will consider all Federal Actions without the project area." The Service responded with "The Service notes the Corps' response and presumes there is a typographical error with the word 'without,' it should state '...will consider all Federal Actions within the project area." (Appendix A).

## IX. CONCLUSIONS

The Service has concluded that there may be limited impacts to the State-listed plants and State-listed breeding birds at Montauk Point, but actions can be taken to avoid these impacts. Such actions include implementation of a Service recommendation that the Corps will coordinate with NYSDEC regarding the proper survey protocols and to further coordinate with NYSDEC if any State-listed species are discovered to determine how to avoid and/or minimize impacts. The impacts to the intertidal benthic community, seabirds, and finfish appear to be minimal and short-term.

The Service has contacted representatives of the State's Bureau of Wildlife and Natural Heritage Program (Bureau). The Bureau representative had no objections to the proposed project, and the Natural Heritage Program supplied information on the presence of State-listed species in and around the project area (Appendix A). The Service has also contacted NPS who, in turn, relayed their desire to be involved with the project planning (Appendix A). In the Draft FWCA Report, the Service recommended that the Corps coordinate with NPS as the project progresses. The Service is aware of the ongoing coordination and correspondence between the Corps and NPS.

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# FIGURES

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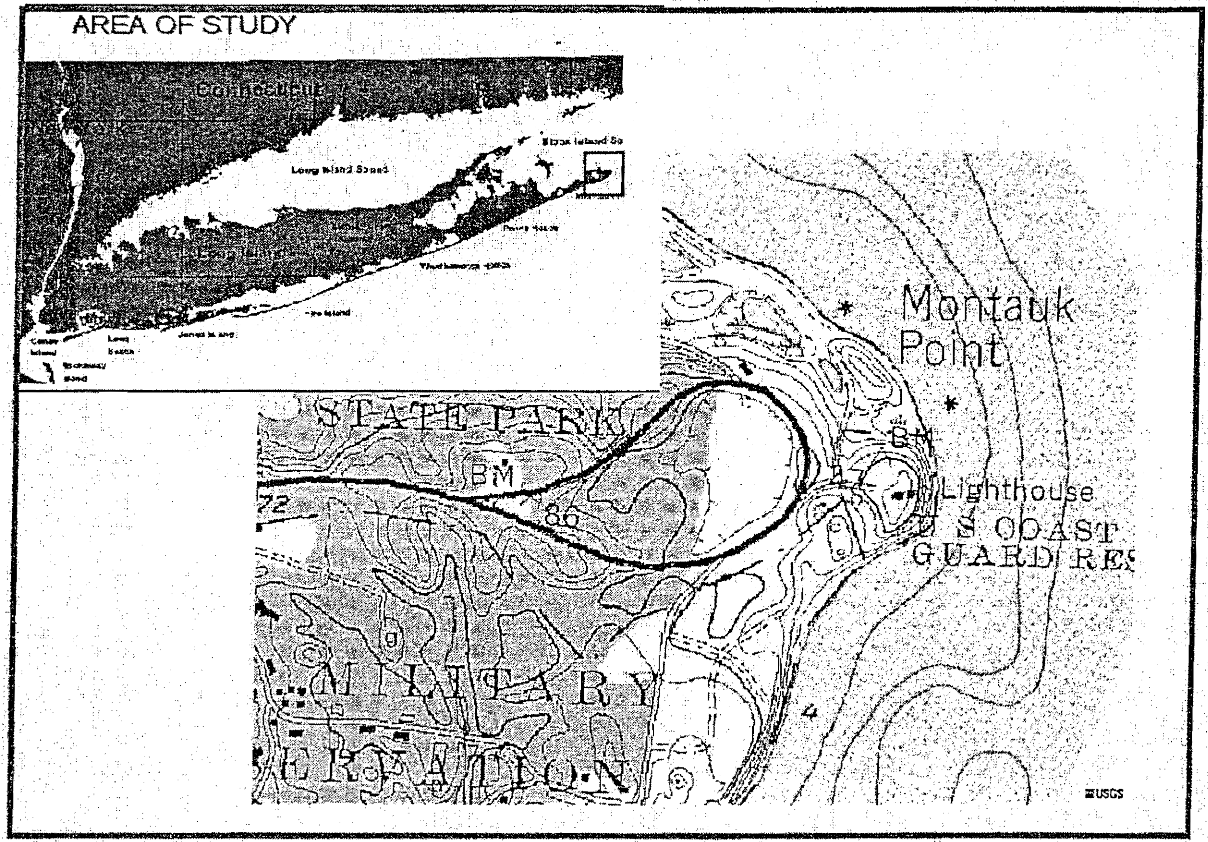


Figure 1. Location of proposed Montauk Point Storm Reduction Project.

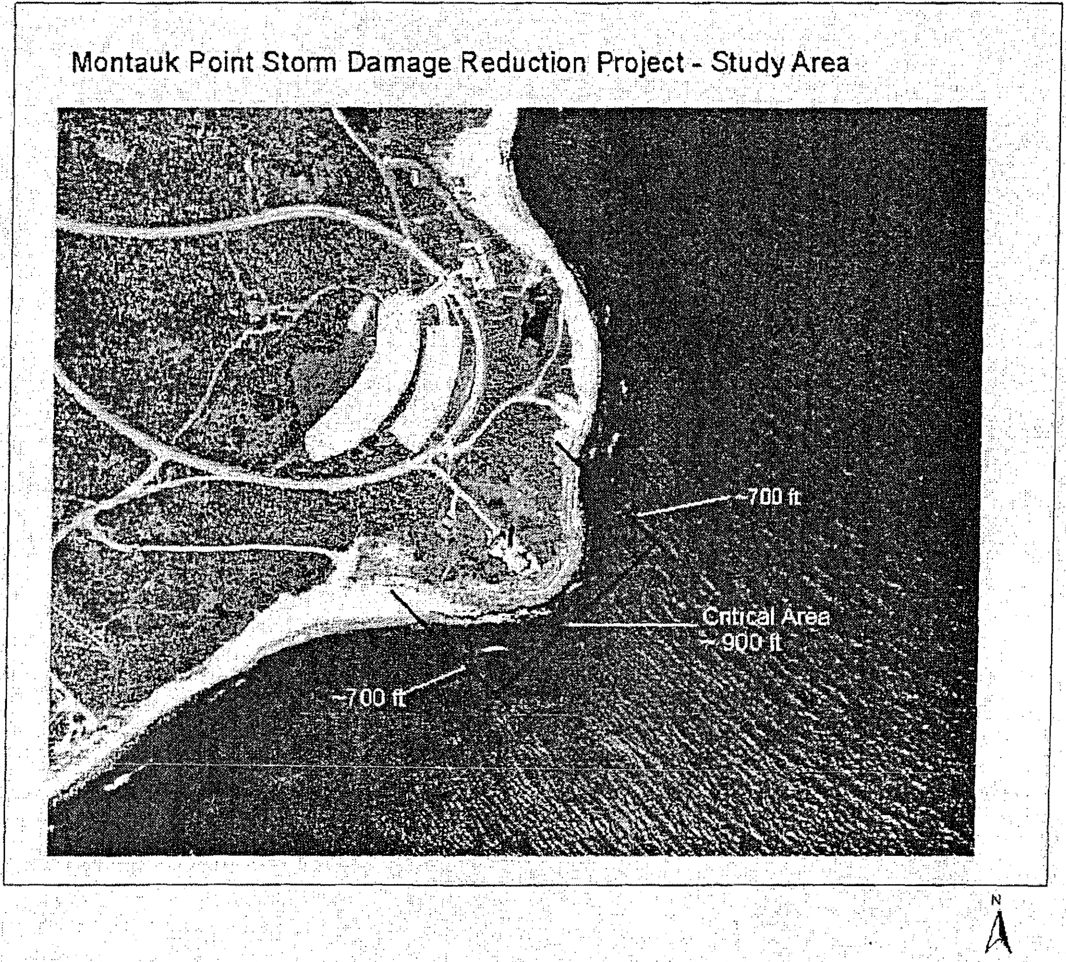


Figure 2. U.S. Army Corps of Engineers proposed study area for the Montauk Point Storm Damage Reduction Project (U.S. Fish and Wildlife Service 2003 *after* U.S. Army Corps of Engineers 2002).

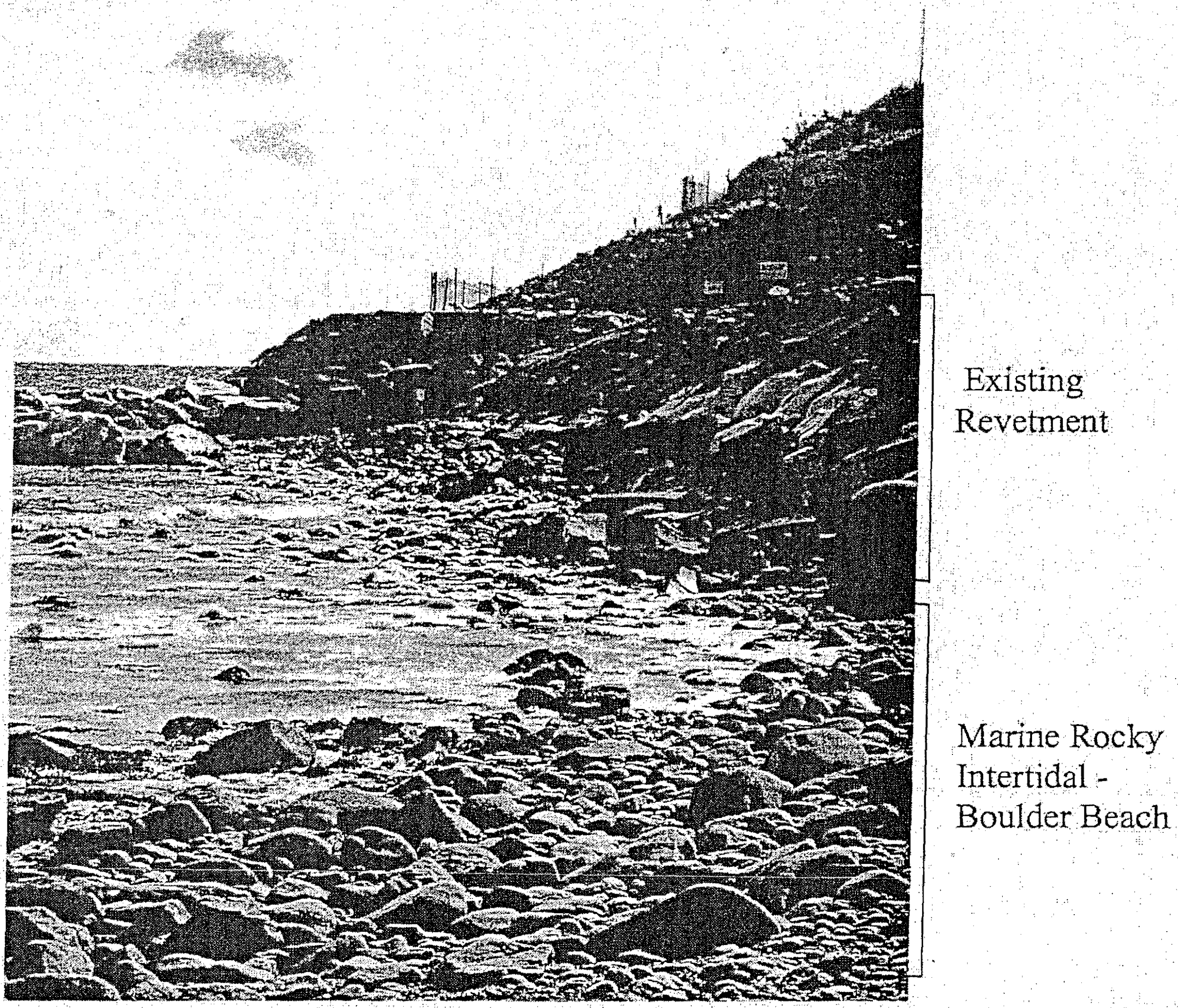
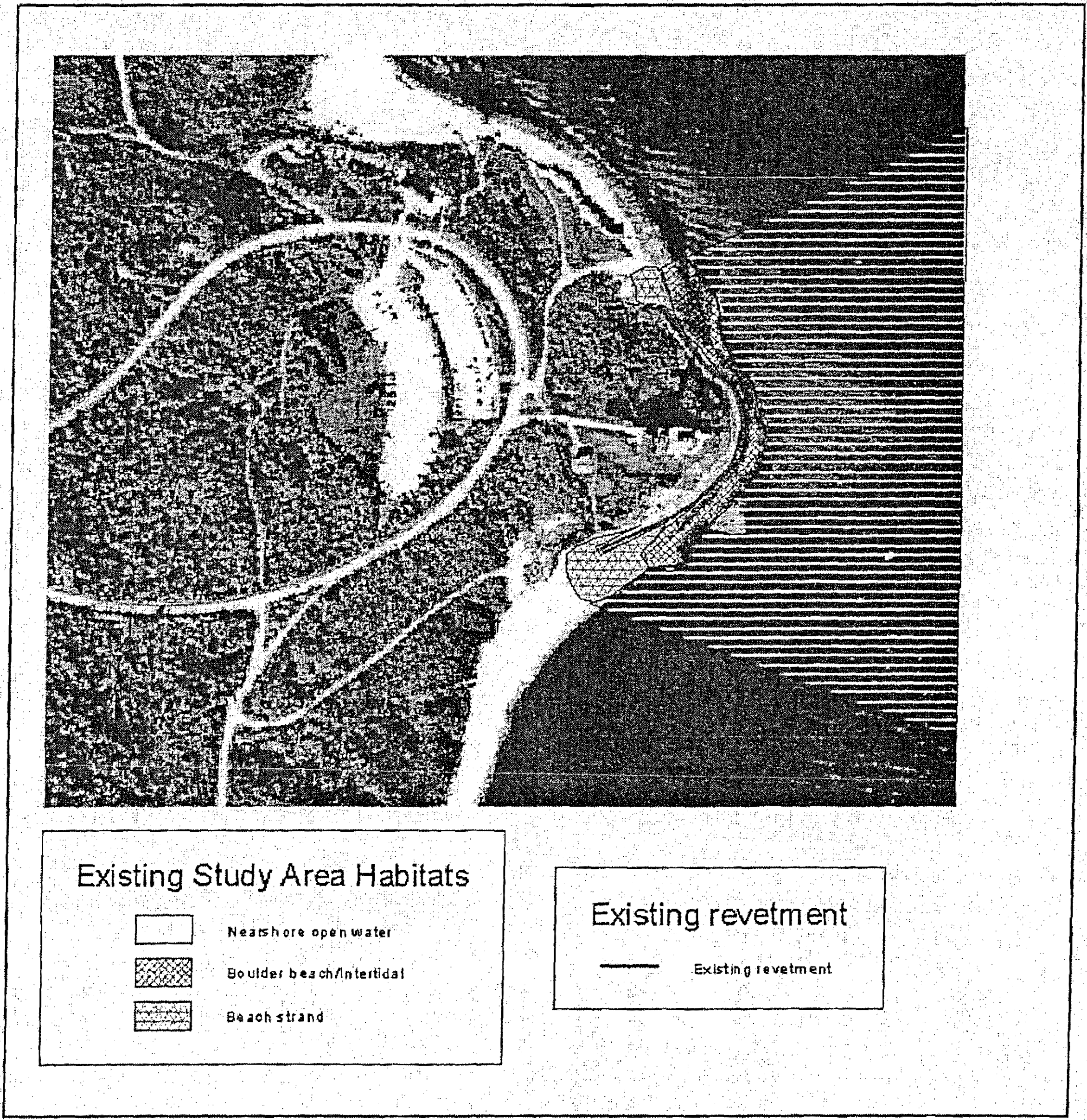
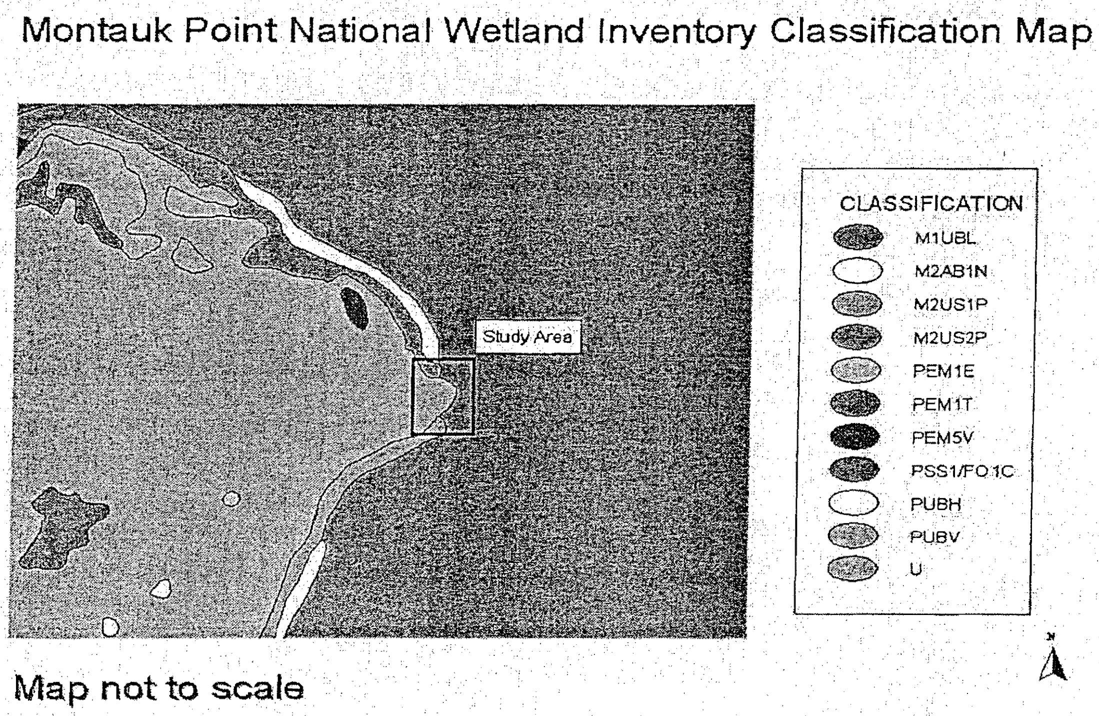


**Figure 3. Photo and diagram of Montauk Point, Scott's Hole, marine rocky intertidal, boulder beach habitat and existing revetment. (U.S. Fish and Wildlife Service 2003).**



*Map created by the Long Island Field Office, March 2003*

**Figure 4. Approximate delineation of existing habitat types within the proposed project study area, including nearshore open water, rocky intertidal, and beach strand habitats. The existing revetment location is also shown.**



**Study Area Classifications:**

M2AB1N = Marine, Intertidal, Aquatic Bed, Algal, and Regularly Flooded.
M2US2P = Marine, Intertidal, Unconsolidated Shore, Sand, and Irregularly Flooded.
U = Upland
M2US1P = Marine, Intertidal, Unconsolidated Shore, Cobble-Gravel, Irregularly Flooded.

**Figure 5. The National Wetlands Inventory map of Montauk Point and associated classications by Cowardin *et al.* (1979).**

# TABLES

Table 1. Chronological summary of erosion control attempts at Montauk Point.

| Year | Erosion Control Action |
|---|---|
| 1946 | 700 ft. stone revetment constructed at bluff toe, vegetative establishment along upper half of cliff |
| 1960's | Rubble is placed over edge of bluff just to south of lighthouse |
| 1971 | First terracing project constructed along bluff just north of lighthouse |
| 1972 | Gabions placed along 280 feet of 1946 seawall along toe of the bluff |
| 1970's & 1980's | Terracing and beach grass establishment continue |
| 1990 | A 263 linear foot revetment constructed along Turtle Cove, south of lighthouse |
| 1992 | New 300 ft. revetment is constructed and a 150-foot long structure is created along the eastern section of Turtle cove |

(U.S. Army Corps of Engineers 2002)

**Table 2. Summary of the Functions and Values of Intertidal Boulder Habitats.**

| Functions | Values |
|---|---|
| 1. Production of animals on rocks, under rocks, in sediments under boulders, on and within algal beds | Support shorebirds, seabirds, and sea ducks<br>Supports the food web<br>Supports recreational sport fishery<br>Supports commercial fisheries |
| 2. Permanent and stable attachment sites for primary producers (e.g. kelp and rockweed) | Food resources for consumers<br>Support wildlife and commercial fisheries<br>Commercially harvested for food and nutrients |
| 3. Roosting sites and wintering habitat for birds | Helps sustain healthy populations of shorebirds, seabirds, and sea ducks |
| 4. Intercepts and slows currents and waves | Reduces shoreline erosion of nearshore habitats<br>Increases sedimentation |
| 5. Nursery and spawning ground | Promotes and sustains lobster populations<br>Helps sustain mussel populations<br>Maintains balanced ecosystem |
| Nutrient and contaminant filtration | Improves water quality<br>Supports commercial fisheries |
| 7. Oxygen production | Provides oxygen for marine organisms<br>Improves water quality<br>Supports commercial fisheries |
| 8. Production, accumulation and export of detritus | Fuels microbial, estuarine and offshore food webs<br>Supports commercial fisheries |
| 9. Recycling of nutrients | Supports plant and algal growth<br>Supports commercial fisheries |
| 10. Self-sustaining ecosystem | Increases marine biodiversity<br>Forms numerous and complex microhabitats<br>Supports tourism industry |

(Source: After Ward 1999)

**Table 3. Marine Mammals commonly found off Montauk Point and time of year.**

| Species | Time of Year Commonly Found |
|---|---|
| Northern right whale *(Megaptera novaengliae)* | March - June |
| finback whale *(Balaenoptera physalus)* | January - March |
| Minke whale *(Balaenoptera acutorostrata)* | Throughout year - more abundant in summer |
| humpback whale *(Megaptera novaeangliae)* | June - September |
| bottle-nosed dolphin *(Tursiops truncatus)* | June - September |
| harbor porpoise *(Phocoena phocoena)* | December - June |
| gray seal *(Halichoerus grypus)* | November - May |
| harbor seal *(Phoca vitulina)* | November - May |

(U.S. Fish and Wildlife Service 1997)

**Table 4. Recovery time of benthic communities following dredging activities in various habitat types (Newell et al. 1998).**

| Location | Habitat Type | Recovery Time |
|---|---|---|
| Coos Bay, Oregon | Disturbed Muds | 4 weeks |
| Gulf of Cagaliari, Sardinia | Channel muds | 6 months |
| Mobile Bay, Alabama | Channel muds | 6 months |
| Goose Creek, Long Island | Lagoon muds | >11 months |
| Klaver Bank, North Sea | Sands-gravels | 1-2 years |
| Chesapeake Bay | Muds-sands | 18 months |
| Lowestoft, Norfolk | Gravels | >2 years |
| Dutch coastal waters | Sands | 3 years |
| Boca Ciega Bay, Florida | Shells-sands | 10 years |

**Table 5. List of the plant species commonly found in or near the footprint of the proposed project.**

| *Species* | *Common Name* |
|---|---|
| *Arctostaphylos uva - ursi* | Bearberry |
| *Crataegus spp.* | Hawthorn |
| *Danthonia spicata* | Poverty Grass |
| *Deschampsea flyvosa* | Common Hairgrass |
| *Gaylussacea baccata* | Black Huckleberry |
| *Hudsonia tomentosa* | Beach Heather |
| *Ilex opaca* | American Holly |
| *Mysica pensylvanica* | Bayberry |
| *Prunus pensylvanica* | Pin Cherry |
| *Prunus serotina* | Black Cherry |
| *Prunus maritima* | Beach Plum |
| *Rhus glabra and R. copallinum* | Sumac |
| *Rosa spp.* | Wild Rose |
| *Rubus spp.* | Black Berry |
| *Schizachyrium scoparium* | Little Bluestem |
| *Smilax rotundifolia* | Catbriar |
| *Vaccinium spp.* | Blueberry |
| *Viburnum dentatum* | Arrow Wood |

(U.S. Fish and Wildlife Service 1997, Edinger et al. 2002)

# APPENDIX A
# CORRESPONDENCE

New York State Department of Environmental Conservation
Division of Fish, Wildlife & Marine Resources
New York Natural Heritage Program
625 Broadway, 5th floor, Albany, New York 12233-4757
Phone: (518) 402-8935 • FAX: (518) 402-8925
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

February 14, 2003

Laura Patrick
U. S. Fish and Wildlife Service
Long Island Field Office
500 St. Marks Lane, Box 1
Islip, NY 11751

Dear Ms. Patrick:

In response to your recent request, we have reviewed the New York Natural Heritage Program database with respect to the proposed Montauk Point Storm Damage Reduction Corps Project, area as indicated on the map you provided, located in the Town of Montauk Point, Suffolk County.

> Enclosed is a report of rare or state-listed animals and plants, significant natural communities, and other significant habitats, which our databases indicate occur, or may occur, on your site or in the immediate vicinity of your site. The information contained in this report is considered sensitive and may not be released to the public without permission from the New York Natural Heritage Program.
> NOTE: This project lies within the Montauk Wildlife Management Area.

The presence of rare species may result in your project requiring additional permits, permit conditions, or review. For further guidance, and for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the appropriate NYS DEC Regional Office, Division of Environmental Permits, at the enclosed address.

For most sites, comprehensive field surveys have not been conducted; the enclosed report only includes records from our databases. We cannot provide a definitive statement on the presence or absence of all rare or state-listed species or significant natural communities. This information should not be substituted for on-site surveys that may be required for environmental impact assessment.

Our databases are continually growing as records are added and updated. If this proposed project is still under development one year from now, we recommend that you contact us again so that we may update this response with the most current information.

Sincerely,

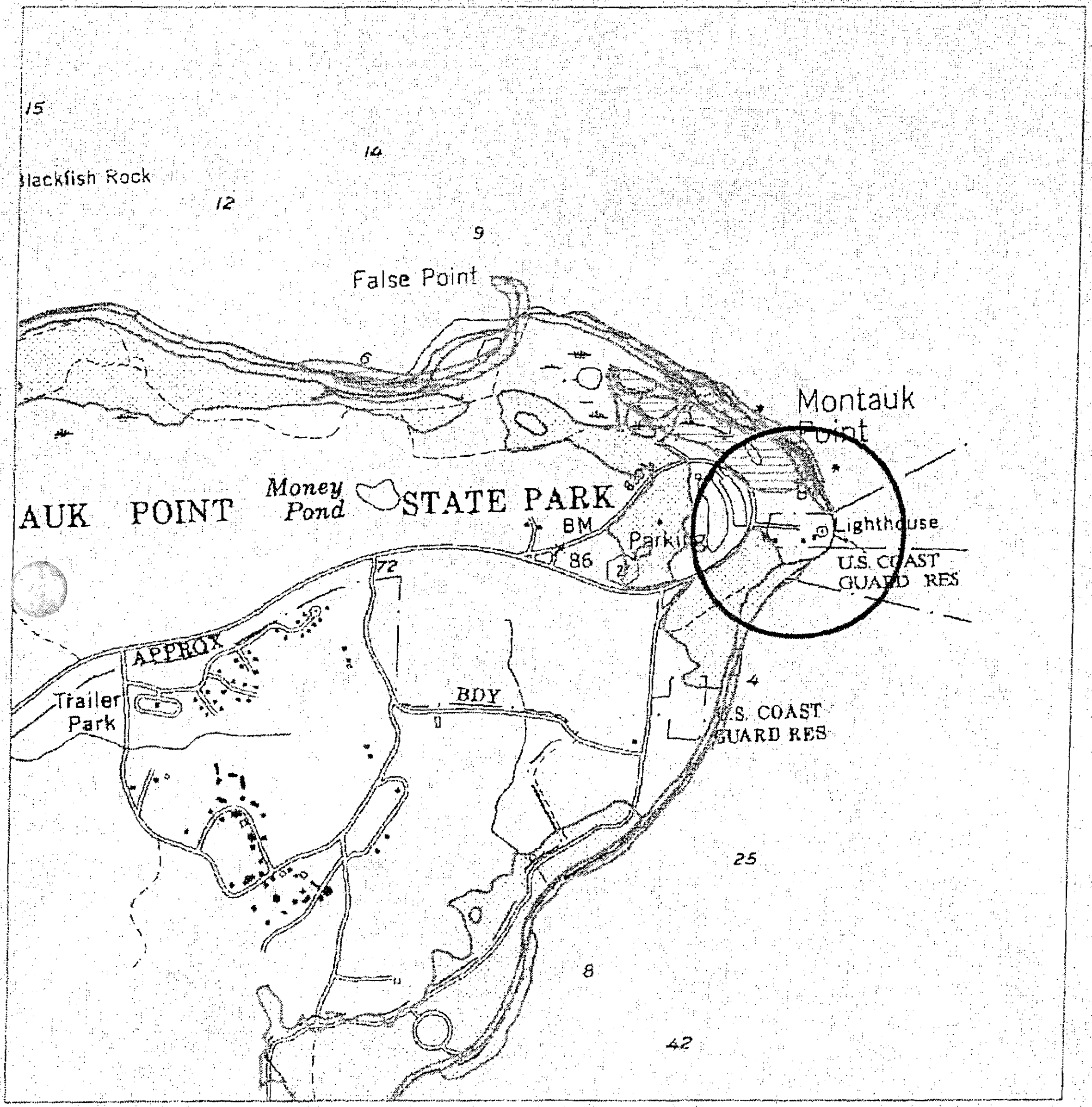
Charlene Houle jp

Charlene Houle, Information Services
NY Natural Heritage Program

Enc.
cc: Reg. 1, Wildlife Mgr.
Reg. 1, Fisheries Mgr.

# Natural Heritage Map of Rare Species and Ecological Communities

Prepared February 13, 2003 by NY Natural Heritage Program, NYS DEC, Albany, New York



▭ PROJECT SITES

New York Natural Heritage Program Database Records*

▥ Animal

☐ Community

Animal Concentration Area

☐ Plant

Scale: 1:24000

0.2 0 0.2 0.4 Miles

N

*The locations that are displayed are considered sensitve and cannot be released to the public without permission. We do not provide map locations for all records. Please see report for details.

United States Department of the Interior
NATIONAL PARK SERVICE
Boston Support Office
15 State Street
Boston, Massachusetts 02109-3572

January 30, 2003

Christopher Ricciardi, Archaeologist
U.S. Army Corps of Engineers
New York District, Planning Division
Jacob K. Javits Federal Building
26 Federal Plaza - Room 2131
New York, NY 10278-0090

Dear Mr. Ricciardi:

The Corps is currently preparing for a project entitled Montauk Point Storm Damage Reduction Project in the Town of East Hampton, Suffolk County, New York. If the Corps intends to use a parcel of land, owned by the Town of East Hampton, and referred to as Turtle Cove, for this project, even on a temporary basis, the National Park Service must be included in the project planning.

The National Park Service transferred Turtle Cove to the Town of East Hampton for park and recreational purposes. The terms of the transfer require the area to be open to the general public, utilized for park and recreational purposes in perpetuity, and managed in accordance with a program of utilization prepared by the town and approved by the National Park Service. The Town of East Hampton may have been remiss in the past by granting the Corps access to the site without first securing NPS approval. In addition, the Corps may have constructed a parking area on the property that is not in accordance with the property's use agreement.

The Corps must assure there is no impairment of the park and recreational value of the property; the general public is not unduly restricted in their use of the property, and the resource is not altered in a manner that is not in accordance with the Town's approved Program of Utilization.

The Town of East Hampton faces the possible reversion of the Turtle Cove property because they have not managed the property in accordance with our deed restrictions. It would be unfortunate if the Corps exacerbates the problems there.

Please feel free to call (617) 223-5190 or email (elyse_laforest@nps.gov) me if I can provide any additional information.

Sincerely,

Elyse R. LaForest
Program Manager
Federal Lands to Parks Program

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

APR 09 2003

April 10, 2003

Environmental Analysis Branch

Mr. David Stilwell
Supervisor, New York Field Office
U.S. Department of the Interior
Fish and Wildlife Service
3817 Luker Road
Cortland, New York 13045

Dear Mr. Stilwell:

On behalf of the U.S. Army Corps of Engineers, New York District (Corps), I am writing with regard to the Draft Fish and Wildlife Coordination Act Report (FWCAR) that the Fish and Wildlife Service (Service) submitted to the Corps on behalf of the Montauk Point Storm Damage Reduction Project and you letter dated 26-March 2003.

The first attachment to this letter deals with the Corps responses and comments to the Draft FWCAR. Although our comments are mostly general, we do have a couple of specific questions and concerns that we raise regarding the four recommendations by the Service.

The second attachment is a copy of the information that has already been provided to the Service through fax and telephone conversations with regard to the proposed staging area for the project. Although this information is not new to the Service, we hope that its inclusion in this letter will rectify any misunderstandings on the part of the Service.

The final attachment address specific comments from your letter dated 26-March 2003.

If you have any questions with regard to the Montauk Point Project please contact the Team Leader, Ms. Roselle Henn at (212) 264-2119.

Thank you very much for your time, understanding and action.

Sincerely,

L. Houston

Leonard Houston
Chief, Environmental Analysis Branch

Enclosures:

c.c. Steven Mars, Supervisor, Long Island Field Office
Steven Sinkevich, Long Island Field Office
Laury Zicari, Cortlandt Office
S. Tosi and J. Wright, U.S. Army Corps of Engineers, North Atlantic Division
M. Snyder, U.S. Fish and Wildlife Service, Region 5, Hadley, MA

# ATTACHMENT #1:

## Comments to the Draft Report
## Fish and Wildlife Coordination Act (FWCAR) for the
## Montauk Point Storm Damage Reduction Project

10-April 2003

Page i: 1st paragraph…1st sentence…

We request that the Service change "to provide, in part," to "to evaluate"

1st paragraph…2nd sentence…

We request that the Service change this to read, "The Corps and the non-federal sponsor, New York State, Department of Conservation, is currently conducting a Feasibility Study to evaluate…"

2nd paragraph…3rd sentence…

COMMENT: The project lands are not under the ownership and/or management of the National Parks Service. The Montauk Point Historical Society and New York State are the sole landowners of the project area. The Town of Easthampton own the lands adjacent to the project area.

2nd paragraph…4th sentence…

COMMENT: REMOVE – do not need to know that the Lighthouse still functions for navigation.

2nd paragraph…last sentence…

We request that the Service change this to read, "The Draft EIS identifies Alternative #2…with similar material of greater size…as the preferred alternative."

Page ii: 1st paragraph…2nd sentence…

COMMENT: The maximum staging/access area was submitted by fax and by phone conversation to the Service and is attached here again. The NYS DEC will provide all lands, easements and right-of-ways for the project and we do not perceive the need for land ownership to be defined for the Service to assess the potential impacts.

Recommendation #1:

RESPONSE: The Corps has consulted with the National Marine Fisheries Service (USACE letter dated 21 March 2003) pursuant to Section 7 of the Endangered Species Act.

Recommendation #2:

RESPONSE: The Corps will continue to coordinate with the NMFS regarding potential impacts to seals and their haul out areas. We request that the Service identify any other fish and wildlife resources that might be impacted by the maximal extent of the staging road and access areas previously provided to the Service and attached here again.

Page iii: Recommendation #3:

RESPONSE: The Corps is in contact with our Non-Federal Sponsor, the New York State Department of Environmental Conservation, with regard to permits and other species information. A survey document will be put together listing the potential birds that may use the area.

Recommendation #4:

RESPONSE: please see response to Recommendation #2

Last paragraph…last sentence…

COMMENT/CONCERN: Will those recommendations be drastically different from the four recommendations presented in the draft? If so, what are they and why?

Page 1: I. INTRODUCTION:

1st paragraph…last sentence…

We request that the Service change the last sentence to: "The Draft FR/ EIS identified Alternative #2 as the preferred Alternative."

Page 2: 1st full sentence in the continuing paragraph…

We request that the Service change portions of the sentence to read, "…bluff that the lighthouse and its associated structures rest upon,…"

1st full paragraph…2nd sentence…

We request that the Service change the portions of the sentence to read, "…The District has recommended to NAD that Alternative #2 – Stone Revetment solution is the best preferred alternative…"

Page 3: 1st full paragraph…2nd sentence…

COMMENT: please see comment for page ii, 1st paragraph, 2nd sentence.

1st full paragraph…3rd sentence…

COMMENT/CONCERN: Why weren't the potential effects evaluated in the draft? The staging area has previously been identified to the Service.

Page 12: I. Marine Mammals

1st full paragraph…5th sentence…

COMMENT/CONCERN: Please provide the Corps documentation of the seal use areas relative to the project area.

Page 22: E. VEGETATION

Last sentence in this section…

COMMENT/CONCERN: Why weren't existing vegetation conditions defined in the draft? Will this change the listed recommendations?

Page 23: VI. RECREATOINAL, HISTORICAL AND SECENIC IMPORTANCE OF STUDY AREA

2nd sentence in this section…

COMMENT: please see comment for page ii, 1st paragraph, 2nd sentence. Also, to clarify, the National Park Services does not own property within the project or staging areas. The Montauk Point Historical Society, New York State and the Town of Easthampton are the current owners of the land within the project and staging areas.

Page 24: 2nd full paragraph…last sentence…

COMMENT: The correct information is that Camp Hero Air Force Base is a Formerly Used Defense Site and is no longer active, nor a Department of Defense property.

Page 26: last sentence of continuing paragraph...

COMMENT/CONCERN: See comment for page 12, Section b

Page 27: State-listed Plants

Within this section...

COMMENT/CONCERN: The maximum extent of the staging area has already determined. The two existing dirt roads, and staging areas, used during the construction of the 1992 revetment wall by the U.S.C.G. and the Montauk Historical Society will once again be used for access and staging. The road will be returned to the condition in which the Corps surveyed them prior to beginning of the construction phase.

According to the Project Cooperation Agreement between the Corps and our Non-Federal Sponsor, NYS DEC, it is the responsibility of the Non-Federal Sponsor to obtain all permits, lands, easements and rights-of-way for the project.

State-listed Breeding Birds

Within this section...

COMMENT/CONCERN: As stated in previous comment, the staging and access areas have already been determined. Determination of impacts, if any, should be included in this draft.

Page 28: last sentence...last paragraph

RESPONSE: Construction equipment is as follows:
Crane
Excavator
Truck (2x)

Page 29: 2nd paragraph...

COMMENT/CONCERN: Access and staging areas have already been determined. This information should have been incorporated into this draft report.

Page 30: VIII. RECOMMENDATIONS

See comments/responses listed above for pages i to iii.

Page 32: <u>1st full paragraph...</u>

RESPONSE: The Cumulative Impacts section of the FIMP Reformulation EIS will consider all Federal Actions without the project area.

Page 33: <u>X. CONCLUSION</u>

Overall comments:

Please refer to the comment for page ii

Page 34: Overall comments (continued)

See comments/responses listed above for pages i to iii. Secondly, why did F&WS contact the NPS since NPS has no jurisdiction within the project area? The Corps will gladly communicate with any group/individual with regard to this, and all of our projects, however, formal consultation and coordination is not required since NPS is not the landowner either in or adjacent to, the project area.

**New York State Department of Environmental Conservation**
**Office of Natural Resources, Region One**
Charles T. Hamilton - Regional Supervisor of Natural Resources
Building 40 - SUNY, Stony Brook, New York 11790-2356
**Phone:** (631) 444-0270 • **FAX:** (631) 444-0272
**Website:** www.dec.state.ny.us

Erin M. Crotty
Commissioner

APR - 9 2003

April 23, 2003

Steven Mars
Supervisor L I Field Office
US Fish & Wildlife Service
US Department of Interior
500 St. Marks Lane
Islip NY 11751

RE: Draft Fish & Wildlife Coordination
Act Section 2(b) Report, "Montauk Point Storm Damage Reduction Project, Suffolk County, New York"

Dear Mr. Mars:

We have completed our review of the above report. We concur with your conclusions and recommendations of this report.

Thank you for this opportunity to comment.

Very truly yours,

Charles T. Hamilton

Charles T. Hamilton

CTH:io

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

RECEIVED
JUN 1 2003

16 June 2003

Environmental Analysis Branch

Mr. David Stilwell, Supervisor
New York Field Office
U.S. Department of the Interior
Fish and Wildlife Service
3817 Luker Road
Cortland, New York 13045

Dear Mr. Stilwell:

On behalf of the U.S. Army Corps of Engineers, New York District (Corps), I am writing with regard to the correspondence from the Fish and Wildlife Service (Service) about the Montauk Point Storm Damage Reduction Project's, Fish and Wildlife Coordination Report (FWCAR) submitted to the Corps by fax on June 3, 2003.

The Corps thanks the Service for their efforts with regard to the Draft FWCAR and is looking forward to receiving the completed FWCAR on the due date 31 July 2003.

At this time, the Corps concurs with the Service's suggestion that Access Road #2 not be used. Alternate Access Road #2 will become the primary access route to get to Staging Area #2 on the northern side of the revetment.

The Corps will comply with Recommendation #3 and conduct a pre-construction survey, including a review of any relevant State listings, to document any existing State-listed species within the project, access road and staging area. If any listed species be are discovered within those areas, the Corps will coordinate with the New York State Department of Environmental Conservation.

If you have any questions with regard to the Montauk Point Project please contact the Team Leader, Ms. Roselle Henn at (212) 264-2119.

Thank you very much for your time, understanding and action.

Sincerely,

L Houston

Leonard Houston
Chief, Environmental Analysis Branch

Enclosures:

c.c. Laura Patrick, Long Island Field Office
M. Snyder, U.S. Fish and Wildlife Service, Region 5, Hadley, MA
Charles Hamilton, NYS Department of Environmental Conservation – Stony Brook

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Region
Habitat Conservation Division
Milford Biological Laboratory
212 Rogers Avenue
Milford, CT 06460

DATE: April 23, 2003

TO: Roselle Henn, New York District, Army Corps of Engineers

FROM: Mike Ludwig, NOAA/NMFS, Milford, CT Mike Ludwig

SUBJECT: Montauk Point storm Damage Reduction Project, Suffolk County, New York.

1) This memorandum responds to your request for clarification regarding the potential for marine mammal and construction interactions / conflicts at the subject, Montauk Point Lighthouse construction site. We have coordinated our evaluation with members of the NMFS Protected Resources Division and our Stranding Network representative familiar with the site. The Riverhead Foundation (the NMFS, Stranding Network representative for Montauk Point) reports that seals do not appear to utilize the Montauk Point Lighthouse revetment or the beach area proximal to that structure. Based on that information, we have determined that there is little likelihood of conflicts occurring and the likelihood diminishes, further, when construction activities are being undertaken. Since the commencement of the construction should predate the arrival of the seals, their use of the area would be unusual. Seals do not actively seek out areas where human presence or noise are components of the environment.

2) The Riverhead Foundation reports that the haulout area most utilized by the three species of seals recorded in the area (Harp, Harbor and Hooded), is found about one mile north, northeast of the construction area. It appears that human presence, local topography, hydrodynamics and food availability at the Lighthouse conspire to limit the desirability of the area. We do not expect that the proposed restoration / rehabilitation work will alter those basic incompatibilities for the marine mammals during their overwintering in the area.

3) As always, should new information or a change circumstances occur that might alter the basis for our assessment, we recommend that consultation be reopened. You should consider obtaining a "taking" authorization (described below) as an additional protective measure.

4)
-------- Original Message --------
Subject: Montauk Lighthouse Work
Date: Wed, 23 Apr 2003 16:37:53 -0400
From: "David Gouveia" <David.Gouveia@noaa.gov>
Organization: NOAA
To: Michael Ludwig <Michael.Ludwig@noaa.gov>

Hi Mike -

This note is a follow-up to our conversation today regarding the emergency work planned for the lighthouse located in Montauk, NY by the Army Corp of Engineers. As I understand the situation, a rock abutment that supports the lighthouse is in need of emergency repair. Without repair the structure will become weak and unstable. The work would be confined to a 900 linear foot area (approximately) and would take approximately 18 months to complete. In assessing the project, the Army Corp / NMFS noted that seals are in the general area of the construction (approximately a mile away from the actual proposed construction). Consequently, the Army Corp has contacted you requesting guidance on whether they need to pursue a permit for potential interactions with marine mammals.

I have consulted with several colleagues at headquarters regarding this issue. Since we are not dealing with any endangered or threatened seals and the seals are quite a distance away from the proposed construction (approximately one mile), the likelihood of any take associated with noise or physical harassment resulting from the proposed construction is minimal. Therefore, an incidental take permit/authorization is not necessarily needed. However, we are all in agreement that it is better to be safe than sorry. As an extra caution, we suggest that the Army Corp still consider applying for an incidental take permit. An application for the permit can be obtained by calling our headquarters staff at (301) 713-2289 or using our NOAA Fisheries National web site at http://www.nmfs.noaa.gov/prot_res/prot_res.html

The authorization process is generally 120 days. However, the construction should not be delayed by the authorization process. This is just a precaution to be sure all bases are covered in the event some other unforeseen marine mammal issue arises during the course of the repair work that had not previously been anticipated.

I hope this helps. If any other questions, just give me a call.

- Dave

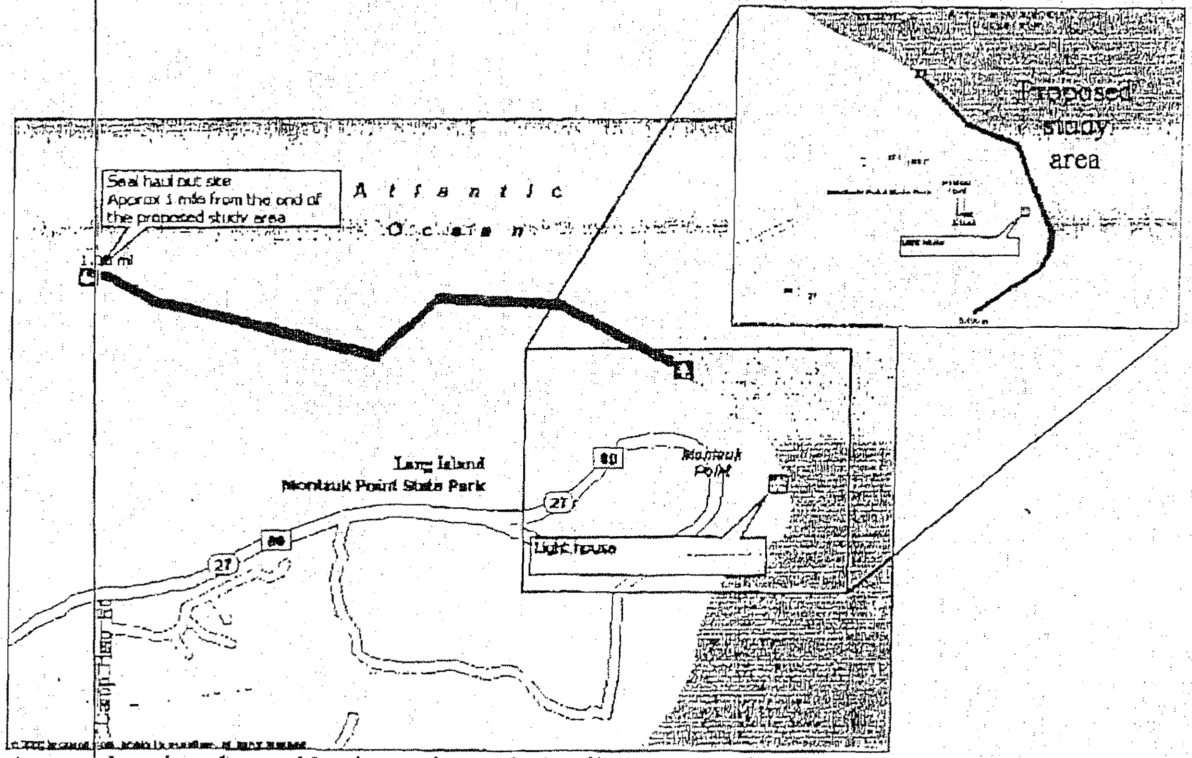
5) As always should you wish to discus this matter further, please contact me at Milford.

Riverhead Foundation For
MARINE
RESEARCH &
PRESERVATION

Ms. Laura Patrick
U.S. Fish and Wildlife Service
Long Island Field Office
500 St. Marks Lane
Box 1
Islip, NY 11751

January 17, 2003

Every year from November through May the Riverhead Foundation observes seals hauled out on rocks approximately 1 mile east of the east end of the proposed study area in Montauk Point State park. On average we see 15 to 20 harbor seals, either on rocks or in the water. On some occasions we also observed gray seals, and we had documented sightings of hooded seals.
In that same area we have recovered a number of stranded seals and a few sea turtles in the past.
The Riverhead Foundation recommends that the surveys continue to be conducted to monitor any changes in animals' distribution and species composition over time.



A map showing the seal haul out site with detailed proposed study area.

467 East Main Street Riverhead, New York 11901 Telephone: 631.369.9840 Fax: 631.369.9826 Rescue Hotline: 631.369.9829
www.riverheadfoundation.org

Faxed 6/3/03

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

June 3, 2003

Mr. Leonard Houston
Chief, Environmental Analysis Branch
Planning Division
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

Dear Mr. Houston:

This is in regard to the U.S. Army Corps of Engineers' (Corps) project entitled, "Montauk Point Storm Damage Reduction Project" and coordination relative to the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*). Please find enclosed the U.S. Fish and Wildlife Service's (Service) comments on potential impacts to fish and wildlife resources from the staging and access road areas. These draft comments were requested by the Corps to be delivered prior to the final Fish and Wildlife Coordination Act Report (FWCAR) which is due June 30, 2003.

### Additive Effects of Construction Vehicle Activity on Beaches

The Corps' "Montauk Point, New York-Proposed Staging and Access Areas" maps dated April and May 2003 depict two access roads, two staging areas and one alternate access road to Access Road 2. The Service recommends that in order to minimize erosion of beach and dune habitat and reduce impacts to species associated with this habitat, the Corps avoid using Access Road 2. Access Road 1 and Alternate Access Road 2 should provide adequate access while resulting in fewer impacts to beach and dune habitat and its associated natural resources.

Although the road along the north beach is currently used by off road vehicles, the Service believes that additional vehicle use, especially by heavy equipment, could exacerbate erosion in the Montauk Point area. The passage of vehicles on beaches can displace large quantities of sand seaward and may contribute to the rate of erosion. As little as one vehicle pass per week, over a two-year period, caused significant loss of vegetation and altered the profile of foredunes (Anders and Leatherman 1987a, 1987b). Driving at the foot of the dunes tends to churn up sand, making the dunes less stable. This activity interferes with the growth of dune grass (American beachgrass, *Ammophila breviligulata*). Dune grass is responsible for promoting the dune building process (National Park Service 2003). The backshore zone or area that is submerged only during storms or exceptionally high tides is very sensitive to disturbance and also supports plants that contribute to beach stabilization. This zone can support such flora as seabeach knotweed (*Polygonum glaucum*), a New York State listed species.

Driving near the water causes damage by crushing the wrack line. The wrack line and area seaward of the wrack line are areas that afford essential feeding opportunities for many species of birds and invertebrates. (National Park Service 2003). The passage of vehicles on the beach has been found to reduce the species diversity, percent vegetative cover and height of dune plants, resulting in the exposure of bare sand and creation of blowouts. Vehicular traffic also breaks up the salt-crust that normally reduces the wind-blown transport of sand, disrupts the drift line, and lowers the height of the dune (Lasiak 2002).

## Potential Impacts to State-listed Species

There are five State-listed species of birds at Montauk Point. The threatened least bittern (*Ixobychus exilis*) and northern harrier *(Circus cyaneus)*, as well as three species of concern, the osprey (*Pandion haliaetus*), red-shouldered hawk (*Buteo lineatus*), and whip-poor-will (*Caprimulgus vociferus*) nest at Montauk Point. Depending on their nest locations in relation to the access roads and staging areas, they may be highly vulnerable to disturbance. Disturbance may lead to nest abandonment and overall nest failure for the season. Some species will abandon the nest site and not return the following season.

The New York State Natural Heritage Program reports extant populations of three State-listed species at Montauk Point: salt-marsh spikerush (*Elocharis halophila*), small's knotweed (*Polygonum buxiforme*), and seabeach knotweed. Excess erosion from increased road and beach use associated with the proposed project may lead to destruction of these and other plant species. The Service recommends that the Corps proceed with Recommendation 3 from the draft CAR and conduct a pre-construction vegetation and breeding bird survey to document any existing State-listed species. If there are any State-listed species present, the Corps should coordinate with New York State Department of Conservation (NYSDEC) for recommended guidelines on protecting these species.

## Seals

The Service has received the National Marine Fisheries/NOAA Fisheries (NMFS/NOAA) response to the Corps indicating that seals do not appear to utilize the Montauk Point Lighthouse revetment or the adjacent beach area. We have been further advised by NMFS that the use of Access Road 2 will not be likely to adversely affect seals.

## Conclusions

The Service recommends that Access Road 2 not be used in order to minimize erosion of beach and dune habitats. We also recommend that a pre-construction survey be conducted for State-listed plants and birds. If any State-listed species are found, coordination with NYSDEC is recommended for project activity guidance.

If you have any questions or require further assistance, please have your staff contact Laura Patrick, of the Long Island Field Office, at 631-581-2941.

Sincerely,

Anne L. Secord

for David A. Stilwell
Field Supervisor

**Literature Cited**

Anders, F.J. and S.P. Leatherman. 1987a. Disturbance of beach sediment by off-road vehicles. Environmental Geology & Water Science. 9(183-189).

Anders, F.J. and S.P. Leatherman. 1987b. Effects of off -road vehicles on coastal foredunes at Fire Island, New York, USA. Environmental Management. 11(45-52).

Lasiak, T. 2002. Comment and Review - What's happening down the track? Centre for Research on Ecological Impacts of Coastal Cities. Http://www.eicc.bio.usyd.edu.au/eicc.html.

National Park Service. 2003. Beach Driving on Fire Island: Environment/Conservation Position. http://www.firei.org/site/regneg.shtml

New York Audubon Society Chrismas Bird Counts (1990-2002) and Waterfowl Survey (2001) for the Montauk P t census area.

| | |
|---|---|
| American bittern | (*Botaurus lentiginosus*) |
| American black duck | (*Anas rubripes*) |
| American coot | (*Fulica americana*) |
| American crow | (*Corvus brachyrhynchos*) |
| American goldfinch | (*Carduelis tristis*) |
| American kestrel | (*Falco sparverius*) |
| American oystercatcher | (*Haematopus palliatus*) |
| American (water) pipit | (*Anthus spinoletta*) |
| American robin | (*Turdus migratorius*) |
| American tree sparrow | (*Spizella arborea*) |
| American widgeon | (*Anas americana*) |
| American woodcock | (*Philohela minor*) |
| Bald eagle | (*Haliaeetus leucocephalus*) |
| Baltimore oriole | (*Icterus galbula*) |
| Barn owl | (*Tyto alba*) |
| Barnacle goose | (*Branta leucopsis*) |
| Barrow's goldeneye | (*Bucephala islandica*) |
| Belted kingfisher | (*Megaceryle alcyon*) |
| Black guillemot | (*Cepphus grylle*) |
| Black scoter | (*Melanitta nigra*) |
| Black-bellied plover | (*Pluvialis squatarola*) |
| Black-billed magpie | (*Pica pica*) |
| Black-capped chickadee | (*Parus atricapillus*) |
| Black-crowned night-heron | (*Nycticorax nycticorax*) |
| Black-headed gull | (*Larus ridibundus*) |
| ck-legged kittiwake | (*Rissa tridactyla*) |
| Blue jay | (*Cyanocitta cristata*) |
| Blue-gray gnatcatcher | (*Polioptila caerulea*) |
| Blue-winged teal | (*Anas discors*) |
| Bohemian waxwing | (*Bombycilla garrulus*) |
| Bonaparte's gull | (*Larus philadelphia*) |
| Brant | (*Branta bernicia*) |
| Broad-winged hawk | (*Buteo platypterus*) |
| Brown creeper | (*Certhia familiaris*) |
| Brown thrasher | (*Toxostoma rufum*) |
| Brown-headed cowbird | (*Molothrus ater*) |
| Bufflehead | (*Bucephala albeola*) |
| Canada goose | (*Branta canadensis*) |
| Canvasback | (*Aythya valisineria*) |
| Carolina wren | (*Thryothorus ludovicianus*) |
| Cattle egret | (*Bubulcus ibis*) |
| Cedar waxwing | (*Bombycilla cedrorum*) |
| Chipping sparrow | (*Spizella passerina*) |
| Clapper rail | (*Rallus longirostris*) |
| Clay-colored sparrow | (*Spizella grammacus*) |
| Common eider | (*Somateria mollissima*) |
| Common goldeneye | (*Bucephala clangula*) |
| Common grackle | (*Quiscalus cyanocephalus*) |
| Common loon | (*Gavia immer*) |
| Common merganser | (*Mergus merganser*) |
| Common murre | (*Uria aalge*) |
| Common redpoll | (*Carduelis flammea*) |
| Common snipe | (*Capella gallinago*) |
| Common yellowthroat | (*Geothlypis trichas*) |
| Cooper's hawk | (*Accipiter cooperii*) |
| Dickcissel | (*Spiza americana*) |
| Double-crested cormorant | (*Phalacrocorax auritus*) |
| Dovekie | (*Alle alle*) |
| Downy woodpecker | (*Picoides pubescens*) |
| Dunlin | (*Calidris alpina*) |
| Eared grebe | (*Podiceps nigricollis*) |
| Eastern bluebird | (*Sialia sialis*) |
| Eastern meadowlark | (*Sturnella magna*) |
| Eastern phoebe | (*Sayornis phoebe*) |
| Eastern screech owl | (*Otus asio*) |
| Eastern towhee | (*Pipilo erythrophthalmus*) |
| Eurasian widgeon | (*Anas penelope*) |
| European starling | (*Sturnus vulgaris*) |
| Evening grosbeak | (*Hesperiphona vespertina*) |
| Field sparrow | (*Spizella pusilla*) |
| Fish crow | (*Corvus ossifragus*) |
| Forster's tern | (*Sterna forsters*) |
| Fox sparrow | (*Passerella iliaca*) |
| Gadwall | (*Anas strepera*) |
| Glaucus gull | (*Larus hyperboreus*) |
| Golden eagle | (*Aquila chrysaetos*) |
| Golden-crowned kinglet | (*Regulus satrapa*) |
| Grasshopper sparrow | (*Ammodramus savannarum*) |
| Gray catbird | (*Dumetella carolinensis*) |
| Great cormorant | (*Phalacrocorax carbo*) |
| Great black-backed gull | (*Larus marinus*) |
| Great blue heron | (*Ardea herodius*) |
| Great egret | (*Casmerodius albus*) |
| Great black-backed gull | (*Larus marinus*) |
| Great horned owl | (*Bubo virginianus*) |
| Greater scaup | (*Aythya marila*) |
| Greater yellowlegs | (*Tringa melanoleuca*) |
| Green-winged teal | (*Anas crecca*) |
| Hairy woodpecker | (*Picoides villosus*) |
| Harlequin duck | (*Histrionicus histrionicaus*) |
| Hermit thrush | (*Catharus guttatus*) |
| Herring gull | (*Larus argentatus*) |
| Hooded merganser | (*Lophodytes cucullatus*) |
| Horned grebe | (*Podiceps auritus*) |
| Horned lark | (*Eremophila alpestris*) |
| House finch | (*Carpodacus mexicanus*) |
| House sparrow | (*Passer domesticus*) |
| House wren | (*Troglodytes aedon*) |
| Iceland gull | (*Larus glaucoides*) |
| Killdeer | (*Chardrius vociferus*) |
| King eider | (*Somateria spectabilis*) |
| Lapland longspur | (*Calcarius lapponicus*) |
| Least flycatcher | (*Empidonax minimus*) |
| Least sandpiper | (*Calidris minutilla*) |
| Lesser black-backed gull | (*Larus fuscus*) |
| Lesser scaup | (*Aythya affinis*) |
| Lincoln's sparrow | (*Melospiza lincolnii*) |
| Little gull | (*Larus minutus*) |
| Long-billed dowitcher | (*Limnodromus scolopaceus*) |
| Long-eared owl | (*Asio otus*) |
| Long-tailed duck | (*Ciangula hyemalis*) |
| Mallard | (*Anas platyrynchos*) |
| Marsh wren | (*Cistothorus palustris*) |
| Merlin | (*Falco columbarius*) |

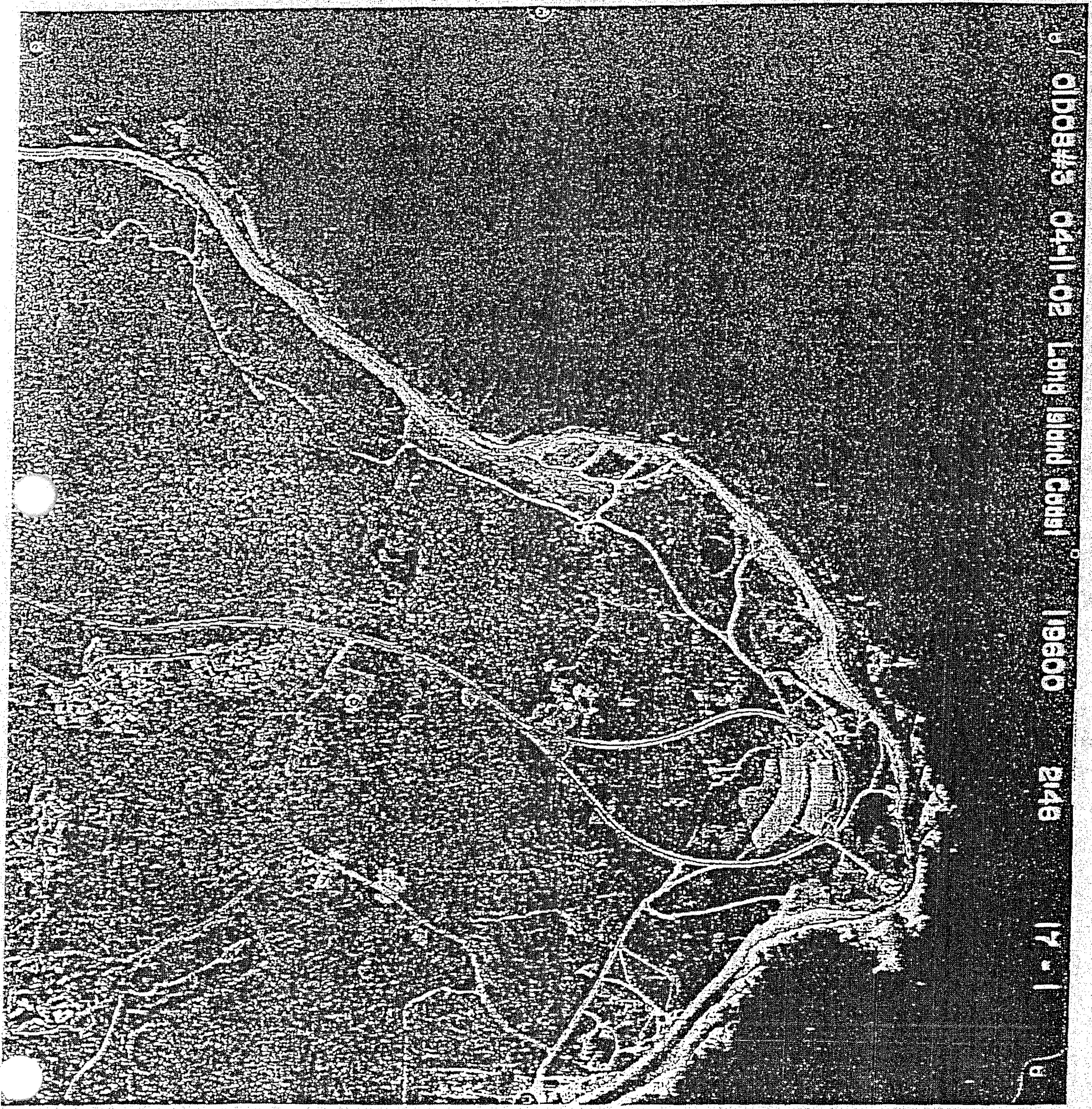
## ATTACHMENT #2:

Map showing the location of the staging area for the
Montauk Point Storm Damage Reduction Project

Please note:

As previously discussed by fax and telephone conversation, the staging areas to be used for the project will be directly adjacent to the current stone revetment wall. These were the two areas previously used as staging areas by the Montauk Point Historical Society and the U.S. Coast Guard in 1992-1994 when they constructed the existing stone revetment wall. Access to the staging areas will be from the two dirt roads, one on each side of the revetment wall, leading off of Montauk Highway, extending to the beach and then to the staging area. As with all Corps projects, the dirt roads and staging areas will be returned to the condition that it was found in prior to the commencement of construction.

[illegible]uk Point Storm Damage Reduction Project
Preliminary Staging Areas and Access Road



# ATTACHMENT #3

Comments with regard to the Service's letter dated 26 March 2003

Paragraph 2:

The Service lists three factors leading to the delay in the Draft FWCAR including 1) lack of site specific information, 2) conflicting information sent to the Service and 3) genuine miscommunication between the Corps and the Service.

First, all current project information was sent by mail, and fax, followed by numerous telephone conversations between Laura Patrick from the Service and the EIS Coordinator for the Corps, Christopher Ricciardi. No information was withheld. The Project is currently in a feasibility stage and final plans will not be developed until after the NEPA Process and other reviews are completed.

There was conflicting information sent to the Service on Friday, February 7, 2003 as Ms. Patrick had contacted another Project Delivery Team (PDT) member at the Corps. However, this information was corrected on Monday, February 10, 2003 when the EIS coordinator realized that the information from the fax and phone conversation on Friday afternoon was incorrect. The proper information was transmitted to Ms. Patrick by Monday afternoon, February 10, 2003 and therefore should have cleared the confusion on the part of the Service.

Finally, in our view the only miscommunication is on the part of the Service with regard to the staging and access area. More than a dozen phone conversations took place between Mr. Ricciardi and Ms. Patrick between January 15, 2003 and February 28, 2003. With the exception of that one particular conversation with someone other than the appointed POC, Mr. Ricciardi consistently reminded Ms. Patrick of the facts of the staging and access areas. The Corps cannot understand why after these numerous phone calls and several faxes, why the Service could not proceed with their summary with the information provided.

Paragraph 3:

Once again, pertaining the staging and access area, the fax of February 7, 2003 was incorrect. That information was corrected on Monday, February 10, 2003 by the appointed POC. The Corps admits that incorrect information was sent by the non-POC however, correctly that mistake within one business day should not have impacted the Service's work.

We would also like to clarify the extent of the project boundary relative to Turtle Cove. The use of a preexisting dirt road that leads down to the beach will be used. Equipment will then traverse the portion of the beach from the road to each end of the existing revetment wall. These two approaches, one on each side of the standing revetment wall, are the same ones that were used by the Montauk Point Historical Society and the U.S. Coast Guard during the 1992-1994 construction. All of Turtle Cove is not within the project area and should not be considered so.

Mr. Ricciardi stated this time and again in phone conversations with Ms. Patrick from February 14, 2003 on.

Paragraph 4:

The Service did receive a fax outlying the project area on February 10, 2003 and has admitted so in your letter. Follow-up phone conversations were held and according to Mr. Ricciardi, the situation was resolved.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

April 30, 2003

Mr. Leonard Houston
Chief, Environmental Analysis Branch
Planning Division
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

Dear Mr. Houston:

This is in regard to the U.S. Army Corps of Engineers' (Corps) project entitled, "Montauk Point Storm Damage Reduction Project" and coordination relative to the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*). Please find enclosed the U.S. Fish and Wildlife Service's (Service) response to the Corps' April 8, 2003, comments on the Draft Fish and Wildlife Coordination Act Report dated March 2003.

In a letter dated April 23, 2003, the New York State Department of Environmental Conservation, Region 1, concurred with the Service's impact assessment and mitigation recommendations. We have not yet received comments from the National Marine Fisheries Service.

Ms. Laura Patrick, the Service's point of contact on this project, will contact your office next week to identify a date for submission of the final report. We hope that our responses clarify the issues and comments you raised concerning project coordination, the project description, etc., and that our agencies can move forward with the goal of completing the agreement.

If you have any questions or require further assistance, please have your staff contact Laura Patrick, of the Long Island Field Office, at 631-581-2941.

Sincerely,

David A. Stilwell
Field Supervisor

Enclosure

cc: NYSDEC, Stony Brook, NY (Env. Permits)

OPTIONAL FORM 99 (7-90)

**FAX TRANSMITTAL**

| | |
|---|---|
| | # of pages ► 8 |
| To Len Houston Rosalle Hoan | From L. ZICARI |
| Dept./Agency CC LICO | Phone # 607 753 9334 |
| Fax # 212-264-0961 | Fax # 9699 |

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

# U.S. Fish and Wildlife Service's Response to the U.S. Army Corps of Engineers' Comments on the Draft Fish and Wildlife Coordination Act Report

The following are the U.S. Fish and Wildlife Service's (Service) responses to the comments received on April 8, 2003, from the U.S. Army Corps of Engineers (Corps) for the Montauk Point Storm Damage Reduction Project Draft Fish and Wildlife Coordination Act (FWCA) Report.

Comment 1: We request that the Service change "to provide, in part," "to evaluate"

Response 1: The Final FWCA Report has been revised to reflect this request; however, the sentence in question was taken directly from the Department of the Army, Corps of Engineers' "Intent to Prepare a Draft Environmental Impact Statement (EIS) for the Montauk Point Storm Damage Reduction Project" in the Federal Register: May 24, 2002 (Volume 67, Number 101, pages 36578-36579).

Comment 2: We request the Service change this to read, "The Corps and the non-federal sponsor, New York State, Department of Conservation, is currently conducting a Feasibility Study to evaluate...."

Response 2: The Final FWCA Report has been revised to reflect this request and the word "Environmental" was also added to the New York State Department of Environmental Conservation agency title (NYSDEC).

Comment 3: The project lands are not under the ownership and/or management of the National Park Service (NPS). The Montauk Point Historical Society and New York State are the sole landowners of the project area. The Town of East Hampton owns the lands adjacent to the project area.

Response 3: The NPS is a grantor and holder of a reversionary interest of the parcel of land called Turtle Cove, therefore, they are a partial owner. The Montauk Point Historical Society and New York State are not the sole landowners of the project area; Access Road 1 and Staging Area 1, as indicated by the Corps as part of the project plans, are located on Town of East Hampton property.

Comment 4: Remove 4th sentence of second paragraph on page i.

Response 4: The Final FWCA Report has been revised to reflect this request. We note, however, that this description was taken from the Corps' fact sheet describing the Montauk Point Storm Damage Reduction Project faxed to the Service on December 3, 2002. The Service believed that including information stating that the lighthouse still functions for navigation is an important and relevant point, as it emphasizes the need for a solution to the storm damaged area.

| | |
|---|---|
| Comment 5: | We request that the Service change this to read, "The Draft EIS identifies Alternative #2...with similar material of greater size...as the preferred alternative." |
| Response 5: | The Final FWCA Report has been revised to reflect this request. |
| Comment 6: | The maximum staging/access area was submitted by fax and by phone conversation to the Service and is attached here again. The NYSDEC will provide all lands, easements, and right-of-ways for the project, and we do not perceive the need for land ownership to be defined for the Service to assess the potential impacts. |
| Response 6: | Thank you for providing us with a map clarifying the scope of potential construction staging and access impacts. Unfortunately, this is the first time the Service has seen this information which was dated April 2003. The Service received a fax on February 7, 2003, from the Corps Environmental Analysis Branch (EAB) with the following staging information: "Engineering will produce another map for you and get it to you early next week showing the exact location of the two staging areas and access roads. The staging areas and access roads that we will use, if the project is built, will be the same ones used by the Coast Guard and the Montauk Historical Society in the early 1990's to construct the existing revetment wall. On an aerial map you can see two dirt roads, just off Montauk Highway on each side of the Lighthouse Complex. We will stage directly adjacent to the current wall as well." |

The only map the Service received from the Corps Division of Engineering was an unreadable facsimile with photocopied aerial photos and handwritten instructions showing where the access roads and staging areas were going to be. The Service was then told by the Corps EAB that this information was incorrect and should be "disregarded." The Service is not in possession of the former U.S. Coast Guard (USCG) and Montauk Historical Society project plans and, therefore, is unaware of the access roads and staging areas which were used in the early 1990's.

The information given to the Service by the Corps via telephone may have described the attached map, but the Service was still waiting for a clear map to follow. This information was never received. As you can see by the map, there are no road names to clearly identify areas which were described to us over the phone, therefore, resulting in genuine miscommunication by the Service and the Corps.

Not having this information prior to the draft being submitted precluded us from commenting on the access roads and staging areas in the Draft

Response 25: Please see Response 19.

Comment 26: See comments/responses listed above for pages i to iii.

Response 26: Please see Responses 1 through 7.

Comment 27: The Cumulative Impacts section of the Fire Island to Montauk Point Reformulation EIS will consider all Federal actions without the project.

Response 27: The Service notes the Corps' response and presumes there is a typographical error with the word "without", it should state "...will consider all Federal actions with the project."

Comment 28: Please refer to the comment for page ii.

Response 28: Please see Response 6.

Comment 29: See comments/responses listed above for pages i to iii. Secondly, why did the Service contact the NPS since the NPS has no jurisdiction within the project area? The Corps will gladly communicate with any group/individual with regard to this, and all of our projects; however, formal consultation and coordination is not required since the NPS is not the landowner either in or adjacent to, the project area.

Response 29: Please see Responses 1 through 7.

As you are aware, the FWCA provides that wildlife conservation will receive equal consideration and will be coordinated with other features of water resource development project planning, throughout the action agency's planning and decision-making process. The Service uses the FWCA to protect fish and wildlife by trying to provide the action agency, in this case, the Corps, with as complete a picture as possible of area wildlife resources, potential project impacts to those resources, and means to avoid, minimize, and/or compensate for unavoidable impacts. One of the things we address is the potential impact of a project on public uses of fish and wildlife resources. In some cases, we will need to coordinate with outside agencies and other parties, including local community representatives or non-governmental organizations to make sure that we have as complete as possible an inventory of natural resources in the project area. In addition, because we are the lead Department of the Interior agency for FWCA work, we are responsible for coordinating with, and incorporating any comments of other Interior bureaus regarding resources of interest. The NPS has jurisdiction regarding the property in question as stated in Response 3. The NPS deeded this property to the Town of East Hampton August 8, 1986, with several provisions to follow. One of the conditions states, "The Government hereby reserves the right to be apprised of, have access to, review, and approve specifications, plans

# APPENDIX F

# NEW YORK COASTAL ZONE MANAGEMENT CONSISTENCY STATEMENT

# NEW YORK STATE COASTAL MANAGEMENT PROGRAM
# CONSISTENCY DETERMINATION

**Project:** Montauk Point in the Township of East Hampton, Suffolk County, New York, Storm Damage Reduction Project (Project). The proposed Project consists of the construction of an 840-linear-foot revetment at Montauk Point for protection of Turtle Hill plateau and securing the integrity of the Montauk Point Lighthouse (Lighthouse) and its associated facilities from wave and storm activities.

**Applicant:** U.S. Army Corps of Engineers (USACE), New York District (District).

**Applicable Policies:** Based on a review of the Coastal Management Program Policies for New York, 21 policies were found to be potentially applicable to the proposed Project. These policies are listed below.

**Consistency Determination:** Each of the 21 applicable policies was evaluated with respect to the Project's consistency with their stated goals. The Project has been found to be consistent with each policy.

**Policy 1:** Restore, revitalize and redevelop deteriorated and underutilized waterfront areas for commercial, industrial, cultural, recreational and other compatible uses.

**Determination:** The proposed reinforcement of the revetment would protect the Plateau, Lighthouse and its associated facilities, as well as other unknown historic and cultural resources, and enhance recreational activities at Montauk Point State Park.

**Policy 2:** Facilitate the siting of water dependent uses and facilities on or adjacent to coastal waters.

**Determination:** By restoring the existing shoreline of Turtle Hill plateau with the revetment, the Lighthouse and its associated facilities and unknown historic and cultural resources would be protected, and made to be more useful for public recreation.

**Policy 5:** Encourage the location of development in areas where public services and facilities essential to such development are adequate.

**Determination:** The restoration of the Project's shoreline is necessary due to the need of the Lighthouse as an aid for navigation for ships heading for New York Harbor and Long Island Sound, as well as other eastern seaboard ports. The proposed Project would protect the Plateau, Lighthouse and its associated facilities, as well as other unknown historic and cultural resources, and enhance recreational activities at Montauk Point State Park. Public services such as the museum, concession operations, restrooms, and parking facilities appear adequate to support current users.

**Policy 7:** Significant coastal fish and wildlife habitats would be protected, preserved and where practical, restored so as to maintain their viability as habitats.

**Determination:** The Project is not expected to have a significant impact on marine fisheries. The District is currently coordinating with National Marine Fisheries Service (NMFS) to assess impacts to designated Essential Fish Habitat (EFH) as a result of the project. The NMFS is evaluating the existing resources and anticipated Project impacts to EFH in conjunction with the public and agency review period for the Draft Environmental Impact Statement.

The federally-listed endangered Atlantic ridley (*Lepidochelys kempii*) and leatherback (*Dermochelys coriacea*) sea turtles and the threatened loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) sea turtles have been identified as transient species through the Project area (Beach 1992). Recent studies indicate that the nearshore waters within Peconic Bay, Gardiners Bay, Block Island Sound, and Long Island Sound are critical developmental habitat for juveniles of the Atlantic ridley sea turtle and a major feeding area for the Loggerhead sea turtle (USFWS 1997, Bortman and Niedowski 1998, PEP 2001). Juvenile Atlantic ridley sea turtles recorded in Long Island waters represent the largest concentrations ever documented outside the Gulf of Mexico (Morreale *et al.* 1992). In the Northeast, during the summer months, juveniles (approximately 2 to 5 years of age) of the Atlantic ridley, loggerhead, leatherback, and green sea turtles migrate from the open ocean to inshore waters including areas along the coast of Long Island (Bortman and Niedowski 1998).

Federally-listed endangered Northern right whales (*Eubalaena glacialis*) (usually individuals) are regularly sighted migrating through the nearshore waters off Montauk Point, usually from March through June (USFWS 1997) and have been identified as a transient species by the NMFS (Beach 1992). Small aggregations of Federally-listed endangered finback whales (*Balaenoptera physalus*) feed close to shore from Shinnecock Inlet to Montauk Point from January to March, and federally-listed endangered humpback whales (*Megaptera novaengliae*) feed all around Montauk Point, primarily between June and September (USFWS 1997).

One federally-listed and state-listed endangered plant, the sandplain gerardia (*Agalinis acuta*), has been historically known to have occurred at several locations within the Project area (USACE 1993), and there are two extant areas containing this plant within two miles of the Project area (USFWS 1992). However, according to the NYSDEC Wildlife Resources Center, this plant has not been identified in the Project area since 1927 (USACE 1993). Several site visits by District personnel along with local naturalists and Town biologists have concluded that the sandplain gerardia is not present in the Project area (USACE 1993).

The *Atlas of Breeding Birds of New York State* lists the state-listed threatened common tern as a confirmed breeder in the Project area and the least bittern and Northern harrier as probable breeders (Andrle and Carroll 1988). According to the 1989 Long Island Colonial Waterbird and Piping Plover Survey, the least tern has not nested in the Project area since 1984 (Downer and Leibelt 1990) and was not listed by the *Atlas of Breeding Birds of New York State* as occurring in the Project area.

State-listed plant species that may occur in the include the endangered sandplain gerardia (see above), which was historically identified as occurring in the Project area, and the rare seabeach knotweed (*Polygonum glaucum*) and threatened saltmarsh spike rush (*Eleocharis halophile*) are known to be present in the Project area (USACE 1993).

Although several species of federally-listed endangered and threatened species of animals and plants discussed above can be expected to occur in the general vicinity of the Project area at any time (USFWS 1992, Beach 1992), no impacts to these species are expected to occur as a result of construction of the stone revetment alternative. The sea turtle and marine mammal species discussed above are highly mobile and are only considered as transient species in the Project area (Beach 1992). Therefore these species are unlikely to be present or would avoid the Project area during construction. Furthermore, the construction of the revetment is not expected to negatively impact the preferred habitat of these species since they do not breed in the region and are considered pelagic.

Impacts to the rare seabeach knotweed (*Polygonum glaucum*) and the threatened saltmarsh spike rush (*Eleocharis halophile*), which are known to be present within the Project area (USACE 1993), are not expected because construction activities would not impact vegetative areas.

Common terns (state threatened) may be present in the Project area from late April to mid-May. Common terns breed in colonies that may contain several hundred to several thousand birds (NYSDEC 1998a). The nest is a simple scrape built above the high tide line in sand, gravel, shells or windrowed seaweed (Andrle and Carroll 1988). A clutch of 2-4 (usually 3) eggs is laid during late May through July. Both sexes share incubation duties for 21-27 days and the young fledge about 28 days after hatching (Andrle and Carroll 1988). The District will continue to coordinate with the NYSDEC regarding anticipated impacts to individual common terns and their habitat due to implementation of the Project.

Because the selected Project alternative would not impact vegetated habitats (see Section 4.3) impacts to individual least bitterns and northern harriers or their habitat is unlikely due to the Project.

According to the 1989 Long Island Colonial Waterbird and Piping Plover Survey, the least tern has not nested in the Project area since 1984 (Downer and Leibelt 1990) and was not listed by the *Atlas of Breeding Birds of New York State* as occurring in the Project area (Andrle and Carroll 1988).

The District will continue to coordinate with the USFWS, NMFS, and NYSDEC to resolve any outstanding concerns regarding the occurrence of endangered and threatened species within the Project area.

**Policy 9:** Expand recreational use of fish and wildlife resources in coastal areas by increasing access to existing resources, supplementing existing stocks, and developing new resources.

**Determination:** Construction of the proposed Project would have a temporary minimal adverse affect on fish and wildlife resources and recreation activities directly within the project area. However, upon completion of the construction, the Project would continue the provision of full public access to existing fish and wildlife resources and provide long-term protection and additional habitat for numerous fish, shellfish, and wildlife resources.

**Policy 12:** Activities or development in the coastal area would be undertaken so as to minimize damage to natural resources and property from flooding and erosion by protecting natural protective features including beaches, dunes, barrier islands, and bluffs.

**Determination:** The proposed Project would reduce the impact of natural erosional processes, thus protecting the Lighthouse and its associated facilities from storm and wave activities. This Project would represent a continuation of augmentation of the natural features of the bluff.

**Policy 13:** The construction or reconstruction of erosion protection structures shall be undertaken only if they have a reasonable probability of controlling erosion for at least 30 years as demonstrated in design and construction standards and/or assured maintenance or replacement programs.

**Determination:** The construction of the proposed Project would reduce the impact of natural erosional processes and protect Turtle Hill plateau from storm and wave activities. The structure has a reasonable probability of controlling erosion for at least 30 years.

**Policy 14:** Activities and development including the construction or reconstruction of erosion protection structures, shall be undertaken so that there would be no measurable increase in erosion or flooding at the site of such activities or development, or at other locations.

**Determination:** The construction of the proposed Project would protect the Lighthouse and its associated facilities, and reduce the impact of natural erosional processes and storm and wave activities to Turtle Hill plateau. The Project is tied back in a manner that will prevent flanking and will not increase erosion or flooding in adjacent areas.

**Policy 15:** Mining, excavation or dredging in coastal waters shall not significantly interfere with the natural coastal processes that supply beach materials to land adjacent to such waters and shall be undertaken in a manner which would not cause an increase in erosion of such land.

**Determination:** The proposed Project would not involve mining or dredging in coastal waters. However, minor excavation may be necessary for proper access to the revetment. All construction activities in coastal waters would not significantly interfere with coastal processes, but will act to continue the augmentation of the natural features to protect Turtle Hill plateau, the Lighthouse, and other facilities.

**Policy 16:** Public funds shall only be used for erosion protective structures where necessary to protect human life, and new development which requires a location within or adjacent to an erosion hazard area to be able to function, or existing development; and only where the public benefits outweigh the long term monetary and other costs including the natural protective features.

**Determination:** Construction of the proposed Project would have a long-term benefit for the public in that it would maintain recreational and educational opportunities at Montauk Point State Park. In addition, construction of the proposed Project would protect Turtle

Hill plateau from natural erosional processes, thus protecting the Lighthouse and its associated facilities for aiding in navigation.

**Policy 18:** To safeguard the vital economic, social and environmental interests of the State and of its citizens, proposed major actions in the coastal area must give full consideration to those interests, and to the safeguards which the State has established to protect valuable coastal resource areas.

**Determination:** The proposed construction activities would provide a means of protecting an important public navigational aid and recreational area with minimal short-term impacts to natural resources. The protection provided will act to preserve the economic and social interests of the State of New York derived from visitation to Montuak Point State Park and the Lighthouse.

**Policy 19:** Protect, maintain, and increase the level and types of access to public water-related recreation resources and facilities.

**Determination:** Construction of the proposed Project would protect, maintain, and enhance the Montauk Point State Park and adjacent recreational areas.

**Policy 20:** Access to publicly-owned foreshore and to lands immediately adjacent to the foreshore or the water's edge that are publicly-owned shall be provided and it shall be provided in a manner compatible with adjoining uses.

**Determination:** Construction of the proposed Project would protect Turtle Hill plateau from natural erosional processes and increase public access to Montauk Point State Park and adjacent recreational areas.

**Policy 21:** Water dependent and water enhanced recreation would be encouraged and facilitated, and would be given priority over non-water related uses along the coast.

**Determination:** Construction of the proposed Project would support the continuation of water dependent recreation activities such as fishing, surfing, sightseeing, and boating.

**Policy 22:** Development, when located adjacent to the shore, would provide for water-related recreation, whenever such use is compatible with reasonably anticipated demand for such activities, and is compatible with the primary purpose of the development.

**Determination:** Construction of the proposed Project would protect Turtle Hill plateau from natural erosional processes and increase public access to Montauk Point State Park and support the continuation of water dependent recreation activities such as fishing, surfing, sightseeing, and boating.

**Policy 23:** Protect, enhance and restore structures, districts, areas or sites that are of significance in the history, architecture, archaeology or culture of the state, its communities, or the nation.

**Determination:** The Lighthouse was commissioned by President Washington in 1796 and was completed in 1797. Since its construction, the Lighthouse has served as an important navigation aid for the first land encountered by ships headed for New York Harbor and Long Island Sound, as well as other eastern seaboard ports. In addition, the Lighthouse is included in the U.S. Department of Interior's National Register of Historic Places.

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Construction of the proposed Project would protect Turtle Hill plateau from natural erosional processes, thus securing the integrity of the Lighthouse, its associated facilities, and other unknown artifacts that might be present in the area.

**Policy 24:** Prevent impairment of scenic resources of statewide significance.
**Determination:** Construction of the proposed Project would protect Turtle Hill plateau from natural erosional processes, thus preserving the scenic resources at Montauk Point State Park and the Lighthouse and its associated facilities.

**Policy 25:** Protect, restore or enhance natural and man-made resources which are not identified as being of statewide significance, but which contribute to the overall scenic quality of the coastal area.
**Determination:** Construction of the proposed Project would protect Turtle Hill plateau from natural erosional processes, thus enhancing recreational activities and preserving scenic quality at Montauk Point State Park and the Lighthouse and its associated facilities.

**Policy 35:** Dredging and filling in coastal waters and disposal of dredged material would be undertaken in a manner that meets existing State permit requirements, and protects significant fish and wildlife habitats, scenic resources, natural protective features, important agricultural lands, and wetlands.
**Determination:** Construction of the proposed Project may require minor excavation along coastal waters and may have a short-term, temporary impact on fish and wildlife resources. However, the proposed project would secure the integrity of Turtle Hill plateau, thus enhancing and protecting wildlife habitats and scenic resources. In addition, the revetment from the high tide mark seaward would have a long-term beneficial affect for fish and shellfish in providing shelter and forage opportunities.

**Policy 38:** The quality and quantity of surface water and groundwater supplies, would be conserved and protected, particularly where such waters constitute the primary or sole source of water supply.
**Determination:** Construction of the proposed Project would cause a short-term, temporary increase in turbidity and sedimentation of adjacent surface waters. However, the increase in sedimentation is expected to settle quickly out of the water column and would not cause any adverse harmful affect to fish and wildlife. No impacts to groundwater are expected from the proposed Project.

**Policy 44:** Preserve and protect tidal and freshwater wetlands and preserve the benefits derived from these areas.
**Determination:** Construction of the proposed Project would protect Turtle Hill plateau and not have any direct or indirect impacts to freshwater wetlands, coastal ponds, or interdunal swales in the project area.

# APPENDIX G

# CLEAN AIR ACT
# AIR CONFORMITY STATEMENT

**US Army Corps of Engineers®**

31- March 2003

The 1990 Clean Air Act amendments include the General Conformity (GC) Rule, which ensures that Federal actions conform to a nonattainment area's State Implementation Plan (SIP) thus not adversely impacting the area's progress toward attaining the National Ambient Air Quality Standards (NAAQS).

In the case of the Montauk Point Storm Damage Reduction Project (MPSDRP);
The Federal Action is the construction of the in-kind replacement of the existing stone revetment wall that surrounds Montauk Point by the USACE, New York District. The Federal Action will take place within the New York-New Jersey-Long Island Nonattainment Area (NYNJLINA) that is classified as severe nonattainment for ozone (oxides of nitrogen [NOx] and volatile organic compounds [VOCs]) and as a maintenance area for carbon monoxide (CO). For this conformity analysis, only NOx was evaluated, because it is the most prevalent pollutant from diesel marine/ internal combustion engines. If the project conforms for NOx then by default it will likely conform for VOCs and CO as their emissions will be lower then NOx levels.

GC is applicable to the Federal Action associated with MPSDRP. However after completing the air analyses required for the MPSDRP, the results show that the total direct and indirect emissions associated with the project do not exceed GC trigger levels for the NYNJLINA Nonattainment area, as presented in Table 1 below.

GC is not triggered as the MPSDRP total NOx emissions do not exceed the deminimus level of 25 tons per year (over a rolling monthly average).

Attached are the preliminary NOx emissions estimates for the first and second years of project construction with a breakdown of equipment information. Also note that the majority of emissions are from land based sources.

**Table 1. Project Emissions as Compared to General Conformity Trigger Levels.**

| Pollutant | General Conformity Trigger Levels (tpy) | 2003 Project Emissions (tpy) | 2004 Project Emissions (tpy) |
|---|---|---|---|
| NOx | 25 | 19.66 | 19.66 |

Note: tpy – tons per year

To conclude, this project conforms to the requirements of the regulation (40CFR§93.150-160) as the GC trigger level will not be exceeded during the 2-year project duration.

Bonnie Hulkower
Project Air Coordinator

# Montauk Point Storm Damage Reduction Project

Version 2.1 March 27, 2003

### *Preliminary NOx Estimates – First Year*

| **EQUIPMENT** | **HOURS** | **HP** | **LOAD** | **NOX_EF g/hp-hr** | **NOX_TONS** | **PCNT** |
|---|---|---|---|---|---|---|
| Crane | 2,620 | 275 | 43% | 7.60 | 2.60 | 13% |
| Excavator | 2,620 | 275 | 70% | 6.50 | 3.61 | 18% |
| Truck | 8,042 | 300 | 57% | 5.60 | 8.49 | 43% |
| Tug | 240 | 350 | 68% | 13.32 | 0.84 | 4% |
| *subtotal* | | | | | 15.54 | 100% |

| **EQUIPMENT** | **HOURS** | **SPEED** | **VMT** | **NOX_EF g/mile (1)** | **NOX_TONS** | **PCNT** |
|---|---|---|---|---|---|---|
| Truck (HDDV8A) | 5,240 | 43 | 225,320 | 16.6 | 4.12 | 21% |
| Total | | | | | **19.66** | **100%** |

*(1) source: MOBILE6.2*

### *Preliminary NOx Estimates – Second Year*

| **EQUIPMENT** | **HOURS** | **HP** | **LOAD** | **NOX_EF g/hp-hr** | **NOX_TONS** | **PCNT** |
|---|---|---|---|---|---|---|
| Crane | 2,620 | 275 | 43% | 7.60 | 2.60 | 13% |
| Excavator | 2,620 | 275 | 70% | 6.50 | 3.61 | 18% |
| Truck | 8,042 | 300 | 57% | 5.60 | 8.49 | 43% |
| Tug | 240 | 350 | 68% | 13.32 | 0.84 | 4% |
| *subtotal* | | | | | 15.54 | 100% |

| **EQUIPMENT** | **HOURS** | **SPEED** | **VMT** | **NOX_EF g/mile (1)** | **NOX_TONS** | **PCNT** |
|---|---|---|---|---|---|---|
| Truck (HDDV8A) | 5,240 | 43 | 225,320 | 16.6 | 4.12 | 21% |
| Total | | | | | **19.66** | **100%** |

*(1) source: MOBILE6.2*

# DRAFT GENERAL CONFORMITY – RECORD OF NON-APPLICABILITY

Project/Action Name: Montauk Point Storm Damage Reduction Project

Project/Action Identification Number: N/A

Project/Action Point of Contact: Christopher Ricciardi, Project Archaeologist (917) 790-8630

Estimated Begin Date: January 2008

Estimated End Date: January 2010

General Conformity under the Clean Air Act, Section 176 has been evaluated for the project described above according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project/action because:

_X____ Total direct and indirect emission of from this project/action have been estimated that Ozone (NOx & VOC's) 19.66 tons are below the conformity threshold value established at 40 CFR 93.153(b) of 25 tons per year.

**AND**

The project/action is not considered regionally significant under 40 CFR 93.153(i).

Supporting documentation and emissions estimates are

( X ) ATTACHED

(  ) APPEAR IN THE NEPA DOCUMENTATION (*PROVIDE REFERENCE*)

(  ) OTHER ______________________________________.

SIGNED ___________________________________.

(*Frank Santomauro, Chief, Planning Division*)

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# APPENDIX H

# RESPONSE TO COMMENTS AND ECERRETRA

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As part of the Draft EIS process, comments were solicited from Federal, State, Local agencies as well as interested groups and individuals. What follows is a summary of the correspondences submitted to the Corps and a review of the Public Information Session.

Twenty-seven (28) letters were sent to the Corps. Of those, 9 were of an identical form letter; two others added an additional comment to the form letter.

The comments were grouped according to Federal, State, Local agency responses, groups and finally individuals. The letters are numbered from 01 to 27 and are presented in the format: L01, L02, L03, etc. Individual comments within a letter were assigned alphabetical letters. Therefore, when the notation on the letter is (for example) L10a, L10b, L10c, this means that it is the tenth letter and there are three different comments and/or questions.

The letters are presented as sent to the Corps, with this identification system marked. The responses are found preceding the letter and are in a similar format. The comment and/or question are summarized followed by the response.

A table summarizing the Public Information Session that was held on 19 September 2005 at the Montauk Point Fire House follows. There were five main questions, mirroring the types of comments and/or questions presented in the letters. Therefore, the comments and/or questions are highlighted and reference is made as to which letter response answers them. Therefore, if the response is "see L04a" this means that the reader should look to the answer section of Letter Number 04, question 1.

Finally, attached to one of the standardized form letters, from a teacher at East Hampton High School, is a form signed by thirty-eight (38) students stating that they agreed with the form letter submitted by their teacher. The signatures were on three separate pages, which are included after the general letters.

Several minor typographical changes were made to the DEIS Report itself. These changes included:

INTERNAL CHANGES:

Section 2.2.1 – Moving the Lighthouse. An additional sentence was added as the last sentence of the final paragraph in the section.

Section 4.2.4 – Erosion and Downdrift Sand Movement section added in.

Section 4.21.2 - Reasonably Foreseeable Future Actions – three paragraphs added after the introduction of the FIMP Project.

USACE NORTH ATLANTIC DIVISION COMMENTS:

1. The district should be prepared to select a Preferred Environmental Alternative when preparing the ROD.

The District concurs and the Preferred Environmental Alternative will be added to the ROD.

USACE HEADQUARTERS COMMENTS:

1. Study Authority. The feasibility report (pages 7 and 45) states that the U.S. Senate, Environment and Public Works Committee authorized the study. The DEIS (page *i* executive summary, page 3 DEIS, and page 1 of Appendix D) states that the U.S. House of Representatives, Environment and Public Works Committee authorized the study. Given that EPW is a Senate committee, it is likely that the Senate authorized the study. Verify study authority and revise report and EIS accordingly.

The District concurs and changes have been made on page i, page 3 and page 1 of Appendix D to reflect the Senate authorized this section of the study.

2. Table 3.

(a) Clean Water Act. This table on page 10 of the DEIS, notes that Nationwide Permit 12 would be issued for the project. It is unclear why NWP 12 (Utility Lines) would be required for this revetment project, because there is no discussion of utility line issues on the report or DEIS. Should utility line relocations or installations be required for the project, this statement should be re-worded to state that the project would be in compliance with the terms and conditions of NWP 12. Normally, the Corps does not issue permits to itself for Civil Works projects.

The District concurs and the reference to NWP 12 will be removed from Table 3.

(b) Clean Air Act. This table does not include a reference to the Clean Air Act. A statement concerning the status of compliance with the CAA should be provided. A statement of conformity for the CAA is found in Appendix G of the DEIS.

The District concurs and changes to Table 3 have been made to reflect the Clean Air Act Conformity Statement.

3. The second paragraph in Section 1.3 on page 4 of the EIS contains a sentence that starts with the phrase "The World Ware Two ear..." This typographical error should be corrected in the final report.

The District concurs and the typographical error has been corrected in Section 1.3, page 4.

DEPARTMENT OF THE INTERIOR COMMENT:

Page 44. The Montauk Point Lighthouse is not a National Landmark. It is listed on the National Register and on the State Register only. Please change the comment.

The Corps concurs and the change was made. However, it is also noted that the Montauk Lighthouse is considered of "National Significance" and is in the process of requesting listing as a National Landmark.

SURFRIDER FOUNDATION COMMENT:

Section 4.1 – ambiguous statement with regard to the proposed revetment wall – the last two sentences.

The Corps has updated the last two sentences of this first paragraph in Section 4.1

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Public Information Session – 19 September 2005 – Montauk Fire House, Montauk, New York

82 Individuals attended the meeting.

16 Individuals Spoke:

- 5 in support (Town of East Hampton, Montauk Historical Society (2), Surfer, Surfacsters)
- 11 not in support (Surfrider (7x), Homeowner (4x))

---

Support:

| | | |
|---|---|---|
| 1) | Good for economy and area | (1 person) |
| 2) | Good for fishing | (1 person) |
| 3) | Good for history of area | (2 people) |
| 4) | Good for surfing | (1 person) |

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Issues and Concerns Raised: (more than one person raised an individual issue)

1) Want the Lighthouse moved (8 people)

Response 1: See Response L05d:

2) Negative impacts to littoral drift and downdrift beaches (6 people)
  a. pg 60 of Feasibility Report – how is sand stabilized
  b. no talk of sand in the littoral drift
  c. pg 32 of EIS – plans must minimize impacts – but does not list the impacts
  d. F&WS says wait till FIMP – why not?
  e. revetment is the cause of the littoral drift problem

Response 2: See Response L05a and b:

3) Too many changes to wave reflection/refraction (4 people)
  a. wave modeling does not work
  b. wall just fine – not moving
  c. where are the "numbers" to prove what you are saying?
  d. pg 65 of EIS – no effect? How?

Response 03: See Response L05a and b:

4) Sets precedent for future shoreline hardenings (4 people)
  a. what will stop private landowners from hardening the shore?

Response 4: The Corps recommends individuals contact their particular regulatory agency for issues relating to regulations as to what an individual can and cannot do on their particular property.

5) Cannot trust anything the Corps of Engineers says or does (2 people)
(NOTE: with regard to the issue of the jetties at Lake Montauk/Culloden Point)

Response 5: These two comments were with regard to the Corps ongoing Lake Montauk Navigation and Shoreline Protection Project and not related to the Montauk Point Draft Environmental Impact Statement. Comments were referred to the Lake Montauk Project Delivery Team.

6) Access Road – which will be used? (1 person)

Response 6: See Response L06a

**New York State Office of Parks, Recreation and Historic Preservation**
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

Bernadette Castro
*Commissioner*

September 8, 2005

Dr. Christopher Ricciardi, EIS Coordinator
US Army Corps of Engineers-NY District
Planning Division-Environmental Branch
26 Federal Plaza, Room 2151
New York, NY 10278-0090

RE: Archeology Survey at the Montauk Point Light Station
Lake Montauk
Montauk, Suffolk County, NY
04PR04116 (formerly 02PR04111)

Dear Dr. Ricciardi,

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We received the Draft Environmental Impact Statement on August 22, 2005 and are reviewing the project in accordance with Section 106 of the National Historic Preservation Act of 1966 and relevant implementing regulations.

L01a Douglas Mackey of our archeology unit has reviewed the DEIS and concurs with the recommendations regarding archeology issues.

L01b We understand that moving the lighthouse was explored, but will not take place. We feel strongly that it should not be moved and are pleased that it is not being considered.

Please use the PR number of top of this letter when you refer to this project in future. If you or anyone involved with the project has any questions, please contact me at 518-237-8643, ext. 3252.

Sincerely,

Sloane Bullough

Sloane Bullough
Historic Sites Restoration Coordinator

Comments in Letter Number 01:

Sloane Bullough
Historic Sites Restoration Coordinator
The New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Service Bureau
Peebles, Island, P.O. Box 189
Waterford, New York 12188-0189

L01a: Concur with the archaeological findings and recommendations of the DEIS.

Response: Thank you with your concurrence. The District will coordinate with your Office on the specifics of the monitoring plan during the Plans and Specifications portion of the project.

L01b: "We understand that moving the lighthouse was explored, but will not take place. We feel strongly that it should not be moved and are pleased that it is not being considered."

Response: The District acknowledged the NYSOPRHP's strong opinion on this alternative.

**New York State Department of Environmental Conservation**
**Division of Air Resources**
**Bureau of Air Quality Planning, 2nd Floor**
625 Broadway, Albany, New York 12233-3251
**Phone:** (518) 402-8396 • **FAX:** (518) 402-9035
**Website:** www.dec.state.ny.us

Denis M. Sheehan
Acting
Commissioner

October 4, 2005

Dr. Christopher Ricciardi
EIS Coordinator
U.S. Army Corps of Engineers - NY District
Planning Division - Environmental Branch
26 Federal Plaza, Room 2151
New York, New York 10278-0090

Dear Dr. Ricciardi:

The New York State Department of Environmental Conservation (Department) has reviewed the Draft Environmental Impact Statement (DEIS) for the Montauk Point Storm Damage Reduction Project. The comments being submitted by the Department pertain to the project-related emissions in Appendix G: Clean Air Act Air Conformity Statement.

L02a

According to statement of conformity, the preliminary construction equipment emissions during the two-year project duration (2002 and 2003) will be below the General Conformity trigger levels. However, in order to ascertain this finding of conformity, the Department will need to know the number and age of each equipment type that will be utilized in the construction or maintenance of the stone revetment alternative. Additionally, the assumed truck (HDDV8A) speed of 43 mph operating within the project parameter appears to be unrealistic. Since construction related vehicles are expected to be slow-moving within the project area, a conservative truck speed of 10 mph is recommended. If these trucks will be idling during material loading and unloading, the associated idling emissions need to included in the analysis. It is also recommended that the conformity findings be based on 2008 and 2009 analysis years since the conformity determination needs to contemporaneous with project activity, estimated to begin in January 2008 and ends in January 2010.

I would like to thank you for the opportunity to review the DEIS; and if you have any questions, please contact Denny Escarpeta at (914) 332-1835, Ext. 352.

Sincerely,

Matthew J. Ries For JR

James Ralston, P.E.
Director
Bureau of Air Quality Planing
Division of Air Resources

cc: Mike Moltzen USEPA/ Region 2
Denny Escarpeta - DEC
Kevin McGarry - DEC

Comments in Letter Number 02:

Jim Ralston, Director
Bureau of Air Quality Planning
NYS Department of Environmental Conservation
Division of Air Resources
625 Broadway
Albany, NY 12233-3251

L02a: Issues of Air Quality Analysis:

- a) The number and age of each piece of equipment needs to be provided
- b) Include maintenance in your calculations
- c) Recalculate truck speed from 43mph to 10mph
- d) Calculate using truck idling speed and time
- e) Base findings on Year 2008 and 2009 not 2002 and 2003

Response: The Corps concurs with your findings. Since this report is only a preliminary assessment, the Air Conformity Statement will be updated and submitted for approval during the Plans and Specifications stage of the project. During this stage, which occurs approximately one and a half years prior to the proposed construction, more specific and detailed information will be available that addresses the concerns raised. However, due to Corps contracting practices and regulations, the report will not be able to take into account the specific age of the vehicles to be used during construction.

Additionally, we would like to discuss these comments at our meeting on the 19 of October as they relate to not only Montauk Point specifically, but the overall Civil Works Program.

United States Department of the Interior

TAKE PRIDE IN AMERICA

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
408 Atlantic Avenue – Room 142
Boston, Massachusetts 02210-3334

October 11, 2005

ER 05/751

Dr. Christopher Ricciardi
Environmental Impact Statement Coordinator
U.S. Army Corps of Engineers, New York District
26 Federal Plaza Room 2151
New York, New York 10278-0090

Dear Dr. Ricciardi:

The Department of the Interior (Department) has reviewed the Draft Feasibility Report and Draft Environmental Impact Statement (DEIS) for the Montauk Point Storm Damage Reduction Project, Suffolk County, New York. The Department commends the U.S. Army Corps of Engineers (Corps) for addressing the cumulative impacts of the action and implementing the conservation recommendations resulting from the U.S. Fish and Wildlife Service's Fish and Wildlife Coordination Act Section 2(b) Report, dated July 2003. However, several concerns remain and are addressed in the comments that follow.

L03a On page 44 (DEIS), the Montauk Point Lighthouse is referred to as being a National Historic Landmark (NHL). While it is listed on the National Register of Historic Places and on the comparable State Register, we have been unable to verify its designation as an NHL.

L03b We are also concerned about the two staging areas to be used for conducting the project. The proposed Access Road #1 and Staging Area #1 appears to be located within the Town of East Hampton (Town) park called Turtle Cove. Turtle Cove was deeded to the Town to be used for park and recreational purposes, in perpetuity. The Federal Lands to Parks Program of the National Park Service (NPS) retains oversight for the appropriate use of the site.

L03c The Corps is aware that NPS has considered reverting the park; relevant NPS correspondence is included in the DEIS, Appendix B. The revised DEIS or Final EIS (FEIS) should recognize that ownership of the park may change.

L03d The project as described may impact recreational use and accessibility, particularly in the area of the park known as Turtle Cove. The revised DEIS or FEIS must include a description of impacts to recreation and accessibility, and how the Corps intends to ameliorate these impacts. The revised DEIS or FEIS must clearly describe how the Corps will comply with the Americans with Disabilities Act (ADA) for the duration of the project.

L03e The anticipated recreational use conflicts will be especially acute during the fishing season from September to November. The revised DEIS or FEIS needs to clearly describe how the Corps will balance overall traffic with construction and construction equipment, and comply with ADA.

L03f The Corps' proposed Staging area #1 (presently the Turtle Cove "parking area") was apparently left after a U.S. Coast Guard erosion control project in the 1990s. The creation of this "parking area" is not in conformance with the Program of Utilization currently on file for the site. We are currently assisting the Town of East Hampton in its preparation of environmental documentation to determine whether access and use of this area by vehicles is environmentally supportable.

L03g The DEIS needs to be revised to clarify that if it is determined that the parking area is not environmentally supportable, how the Corps will remove it and restore the beach to a more natural condition when the proposed project is complete.

For further information and questions regarding these comments, please contact Elyse LaForest, Program Manager, Federal Lands to Parks Program, (617) 223-5190.

Thank you for the opportunity to review and comment on this project.

Sincerely,

*Andrew L. Raddant* /s/
Regional Environmental Officer

Comments in Letter Number 3:

Andrew L. Raddant, Regional Environmental Officer
U.S. Department of the Interior
Office of Environmental Policy and Compliance
408 Atlantic Avenue – Room 142
Boston, MA 02210-3334

Comment L03a: The Lighthouse is not a National Landmark, but only on the National Register.

Response L03a: The Lighthouse is in the process of being named a National Landmark, but the FEIS will be changed to reflect that it is only on the Register at this time.

Comment L03b: Issues of Staging Area #1/Access Road #1

Response L03b: At this time, the area in question is owned and maintained by the Town of Easthampton. The Town is fully aware of the proposal. Final determination for access and staging will be made during the Plans and Specification portion of the project. All interested user groups will be invited to participate to insure that the short term construction period only impacts are minimized.

Comment L03c: The FEIS should recognize that the National Park Service may take control of Turtle Cover.

Response L03c: Although this may be true, at this time Turtle Cove is owned and controlled by the Town of East Hampton. If during the Project's duration the disputed area in question is transferred the Corps will coordinate with whomever is the property owner at that time.

Comment L03d: The EIS must reflect the impacts to recreation at Turtle Cove and how the project will comply with the Americans with Disabilities Act.

Response L03d: The EIS takes into account the short term impacts that will be caused during construction only. However, there will be no long term impacts to recreation at the Lighthouse, Montauk State Park or Turtle Cove. Since the Project's design does not call for a pedestrian walkway, the ADA does not apply to the reinforcing of the existing stone revetment wall.

Comment L03e: The construction project will conflict with fishing. How will this be handled as well as comply with the Americans with Disabilities Act?

Response L03e: With regard to the Americans with Disabilities Act please refer to Response L03d. Coordination has been ongoing with the Montauk Surfactsers Association throughout the EIS Process. Please refer to the Coordination section for information on this subject. Note also, Letter 06 from the Surfcasters in which they support the recommended alternative.

Comment L03f: NPS and the Town of East Hampton are preparing environmental documentation with regard to the "parking area" near the proposed Staging Area #1.

Response L03f: The Corps requests a copy of this report upon its completion.

Comment L03g: The Corps needs to clarify how it will change the "parking lot" back into a beach.

Response L03g: As per Corps regulation and guidance, the project will return whatever may be affected during construction to whatever condition it was prior to the beginning of the process. If the current property owner, the Town of East Hampton, would like the area changed, that would have to be coordinated and agreed upon by all parties. Funding for this change in the current condition to something else may be subjected to alternative funding that may not be considered a Federal responsibility. This issue, if so desired by the Town will require further coordination and policy review.

**Natural Resources**
**Environmental Protection Department**
**300 Pantigo Place – Suite 107**
**East Hampton, New York 11937-2684**
(631) 324-0496
Fax: (631) 324-1476
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October 4, 2005

Dr. Christopher Ricciardi EIS Coordinator
USACE New York District
Planning Division, Environmetal Branch
26 Federal Plaza, Room 2151
New York, NY 10278-0090

Dear Dr. Christopher Ricciardi,

Please find attached the Natural Resources Department's comments on the DEIS for the Montauk Lighthouse. When we have the new survey showing the recently GPS-ed lines for east Montauk's ocean bluff crests and toes, we'll send it along for your information, should you be interested.

Sincerely,

Larry Penny
Bob Masin

Attach.

# COMMENTS, DRAFT ENVIRIONMENTAL IMPACT STATEMENT MONTAUK POINT, NEW YORK, STORM DAMAGE REDUCTION PROJECT

By Larry Penny, Environmental Protection Director
Bob Masin, Environmental Analyst

(Herein are the comments of the Natural Resources Department, Town of East Hampton, East Hampton, N.Y. 11937)

In general the DEIS of August 2005 covers the potential impacts quite well. Because very little of the research was original, the picture painted by the DEIS is rather thin, but, nonetheless, acceptable.

## Conceptualization: Revetment Drawings

L04a

The drawings depicting the proposed revetment in the DEIS could be amended in order to give the public a better idea of what the eventual structure will look like. The current drawings do not give the reader a clear understanding of how this structure will look in comparison to the present revetment. I believe this has created some confusion in the public's mind as to whether this structure will or will not be beneficial. The clearer this portrayal is, the less confusion there will be overall. Perhaps a three dimensional model or artists rendering would help to better depict the proposed revetment.

## Topography, Geology and Soils

The outstanding reference on these features is the USGS study of the Montauk Peninsula, ca. 1986. The Natural Resource Department has been studying the recession rates of the bluff during the last 75 years (beginning with the USCGS map (from vertical photos) of 1933), combining the study of a variety of vertical photo sets, including three ortho-rectified photomap sets, and topographic and plane surveys, and in the field mapping, primarily by GPS. The US Corps carried out a LIDAR study of the bluffs, beaches and ocean bottom (to closure) between Montauk Point and the downtown center of the hamlet of Montauk (Grosskopf et al, 2001). The most recent of our surveys—of bluff crest, bluff toe—was carried out by land surveyor, William Walsh, with sub-centimeter GPS equipment.

The results of these various mapping studies indicate that during the last 30 years the ocean bluffs and ocean shoreline in the stretch between the lighthouse and downtown Montauk (south of Fort Pond) have been receding at a rate of more than 1.5 feet a year, with a high of 3.5 feet and a low of less than 0.5 feet. Interestingly, Turtle Cove, itself, except on the east edge (perhaps, because it is in the shadow of the lighthouse armament) has receded very little during this time span. However, the bluffs immediately west of Turtle Cove (fronting Camp Hero) have been receding at more than 2 feet per year.

The recession of the unarmored stretch of east-west trending bluff-line northward is attributable to two influences: water and waves acting on the toe and groundwater seeping out along the face of the bluff.

## Regional Hydrology

The regional hydrology is covered very thoroughly in the USGS Montauk Peninsula study and, except for the seeping out of the bluff face and runoff over the bluff top, has little to do with the Montauk Point Lighthouse situation. Obviously, strengthening the point's armament, whether the lighthouse remains in its place or is moved back, water seeping through and down the ocean-facing slope will reduce the lighthouse's expected shelf life. Handling this "loose" water as has been done by Georgiana Reed in the distant past and subsequent contractors, has to be part of any overall mitigation project to preserve the lighthouse.

## Surface Water and Tidal Influence

The surface water is of high quality (as the DEIS points out). Its chief consideration in terms of defending the lighthouse is its trajectory and velocity during times of flood tides and storms. The DEIS takes such into consideration in terms of the size of the revetment needed in one of the mitigation alternatives outlined.

## Adjacent Shoreline

Impacts to adjacent shore areas are not addressed as thoroughly as is possible. Data concerning any long-term effects a larger, longer revetment may have on adjacent shoreline directly to the north and south of the proposed revetment would be helpful. This information simply is not

04b present in the DEIS. It would be helpful to have some estimates concerning any loss or accretion of material that may occur along these shoreline areas in years to come. A depiction of how these shorefront areas may be re-shaped by changing currents moving along the larger revetment should be depicted. I believe this body of work is somewhat lacking in the DEIS and can be studied further.

**Ecological Communities**

The ecological communities involved are obviously not described based on *in situ* studies for they leave out many species (e.g., purple snail, Thais sp.) and include many (Mya arenaria) that are not there. Dr. Liddle's observation is partially correct, it is the only natural rocky intertidal on the Atlantic Coast of Long Island, but there are numerous rocky intertidals along the Long Island Sound and its embayments as well as some in the Peconic Estuary (e.g., Gardiners Island, Robins Island). Unfortunately, the marine macrophyte community and the subtidal summer fish fauna of Montauk Point has never been thoroughly described. Among the fishes are a number of subtropicals (file fish, etc.) taking advantage of the "kelp forest" that populates the deeper part of the subtidal.

**Endangered Species**

Four federally listed species, roseate tern, piping plover, sandplain gerardia, and seabeach amaranth, are found reproducing in East Hampton Town. However, no federally endangered or threatened species of plants or animals are resident to Montauk Point. Three listed state species frequent the site area: Dragon's Tongue Orchid (Arethusa), seabeach knotweed (Polygonum), and southern arrowwood (Viburnum). A reptile deemed rare in New York State, the spotted turtle, also occurs here. None of these species would be harmed by reveting or lighthouse-moving activities associated with the proposed project's alternatives as they are not found in the immediate vicinity of the point.

**Socioeconomic Considerations**

The most important socioeconomic considerations are the lighthouses's historical importance and its status as a mecca for tourists visiting Long Island. Whether the lighthouse stays in its present spot or is moved, it will always be a treasure in this regard. Secondly, the lighthouse and its immediate environs are used by hikers, sightseers and other recreationists. The most important recreation over the years is saltwater fishing which dates back to the pre-World War II years. The point has always been a stop on the annual late summer-fall migration of striped bass, bluefish and other coastal fish moving southerly, feeding as they go. Just as migratory songbirds, hawks, dragonflies and butterflies use the upland portion of the point as a stopping off place during migration, the fast-swimming marine fish do the same.

Intertidal and subtidal revetments are a rock-reef analog and as such supports a variety of epifauna and epiflora, as well as watery nooks and crannies for a variety of free-swimming invertebrates and fish. It is hard to imagine how a larger revetment would in any way diminish the amount of fish stocks using the point, either as a residency or during migration.

Surfing is a new recreational activity and it remains to be seen if the proposed revetment alternative, if implemented, will affect the wave patterns that are most favored by surfers. Rock-reef areas such as those at Half Moon Bay south of San Francisco and the west side of Santa Rosa Island, part of the Channel Islands on the perimeter of the Santa Barbara Channel have large standing waves attendant to them which have been enjoyed by surfers. It is doubtful whether a rebuilt rock revetment will negatively impact the pattern of the waves hitting Turtle Cove, as the waves will continued to be refracted around the point.

L04c

In conclusion it would seem that the less costly alternative, rebuilding the revetment and keeping the lighthouse in its present spot is the best alternative. Such rebuilding is expected to have very little negative impact, if any, on the site's environment.

Comments in Letter Number 04:

Larry Penny, Director and Bob Masin, Environmental Analyst
Natural Resources – Environmental Protection Department
Town of East Hampton
300 Pantigo Place – Suite 107
East Hampton, New York 11937-2684
(631) 324-0496

Comment L04a: Perhaps more clearly defined drawings of the current and proposed revetment wall can be included in the report?

Response L04a: Concur. We are separately providing all requesting agencies, organizations and individuals with larger scale drawings and we will send a copy to your office.

Comment L04b: Can the report comment more on the downdrift and littoral processes?

Response L04b: At the recent public information session, the Corps representatives agreed to develop additional explanation for the Feasibility Report regarding the potential project effects on coastal and littoral processes. The following explanation, though lengthy, provides a fairly simple, yet thorough, discussion regarding the coastal and littoral process considerations involved in the plan formulation evaluation.

Coastal Processes. The proposed project alternative to protect Montauk Point will essentially continue the coastal process impacts of the 1992-1993 revetment over the 50 year planning horizon. The effects on coastal processes at the Point from the man made intervention date back nearly 60 years. Shoreline erosion rates are a function of many factors including the type of material at each shoreline location, total mass of material at each location, and the wave energy impinging upon it. The Long Island shoreline both north and south of Montauk Point consists of a series of concave and convex shoreline reaches, indicating a variation in erodability alongshore. Historic shoreline mapping shows that the 1870, 1933 and 1938 shorelines, preceding construction of revetments at Montauk Point in the 1940's, all have an indentation at Turtle Cove, similar to the shoreline shape that exists now. This indicates that the Turtle Cove reach erodes at a faster rate than the point, and that this indented curvature was not caused by construction of the revetment. Shorelines also show that the Atlantic shore west of the point has been generally erosive over the 1870-1995 period. The existing and the proposed revetment alternative will act to hold or anchor the eastern most end of the Turtle Cove area. While the proposed revetment alternative will continue to limit the coastal erosion at the Point protecting the Lighthouse complex, forces such as the tidal currents and waves will continue to erode the north and south downdrift shores continuing the curvature process, especially immediately adjacent to the revetment.

Downdrift Effects. The erosion of the areas just west of the Point tends to make up for the material covered by the existing revetment that is prevented from entering the littoral system. Since the proposed revetment alternative will extend over virtually the same lineal extent of the shoreline as the existing revetment, the proposed revetment will continue this trend. The effect of both the existing revetment and the proposed revetment on the downdrift, unprotected shoreline is to reduce the amount of sand moving alongshore by a small amount estimated to be approximately 3,000 cy/yr for the south shore. The sediment deficit would tend to increase the erosion rate of shoreline immediately adjacent to the revetment by a similar increment, over a short distance downdrift. Shoreline change mapping for the Turtle Cove area shows approximately a 2-ft/yr increase in retreat rate in the post-revetment period (1938-to 1995) as compared to the pre-revetment period (1870-1938), which may be due in part to the construction of the existing revetment, as well as to all other factors contributing to shoreline erosion. Indications from the shoreline change mapping are that any sediment deficits caused by the revetment are made up within approximately 2,500 feet of the end of the structure, at which point the shorelines changes to one of fluctuation of erosion and accretion. Shorelines north of the existing revetment have a similar response, which would continue with the proposed structure in place. At the same time, the relative impact of the small amount of reduced littoral material due to the revetment also diminishes because the net amount of littoral material moving westerly along the shores gradually increases as the waves and currents act upon the more westerly shores.

The curvature of the immediately downdrift or westerly shore areas will continue but will not pinch off or cause flanking of the protected area during the 50 year project evaluation period. It is also likely that as the curved recession due to waves and currents continues, there would be a tendency toward stabilization as the landform adjusts to the prevailing coastal forces. Subject to the occurrence of future storm events, the rate of erosion observed in relatively recent years could be somewhat reduced.

The following paragraphs give an indication of the volumes of littoral material involved in determining downdrift impacts of the project:

Contribution to Littoral Drift. Erosion of bluffs and beach fronting the Montauk Lighthouse does contribute a small amount of material to the littoral drift that moves along the Atlantic shore southwest of the lighthouse as well as along the Block Island Sound shore northwest of the lighthouse. Based on measurement over the period of record (1868-1993) the average annual erosion rate of bluff and beach as stated in the Feasibility Report, is estimated at 6 cubic yards per year per foot of shoreline. This average includes periods of time when the bluff was covered by a revetment, as well as prior to the construction of protective works. As such, this long-term average is a reasonable estimate for shoreline loss for periods of time covering conditions when the protective works are intact and limit loss, and periods of time when the protective works have lost integrity, resulting in greater amounts of erosion.

The proposed revetment covers approximately 840 linear feet of shoreline, which is virtually identical to the length of the existing revetment. Using the long-term erosion rate of 6 cubic yards(cy) per linear foot per year, approximately 5,000 cy of material can be assumed lost from the beach and bluff per year. Note that the material comprising the bluff is a mix of sand, gravel, and silt, based on boring logs. Some percentage of the eroded material is lost to the net longshore sand transport as it is either too fine, or too coarse. This percentage could be in the 10-30% range, but for this discussion no reduction has been taken for loss of fines or coarse material to the quantity of sediment transport.

The estimated volume of material per year will move either northwest or southwest of the point, except for some finer sediment moved permanently offshore or larger material that settles out. Based on the shape of the point and the length of the revetment, approximately 60% of the eroded material can be expected to move southwest, and approximately 40% can be expected to move northwest, i.e. approximately 3,000 cy/year will be contributed to the littoral drift along the Atlantic shore and approximately 2,000 cy/year along the Block Island Sound shore from the revetted shoreline. The shores to the northwest and southwest tend to make up for the effects of the revetment by contributing substitute littoral material over a relatively short distance downdrift.

For comparative purposes along the Atlantic shore, sediment budget estimates of the net longshore sand transport rate moving westward at Ditch Plains is approximately 70,000 cy per year. At the Montauk beaches, the net longshore transport rate increases to approximately 100,000 cy/yr. There is considerable uncertainty in sediment budget calculations, such that the given amount may differ by +/-40,000 cy/yr. Effects of both the existing structure at Montauk and the proposed structure on the littoral sand transport are small and are expected to be local, i.e. are not likely to extend as far alongshore to developed areas such as Ditch Plains or more developed points further west, especially in view of the variable shoreline shape and materials in between.

The amount of material that would be contributed downdrift if the proposed revetment alternative was not constructed is very small relative to the total sediment budget and this small amount is added back by some equally minor increase in erosion, a relatively short distance west of the revetment. Any adverse impacts from the proposed revetment alternative are not considered to be significant, and would not materially effect areas being considered for protection under the Fire Island Inlet to Montauk Point Reformulation Study.

Surfing Effects. There is a revetment in place at Montauk Point now, and the surfing is considered to be good. The proposed revetment will be in the same place as the existing revetment, made of similar rock material, and will be similar to it in all particulars which might effect waves. As shown in the Feasibility Report, Table 10, and discussed in Section 4.0 – Recreation, wave reflection coefficients are estimated at 13-19 percent less for the proposed revetment alternative than for the existing revetment. The proposed plan will not change wave conditions in any perceivable way.

Comment L04c: In conclusion it would seem that the less costly alternative, rebuilding the revetment and keeping the lighthouse in its present spot is the best alternative. Such rebuilding is expected to have very little negative impact, if any, on the site's environment.

Response L04c: We acknowledge your concurrence with the DEIS.

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

October 3, 2005

Dr. Christopher Ricciardi
EIS Coordinator, U.S. Army Corp of Engineers, New York District
Planning Division-Environmental Branch
26 Federal Plaza- Room 2151
New York, NY 10278-0090

**Re: Montauk Point Storm Damage Reduction Project Draft Environmental Impact Statement (EIS)**

Dear Dr. Ricciardi:

The mission of The Nature Conservancy is to preserve plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. The Long Island Nature Conservancy is working with the Corp on the shared goal of developing an innovative approach to the Fire Island to Montauk Point (FIMP) project "that will reduce risks to human life and property, while maintaining, enhancing, and restoring ecosystem integrity, natural coastal processes and coastal biodiversity." Therefore, we have particular concerns about any interim activities that impact ecosystem integrity within this area.

The following are the comments of the Long Island Nature Conservancy to the Montauk Point Draft EIS:

L05a

1) **Segmentation:** Although this project originates from a separate authorization, we believe that any action taken at Montauk Point should be part of the Fire Island to Montauk Point Reformulation Study (FIMP). It has consistently been our position that the Long Island coastal system is a dynamic and inter-related system that should be addressed by a comprehensive, and long-term regional strategy for the 83 mile portion of the south shore of Suffolk County, Long Island. Moreover, the danger to the lighthouse is not imminent and there is no reason to proceed with this project, within the FIMP boundaries, before FIMP. Segmentation of the Montauk Point project will only address the environmental issues of a small segment of the FIMP study area and may preclude FIMP alternatives in the future.

L05b

2) **Tidal influences:** page 29 states that tidal currents off of Montauk Point are generally strong and 'are strong enough to affect littoral processes." However, there is no discussion in the draft EIS on how this project would impact the littoral process or the natural coastal processes of the FIMP system. Moreover, the impacts of this action upon the larger system must be better quantified.

L05c

3) **Bluffs:** page 31 states that there are "steep coastal bluffs around Montauk Point to the north, east and south" and that "bluff erosion can act as a sand supply for the beach." Moreover, the draft EIS recognizes that the processes influencing bluff erosion include "intervention in natural erosion and sediment supply processes." However, the EIS does not then answer the important

question of what impact the proposed action would have on littoral processes. Moreover, it is not clear whether the project would create more erosion of other bluffs due to changes in the littoral processes or the absence of sand supply resulting from the stabilization at the Point.

L05d

4) **Moving the Lighthouse:** This alternative is not given enough consideration. The consideration of this alternative is premised on the unsupported conclusion that the lighthouse would have to remain at its present elevation. However, although the lighthouse may have a symbolic or sentimental appeal, its navigational functions have long since been the primary function. In fact, this is clearly evidenced by the fact that the lighthouse is no longer owned or operated by the U.S. Coast Guard and the light and fog horn have both been dramatically reduced in recent years. Therefore, given the reality of sea level rise and the challenges this will pose in the future, we believe that this alternative should be given much more careful evaluation.

Thank you for the opportunity to comment. Please feel free to contact me anytime.

Sincerely,

Scott M. Cullen
Coastal Conservation Director

Comments in Letter Number 05:

Scott M. Cullen
Coastal Conservation Director
The Nature Conservancy

Comment L05a: 1) Segmentation: Although this project originates from a separate authorization, we believe that any action taken at Montauk Point should be part of the Fire Island to Montauk Point Reformulation Study (FIMP). It has consistently been our position that the Long Island coastal system is a dynamic and inter-related system that should be addressed by a comprehensive, and long-term regional strategy for the 83 mile portion of the south shore of Suffolk County, Long Island. Moreover, the danger to the lighthouse is not imminent and there is no reason to proceed with this project, within the FIMP boundaries, before FIMP. Segmentation of the Montauk Point project will only address the environmental issues of a small segment of the FIMP study area and may preclude FIMP alternatives in the future.

Response L05a: The Fire Island Inlet to Montauk Point Project, which was authorized in 1960 based a report in 1958, did not include protective works at Montauk Point. It is likely that the Congress was cognizant of that when it authorized a separate study for the protection of Montauk Point.

The Fire Island to Montauk Point Reformulation Study is premised on the existence of the present revetment at Montauk Point that was constructed by the U.S. Coast Guard and the Montauk Historical Society in 1992-1993. In the absence of a project decision at the Point, the Reformulation Study has assumed that local interests would likely maintain some form of the present revetment for the foreseeable future and there is no reason to expect it to be removed. Accordingly, the FIMP Reformation Study has conservatively estimated that no littoral material is generated into the south shore of Long Island littoral system from the Montauk Point area that is protected by the existing revetment. The small amount of material that potentially could enter the south shore littoral system upon the failure of the existing revetment would not significantly affect the evaluation of without and with-project alternatives in the FIMP Reformulation Study. With regard to coastal and littoral processes, the revetment selected for a potential Montauk Point Storm Damage Reduction Project would tend to continue the effects of the existing revetment and the nearly 60 year history of efforts to reduce erosion. These effects are small and diminish with distance from the revetment well before, or east of, any area where the FIMP Reformulation Study would be evaluating protection measures.

In summary, the proposed alternative has independent utility and does not foreclose any alternatives being considered under the FIMP Reformulation Study. If the Montauk Point Feasibility Report is approved and the proposed alternative is recommended for construction, the FIMP Reformulation Study will include analysis of this project in its cumulative effects analysis.

Comment L05b: Tidal influences: page 29 states that tidal currents off of Montauk Point are generally strong and 'are strong enough to affect littoral processes." However, there is no discussion in the draft EIS on how this project would impact the littoral process or the natural coastal processes of the FIMP system. Moreover, the impacts of this action upon the larger system must be better quantified.

Response L05b: At the recent public information session, the Corps representatives agreed to develop additional explanation for the Feasibility Report regarding the potential project effects on coastal and littoral processes. The following explanation, though lengthy, provides a fairly simple, yet thorough, discussion regarding the coastal and littoral process considerations involved in the plan formulation evaluation.

Coastal Processes. The proposed project alternative to protect Montauk Point will essentially continue the coastal process impacts of the 1992-1993 revetment over the 50 year planning horizon. The effects on coastal processes at the Point from the man made intervention date back nearly 60 years. Shoreline erosion rates are a function of many factors including the type of material at each shoreline location, total mass of material at each location, and the wave energy impinging upon it. The Long Island shoreline both north and south of Montauk Point consists of a series of concave and convex shoreline reaches, indicating a variation in erodability alongshore. Historic shoreline mapping shows that the 1870, 1933 and 1938 shorelines, preceding construction of revetments at Montauk Point in the 1940's, all have an indentation at Turtle Cove, similar to the shoreline shape that exists now. This indicates that the Turtle Cove reach erodes at a faster rate than the point, and that this indented curvature was not caused by construction of the revetment. Shorelines also show that the Atlantic shore west of the point has been generally erosive over the 1870-1995 period. The existing and the proposed revetment alternative will act to hold or anchor the eastern most end of the Turtle Cove area. While the proposed revetment alternative will continue to limit the coastal erosion at the Point protecting the Lighthouse complex, forces such as the tidal currents and waves will continue to erode the north and south downdrift shores continuing the curvature process, especially immediately adjacent to the revetment.

Downdrift Effects. The erosion of the areas just west of the Point tends to make up for the material covered by the existing revetment that is prevented from entering the littoral system. Since the proposed revetment alternative will extend over virtually the same lineal extent of the shoreline as the existing revetment, the proposed revetment will continue this trend. The effect of both the existing revetment and the proposed revetment on the downdrift, unprotected shoreline is to reduce the amount of sand moving alongshore by a small amount estimated to be approximately 3,000 cy/yr for the south shore. The sediment deficit would tend to increase the erosion rate of shoreline immediately adjacent to the revetment by a similar increment, over a short distance downdrift. Shoreline change mapping for the Turtle Cove area shows approximately a 2-ft/yr increase in retreat rate in the post-revetment period (1938-to 1995) as compared to the pre-revetment period (1870-1938), which may be due in part to the construction of the existing revetment, as well as to all other factors contributing to shoreline erosion. Indications from the shoreline change mapping are that any sediment deficits caused by the revetment are made up within approximately 2,500 feet of the end of the structure, at which point the shorelines changes to one of fluctuation of erosion and accretion. Shorelines north of the existing revetment have a similar response, which would continue with the proposed structure in place. At the same time, the relative impact of the small amount of reduced littoral material due to the revetment also diminishes because the net amount of littoral material moving westerly along the shores gradually increases as the waves and currents act upon the more westerly shores.

The curvature of the immediately downdrift or westerly shore areas will continue but will not pinch off or cause flanking of the protected area during the 50 year project evaluation period. It is also likely that as the curved recession due to waves and currents continues, there would be a tendency toward stabilization as the landform adjusts to the prevailing coastal forces. Subject to the occurrence of future storm events, the rate of erosion observed in relatively recent years could be somewhat reduced.

The following paragraphs give an indication of the volumes of littoral material involved in determining downdrift impacts of the project:

Contribution to Littoral Drift. Erosion of bluffs and beach fronting the Montauk Lighthouse does contribute a small amount of material to the littoral drift that moves along the Atlantic shore southwest of the lighthouse as well as along the Block Island Sound shore northwest of the lighthouse. Based on measurement over the period of record (1868-1993) the average annual erosion rate of bluff and beach as stated in the Feasibility Report, is estimated at 6 cubic yards per year per foot of shoreline. This average includes periods of time when the bluff was covered by a revetment, as well as prior to the construction of protective works. As such, this long-term average is a reasonable estimate for shoreline loss for periods of time covering conditions when the protective works are intact and limit loss, and periods of time when the protective works have lost integrity, resulting in greater amounts of erosion.

The proposed revetment covers approximately 840 linear feet of shoreline, which is virtually identical to the length of the existing revetment. Using the long-term erosion rate of 6 cubic yards(cy) per linear foot per year, approximately 5,000 cy of material can be assumed lost from the beach and bluff per year. Note that the material comprising the bluff is a mix of sand, gravel, and silt, based on boring logs. Some percentage of the eroded material is lost to the net longshore sand transport as it is either too fine, or too coarse. This percentage could be in the 10-30% range, but for this discussion no reduction has been taken for loss of fines or coarse material to the quantity of sediment transport.

The estimated volume of material per year will move either northwest or southwest of the point, except for some finer sediment moved permanently offshore or larger material that settles out. Based on the shape of the point and the length of the revetment, approximately 60% of the eroded material can be expected to move southwest, and approximately 40% can be expected to move northwest, i.e. approximately 3,000 cy/year will be contributed to the littoral drift along the Atlantic shore and approximately 2,000 cy/year along the Block Island Sound shore from the revetted shoreline. The shores to the northwest and southwest tend to make up for the effects of the revetment by contributing substitute littoral material over a relatively short distance downdrift.

For comparative purposes along the Atlantic shore, sediment budget estimates of the net longshore sand transport rate moving westward at Ditch Plains is approximately 70,000 cy per year. At the Montauk beaches, the net longshore transport rate increases to approximately 100,000 cy/yr. There is considerable uncertainty in sediment budget calculations, such that the given amount may differ by +/-40,000 cy/yr. Effects of both the existing structure at Montauk and the proposed structure on the littoral sand transport are small and are expected to be local, i.e. are not likely to extend as far alongshore to developed areas such as Ditch Plains or more developed points further west, especially in view of the variable shoreline shape and materials in between.

The amount of material that would be contributed downdrift if the proposed revetment alternative was not constructed is very small relative to the total sediment budget and this small amount is added back by some equally minor increase in erosion, a relatively short distance west of the revetment. Any adverse impacts from the proposed revetment alternative are not considered to be significant, and would not materially effect areas being considered for protection under the Fire Island Inlet to Montauk Point Reformulation Study.

Surfing Effects. There is a revetment in place at Montauk Point now, and the surfing is considered to be good. The proposed revetment will be in the same place as the existing revetment, made of similar rock material, and will be similar to it in all particulars which might effect waves. As shown in the Feasibility Report, Table 10, and discussed in Section 4.0 – Recreation, wave reflection coefficients are estimated at 13-19 percent less for the proposed revetment alternative than for the existing revetment. The proposed plan will not change wave conditions in any perceivable way.

Comment L05c: Bluffs: page 31 states that there are "steep coastal bluffs around Montauk Point to the north, east and south" and that "bluff erosion can act as a sand supply for the beach." Moreover, the draft EIS recognizes that the processes influencing bluff erosion include "intervention in natural erosion and sediment supply processes." However, the EIS does not then answer the important question of what impact the proposed action would have on littoral processes. Moreover, it is not clear whether the project would create more erosion of other bluffs due to changes in the littoral processes or the absence of sand supply resulting from the stabilization at the Point.

Response L05c: Please see Response L05b.

Comment L05d: Moving the Lighthouse: This alternative is not given enough consideration. The consideration of this alternative is premised on the unsupported conclusion that the lighthouse would have to remain at its present elevation. However, although the lighthouse may have a symbolic or sentimental appeal, its navigational functions have long since been the primary function. In fact, this is clearly evidenced by the fact that the lighthouse is no longer owned or operated by the U.S. Coast Guard and the light and fog horn have both been dramatically reduced in recent years. Therefore, given the reality of sea level rise and the challenges this will pose in the future, we believe that this alternative should be given much more careful evaluation.

Response L05d: The moving of the Lighthouse was given considerable weight during the Feasibility phase of the project. However, several factors contributed to the decision not to make this proposal the preferred alternative. They included: a) the overall cost of the alternative b) the engineering requirements of having to build up land to meet the hill of Montauk Point to create a level moving surface, c) the destruction of a National Register Landmarked complex - by moving it, the setting is destroyed thus violating the spirit of the National Historic Preservation Act of 1966, as amended, d) the loss of value to the Town of Easthampton, Montauk Point and Montauk Point State Parks, as several hundred thousand visitors come to this area each year, in part to see "the end", i.e. Montauk Point Lighthouse, e) the New York State Office of Parks, Recreation and Historic Preservation (see Letter Number 01), the Regulatory Agency that would have to approve any move of a National Register structure has already stated, and has done so throughout the entire process, that they would not approve the moving of the Lighthouse, which would lead to the destruction of the Lighthouse complex area.

Additionally, while the Montauk Historical Society maintains the lighthouse complex, the U.S. Coast guard still operates the beacon and the foghorn as working aids-to-navigation. If the lighthouse were not present, the U.S. Coast Guard would likely erect a tower of which to mount a replacement beacon. As per the agreement signed during the transfer of the property from the Federal Government to the Montauk Historical Society, If the Montauk Historical Society fails to protect or maintain the lighthouse, the property would revert back to the USCG. Please note that in the analysis of the without and with-project conditions adjustments were made to account for sea level rise.

**MONTAUK SURFCASTERS ASSOCIATION**
**P.O. BOX 497 • MONTAUK, NEW YORK 11954**

Dr. Christopher Ricciardi,EIS Coordinator
U.S. Army Corps of Engineers-NY District
Planning Division- Environmental Branch
26 Federal Plaza, Room 2151
New York, NY 10278-0090

RE: MONTAUK POINT,NEW YORK
STORM DAMAGE REDUCTION PROJECT.

L06a

OUR PREFERENCE FOR STRUCTURAL ALTERNATIVES IS THE STONE REVETMENT, USING ALTERNATE ACCESS ROAD 2. ONE QUESTION REMAINS IN THE USE OF STAGING AREA 1. WILL THE PARKING AREA AT THE END OF THE ROAD BE IN USE FOR THE PUBLIC FROM SEPTEMBER TO NOVEMBER.

SINCERELY.

WILLIAM YOUNG
PRES MONTAUK SURFCASTERS ASSOC.

Comment in Letter Number 06:

William Young, President
Montauk Surfcasters Association
P. O. Box 497
Montauk, New York 11954

L06a: Will the parking area adjacent to Staging Area #1 be open for public use from September to November?

Response: As this is an unofficial parking area, on the property of the Town of East Hampton, the Corps has no authority with regard to its use. Furthermore, we have only identified the area as the potential Staging Area. The exact size and location of the Staging Area will be determined in the Plans and Specification stage of the project. During this design phase all user groups will be invited to provide input as to their concerns so that the project can best minimize any of the short-term impacts associated with construction.

Surfrider Foundation

Eastern Long Island Chapter
PO Box 2681 Amagansett,
New York 11930

Christopher Ricciardi
Army Corps of Engineers
Planning Division-Environmental Branch
26 Federal Plaza, Room 2151
New York, NY 10278-0090

Page 1 of 4

Chris,

Thanks again for coming to Montauk and giving us the opportunity learn more about your proposed plans for the Montauk Point Lighthouse revetment. Below please find some of the questions and comments I presented at the public information meeting on Monday, Sept. 19th, 2005. The following can be considered Surfrider Foundations' initial response to information presented in the US Arm Corps of Engineers' Montauk Point Storm Damage Reduction DEIS. Please include these comments and questions in the official public record as required by Federal guidelines. Further contact between the Coprs and Surfrider Foundation Eastern Long Island chapter regarding proposed work at Montauk Point can be directed to me (contact information included at the end of this letter).

Surfrider Foundation would like to make the following comments and ask the following question regarding the US Arm Corps of Engineers' Montauk Point Storm Damage Reduction DEIS.

L07a

1. Surfrider Foundation questions why this project is being considered on it's own and not as part of the Fire Island to Montauk Point Study (FIMP). Montauk point is in the FIMP study area and Surfrider Foundation suggests that determinations on Montauk Point storm damage reduction should be considered under FIMP and not on its own. This appears to be study segmentation which is expressly not allowed under NEPA.

L07b

2. The bluffs of Montauk are mined 24 hours a day, 7 days a week by ocean waves. These mined sediments add to the littoral budget for all of Long Island's south shore beaches. The Montauk Point storm damage reduction revetment will result in the loss of some sediment to the south shore beaches. The Corps' EIS must address how much of a loss will occur as a result of the project. The current DEIS does not address this issue.

The Corps' EIS should project and quantify the short term or long term potential impacts to beaches down drift of the Montauk Point. Surfrider Foundation request that the Corps' EIS, characterize the recreational, economic, social and environmental impacts of this loss, and state the project's plans to mitigate such loss.

L07c 3. The phenomenon of sea level rises and its impact on design considerations for the new revetment is addressed in the Feasibility study. However, sea level rise and the associated erosion of coastal land masses expected as a result of this phenomenon are not studied in the Corps' DEIS with respect to landforms adjoining the proposed revetment. Surfrider Foundation request that the Corps'EIS characterize shoreline conditions adjoining the proposed revetment for the short and long term and indeed for the projected life of the proposed revetment. The Corps' DEIS states the proposed revetment is designed to be effective for 55 to 75 years. Knowing the current rate of bluff retreat in the Montauk area, we can expect shorelines adjoining the revetment to be radically different from what they are today. With the proposed revetment remaining virtually unchanged while nearby shore lines retreat quickly landward, how will this conflicting dynamic change the recreational, economic and environmental assets of Montauk Point? Surfrider Foundation believes all Montauk point user groups, The Montauk Historical Society, and the citizens of Montauk have the right to know what Montauk Point will look like in the future. What will the Montauk Point coastline look like some 10, 20, 30, 40 (and so on) years from now if the proposed revetment is constructed?

L07d 4. Recently, Long Islanders have seen a lot of controversy regarding revetments, jetties and other forms of shoreline hardening. In almost all cases, such structures have been shown to be damaging to down drift shorelines. Surfrider Foundation is concerned that approval of such a high profile shore hardening project like the proposed Lighthouse revetment will send the wrong message to water-front homeowners across Long Island. This project has the potential to set president and encourage others to construct similar structures. The establishment of stone revetments as a best management practice (BMP) for Long Island shoreline erosion control is a dangerous move. Will this type of revetment proposed for Montauk Point be considered a BMP under FIMP? If not, then why is it being considered for Montauk Point?

L07e 5. It is unclear in the Corps' DEIS if upper bluff work in included in the proposed revetment's Scope of Work. Will the upper bluff be included in the project and if so what will be done, and how?

L07f 6. The Corps' DEIS includes a 'typical revetment section' drawing with little or no reference to the specific existing site conditions currently existing at Montauk Point. The plan view drawing for the proposed revetment has 7 profile transects indicated on it. Surfrider Foundation requests detailed cross section drawing for each transect showing existing and proposed features, included but not limited to: near shore bathymetric data, current armoring elevations and angles, upper bluff intersection with existing and proposed revetment, upper bluff conditions and proposed changes. This information will make it possible for Surfrider Foundation to constructively contribute to potential design alternatives. Surfrider Foundation is committed to working with the Corps to help protect the Lighthouse structures while causing no change in wave patterns around the point.

L07g

7. The Corps' DEIS waffles on the subject of the proposed revetment's impact on wave action around Montauk Point. Table 4 on page 25 list the proposed revetment's impact to recreation as "No-effect". However, in the "Environmental Consequences" chapter of the report, page 65, section 4.1 the report states that "The new revetment might also influence localized wave refraction patterns around Montauk Point." In order for Surfrider Foundation members to feel comfortable with supporting the Corps' proposal to protect the Lighthouse, members will need a clear and detailed plan. A plan that demonstrates clearly and states emphatically that there will be **NO** impacts on current wave patterns at the point.
Surfrider Foundation challenges the Corps do these two things successfully? Protect the Lighthouse and protect the Waves?

L07h

8. Conclusion section of the FWS report was cut off, only a few sentences are viewable. Surfrider Foundation request a complete copy of this report, please.

L07i

9. Surfrider Foundation requests information related to the stated failure of the current revetment. The Corp' DEIS claims that the current revetment is failing and is expected to be ineffective in 5-7 years, however, the report offers no field data related to this failure. In order for Surfrider Foundation to constructively contribute to the project, we will need all historical and current data on the existing revetment.

L07j

10. The Corps' DEIS describes the project's primary mission on page 13, section 1.1. In the third paragraph, 4th sentence the report states that "The Project will provide protection for the various cultural resources associated with the Lighthouse complex and stability to the natural environment." Surfrider Foundation finds the phrase "stability to the natural environment", to be very curious, and requests that the Corps. clarify this statement since it offers insight into the Corps. stated "primary mission" for the Lighthouse revetment.

L07k

11. Moving the Lighthouse: More consideration needs to be given to the Lighthouse relocation alternative. The DEIS's consideration of this alternative is limited and premised on the unsupported conclusion that the lighthouse would have to remain at its present elevation and that the structure is currently too unstable to move. Acknowledging the importance of the lighthouse' symbolic or sentimental appeal, we should also acknowledge that the former primary function of the lighthouse, manly as an aid to marine navigation, has been willfully reduced. This is clearly evidenced by the fact that

the lighthouse is no longer owned or operated by the U.S. Coast Guard and the light and fog horn have both been dramatically weakened in recent years. Therefore, given the reality of sea level rise and the challenges this will pose in the future, we believe that this alternative should be given much more careful evaluation.

Thanks you for your consideration.

Thomas B. Muse

Thomas B. Muse
Environmental Director, Surfrider Foundation Eastern Long Island Chapter.

Mail: 3 Locust Drive Sag Harbor New York 11963

Phones: 631.921.1842 cell 631.725-8725 office 631.725-4792 fax.

E- Mail : museman@hamptons.com

Comments in Letter Number 07:

Thomas B. Muse, Environmental Director
Surfrider Foundation Eastern Long Island Chapter
3 Locust Drive
Sag Harbor, New York 11963
Phone: 631.921.1842, cell: 631.725-8725, office: 631.725-4792 fax
E- Mail: museman@hamptons.com

L07a. Surfrider Foundation questions why this project is being considered on it's own and not as part of the Fire Island to Montauk Point Study (FIMP). Montauk point is in the FIMP study area and Surfrider Foundation suggests that determinations on Montauk Point storm damage reduction should be considered under FIMP and not on its own. This appears to be study segmentation which is expressly not allowed under NEPA.

Response L07a: The Fire Island Inlet to Montauk Point Project, which was authorized in 1960 based a report in 1958, did not include protective works at Montauk Point. It is likely that the Congress was cognizant of that when it authorized a separate study for the protection of Montauk Point.

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In summary, the proposed alternative has independent utility and does not foreclose any alternatives being considered under the FIMP Reformulation Study. If the Montauk Point Feasibility Report is approved and the proposed alternative is recommended for construction, the FIMP Reformulation Study will include analysis of this project in its cumulative effects analysis.

L07b. The bluffs of Montauk are mined 24 hours a day, 7 days a week by ocean waves. These mined sediments add to the littoral budget for all of Long Island's south shore beaches. The Montauk Point storm damage reduction revetment will result in the loss of some sediment to the south shore beaches. The Corps' EIS must address how much of a loss will occur as a result of the project. The current DEIS does not address this issue.

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Response L07b: At the recent public information session, the Corps representatives agreed to develop additional explanation for the Feasibility Report regarding the potential project effects on coastal and littoral processes. The following explanation, though lengthy, provides a fairly simple, yet thorough, discussion regarding the coastal and littoral process considerations involved in the plan formulation evaluation.

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The estimated volume of material per year will move either northwest or southwest of the point, except for some finer sediment moved permanently offshore or larger material that settles out. Based on the shape of the point and the length of the revetment, approximately 60% of the eroded material can be expected to move southwest, and approximately 40% can be expected to move northwest, i.e. approximately 3,000 cy/year will be contributed to the littoral drift along the Atlantic shore and approximately 2,000 cy/year along the Block Island Sound shore from the revetted shoreline. The shores to the northwest and southwest tend to make up for the effects of the revetment by contributing substitute littoral material over a relatively short distance downdrift.

For comparative purposes along the Atlantic shore, sediment budget estimates of the net longshore sand transport rate moving westward at Ditch Plains is approximately 70,000 cy per year. At the Montauk beaches, the net longshore transport rate increases to approximately 100,000 cy/yr. There is considerable uncertainty in sediment budget calculations, such that the given amount may differ by +/-40,000 cy/yr. Effects of both the existing structure at Montauk and the proposed structure on the littoral sand transport are small and are expected to be local, i.e. are not likely to extend as far alongshore to developed areas such as Ditch Plains or more developed points further west, especially in view of the variable shoreline shape and materials in between.

The amount of material that would be contributed downdrift if the proposed revetment alternative was not constructed is very small relative to the total sediment budget and this small amount is added back by some equally minor increase in erosion, a relatively short distance west of the revetment. Any adverse impacts from the proposed revetment alternative are not considered to be significant, and would not materially effect areas being considered for protection under the Fire Island Inlet to Montauk Point Reformulation Study.

Surfing Effects. There is a revetment in place at Montauk Point now, and the surfing is considered to be good. The proposed revetment will be in the same place as the existing revetment, made of similar rock material, and will be similar to it in all particulars which might effect waves. As shown in the Feasibility Report, Table 10, and discussed in Section 4.0 – Recreation, wave reflection coefficients are estimated at 13-19 percent less for the proposed revetment alternative than for the existing revetment. The proposed plan will not change wave conditions in any perceivable way.

L07c. The phenomenon of sea level rises and its impact on design considerations for the new revetment is addressed in the Feasibility study. However, sea level rise and the associated erosion of coastal land masses expected as a result of this phenomenon are not studied in the Corps' DEIS with respect to landforms adjoining the proposed revetment. Surfrider Foundation request that the Corps'EIS characterize shoreline conditions adjoining the proposed revetment for the short and long term and indeed for the projected life of the proposed revetment. The Corps' DEIS states the proposed revetment is designed to be effective for 55 to 75 years. Knowing the current rate of bluff retreat in the Montauk area, we can expect shorelines adjoining the revetment to be radically different from what they are today. With the proposed revetment remaining virtually unchanged while nearby shore lines retreat quickly landward, how will this conflicting dynamic change the recreational, economic and environmental assets of Montauk Point? Surfrider Foundation believes all Montauk point user groups, The Montauk Historical Society, and the citizens of Montauk have the right to know what Montauk Point will look like in the future. What will the Montauk Point coastline look like some 10, 20, 30, 40 (and so on) years from now if the proposed revetment is constructed?

Response L07c: We could not locate the statement, "the proposed revetment is designed to be effective for 55 to 75 years.", in the DEIS. It is evaluated over a 50 year economic period.

The effects on nearby shorelines are discussed in the Response to Comment 2 above.

L07d. Recently, Long Islanders have seen a lot of controversy regarding revetments, jetties and other forms of shoreline hardening. In almost all cases, such structures have been shown to be damaging to down drift shorelines. Surfrider Foundation is concerned that approval of such a high profile shore hardening project like the proposed Lighthouse revetment will send the wrong message to water-front homeowners across Long Island. This project has the potential to set president and encourage others to construct similar structures. The establishment of stone revetments as a best management practice (BMP) for Long Island shoreline erosion control is a dangerous move. Will this type of revetment proposed for Montauk Point be considered a BMP under FIMP? If not, then why is it being considered for Montauk Point?

Response L07d: A wide array of structural and non-structural measures are being considered for application as appropriate over the nearly 83 mile shoreline from Fire Island Inlet to Montauk Point. The Montauk Point bluff fronting the Lighthouse complex is different in many ways from much of the rest of the FIMP Reformulation Study area. The screening and comparison of alternatives for Montauk Point showed the selected revetment alternative to be the best solution for this site under Federal evaluation criteria. The non-Federal sponsor, the NYSDEC, also supports the selected plan and there have been no substantive issues raised by concerned agencies. One size does not fit all.

L07e. It is unclear in the Corps' DEIS if upper bluff work in included in the proposed revetment's Scope of Work. Will the upper bluff be included in the project and if so what will be done, and how?

Response L07e: The proposed plan does not include any construction above elevation +25 ft. NGVD. The local sponsor is expected to continue to upkeep the plantings on the upper bluff.

L07f. The Corps' DEIS includes a 'typical revetment section' drawing with little or no reference to the specific existing site conditions currently existing at Montauk Point. The plan view drawing for the proposed revetment has 7 profile transects indicated on it. Surfrider Foundation requests detailed cross section drawing for each transect showing existing and proposed features, included but not limited to: near shore bathymetric data, current armoring elevations and angles, upper bluff intersection with existing and proposed revetment, upper bluff conditions and proposed changes. This information will make it possible for Surfrider Foundation to constructively contribute to potential design alternatives. Surfrider Foundation is committed to working with the Corps to help protect the Lighthouse structures while causing no change in wave patterns around the point.

Response L07f: Larger scale drawings of the revetment plans and profiles will be sent to you and all who request them. This should provide the information you have requested. Additional cross-section detail would be developed as part of the Plans and Specifications phase of the project.

L07g. The Corps' DEIS waffles on the subject of the proposed revetment's impact on wave action around Montauk Point. Table 4 on page 25 list the proposed revetment's impact to recreation as "No-effect". However, in the "Environmental Consequences" chapter of the report, page 65, section 4.1 the report states that "The new revetment might also influence localized wave refraction patterns around Montauk Point." In order for Surfrider Foundation members to feel comfortable with supporting the Corps' proposal to protect the Lighthouse, members will need a clear and detailed plan. A plan that demonstrates clearly and states emphatically that there will be **NO** impacts on current wave patterns at the point.

Surfrider Foundation challenges the Corps do these two things successfully? Protect the Lighthouse and protect the Waves?
Response L07g: The sentence quoted ("The new revetment might also influence localized wave refraction patterns around Montauk Point") and the one following are incorrect and will be changed to: "The new revetment will not change wave refraction patterns around Montauk Point, significantly change erosion or accretion rates of the adjacent shoreline, or alter the near shore bathymetry. Existing wave down-rush conditions will be maintained by replacing existing large loose toe stones at the base of the revetment that are not required for construction in their existing patterns."

L07h. Conclusion section of the FWS report was cut off, only a few sentences are viewable. Surfrider Foundation request a complete copy of this report, please.

Response L07h: A complete copy of the FWS report is contained in Appendix E. A separate copy has already been emailed to you.

L07i. Surfrider Foundation requests information related to the stated failure of the current revetment. The Corp' DEIS claims that the current revetment is failing and is expected to be ineffective in 5-7 years, however, the report offers no field data related to this failure. In order for Surfrider Foundation to constructively contribute to the project, we will need all historical and current data on the existing revetment.

Response L07i: The DEIS does not claim that the existing revetment will be ineffective in 5-7 years. Evaluation of the existing revetment failure mechanisms was accomplished both analytically and through physical modeling techniques. These are discussed in the Feasibility Report Main Body and in Appendix A. Reports from the Montauk Historical Society and recent site inspections by the Corps confirm that the process of revetment failure is already evident near the southern end of the existing revetment.

L07j. The Corps' DEIS describes the project's primary mission on page 13, section 1.1. In the third paragraph, 4th sentence the report states that "The Project will provide protection for the various cultural resources associated with the Lighthouse complex and stability to the natural environment." Surfrider Foundation finds the phrase "stability to the natural environment", to be very curious, and requests that the Corps. clarify this statement since it offers insight into the Corps. stated "primary mission" for the Lighthouse revetment.

Response L07j: The natural environment that would be protected is located in and around the Lighthouse complex that would be protected from storm damages. The referenced paragraph clearly states that this protection is a secondary benefit.

L07k. Moving the Lighthouse: More consideration needs to be given to the Lighthouse relocation alternative. The DEIS's consideration of this alternative is limited and premised on the unsupported conclusion that the lighthouse would have to remain at its present elevation and that the structure is currently too unstable to move. Acknowledging the importance of the lighthouse' symbolic or sentimental appeal, we should also acknowledge that the former primary function of the lighthouse, manly as an aid to marine navigation, has been willfully reduced. This is clearly evidenced by the fact that the lighthouse is no longer owned or operated by the U.S. Coast Guard and the light and fog horn have both been dramatically weakened in recent years. Therefore, given the reality of sea level rise and the challenges this will pose in the future, we believe that this alternative should be given much more careful evaluation.

Response L07k: The moving of the Lighthouse was given considerable weight during the Feasibility phase of the project. However, several factors contributed to the decision not to make this proposal the preferred alternative. They included: a) the overall cost of the alternative b) the engineering requirements of having to build up land to meet the hill of Montauk Point to create a level moving surface, c) the destruction of a National Register Landmarked complex - by moving it, the setting is destroyed thus violating the spirit of the National Historic Preservation Act of 1966, as amended, d) the loss of value to the Town of Easthampton, Montauk Point and Montauk Point State Parks, as several hundred thousand visitors come to this area each year, in part to see "the end", i.e. Montauk Point Lighthouse, e) the New York State Office of Parks, Recreation and Historic Preservation (see Letter Number 01), the Regulatory Agency that would have to approve any move of a National Register structure has already stated, and has done so throughout the entire process, that they would not approve the moving of the Lighthouse, which would lead to the destruction of the Lighthouse complex area.

Additionally, while the Montauk Historical Society maintains the lighthouse complex, the U.S. Coast guard still operates the beacon and the foghorn as working aids-to-navigation. If the lighthouse were not present, the U.S. Coast Guard would likely erect a tower of which to mount a replacement beacon. As per the agreement signed during the transfer of the property from the Federal Government to the Montauk Historical Society, If the Montauk Historical Society fails to protect or maintain the lighthouse, the property would revert back to the USCG. Please note that in the analysis of the without and with-project conditions adjustments were made to account for sea level rise.

100 Deforest Road
Montauk, NY 11954
September 6, 2005

Dr. Christopher Ricciardi, EIS Coordinator
U.S. Army Corps of Engineers – NY District
Planning Division – Environmental Branch
26 Federal Plaza, Room 2151
New York, NY 10278 – 0090

Dear Doctor Ricciardi,

I recently read the USACE Draft Environmental Impact Statement (DEIS) for the Montauk Point Storm Damage Reduction Project at the Montauk Library and was very disappointed.

While I agree with the importance of the Project, including its size
and scope, I was distressed to find no mention made of the Project's possible effects on
L08a the littoral drift of sand downdrift and west of the Project. I read the "Advese Effects "
section very carefully, anticipating, at least, some discussion of the matter.

I was always led to believe that "hardened structures" greatly
L08b contributed to the downdrift scalping of the beaches and dunes west of those structures.

As an "environmental impact statement", prepared with the full
L08c approval of the D.E.C., I expected to see no less than some mention made of the
previously mentioned environmental "truism".

Inasmuch as the Town of East Hampton has gone on record in its
various drafts of its proposed Coastal Erosion Hazard Act as being totally opposed to
L08d hardened structures, I find it inconceivable that the USACE would omit any discussion
of the matter in the DEIS. Has not the Town broached the subject of its concern for the
welfare of its beaches and harbors downdrift of the Lighthouse?

As a resident of Montauk and as a member of the Board of
Managers of the Montauk Shores Condominium, a seaside resort in the Town of East
L08e Hampton, I am very concerned and distressed at this egregious omission and expect some
sort of explanation from the USACE, especially from the Environmental Analysis
Branch.

Respectfully submitted,
Laurence P. Redican
Laurence P. Redican
Board of Managers
Montauk Shores Condo
100 Deforest Road
Montauk, NY 11954

668-6993 Office: 668-9393
cc: Leonard Houston, Chief, Environmental Analysis Branch, USACE,
William McGintee, Supervisor, Town of East Hampton
Larry Penny, Town of East Hampton

George Hamilton, D.E.C.
James Greenbaum, Attorney, MSC
Laurence Greenbaum, Facilities Manager, MSC
Hugh Herbert, Pres. BOM, MSC

Comment in Letter Number 08:

Laurence P. Redican
Board of Managers
Montauk Shores Condo
100 Deforest Road
Montauk, New York 11954

Comment LO8a: No mention of littoral drift of sand downdrift and west of the Project area

Response L08a: At the recent public information session, the Corps representatives agreed to develop additional explanation for the Feasibility Report regarding the potential project effects on coastal and littoral processes. The following explanation, though lengthy, provides a fairly simple, yet thorough, discussion regarding the coastal and littoral process considerations involved in the plan formulation evaluation.

Coastal Processes. The proposed project alternative to protect Montauk Point will essentially continue the coastal process impacts of the 1992-1993 revetment over the 50 year planning horizon. The effects on coastal processes at the Point from the man made intervention date back nearly 60 years. Shoreline erosion rates are a function of many factors including the type of material at each shoreline location, total mass of material at each location, and the wave energy impinging upon it. The Long Island shoreline both north and south of Montauk Point consists of a series of concave and convex shoreline reaches, indicating a variation in erodability alongshore. Historic shoreline mapping shows that the 1870, 1933 and 1938 shorelines, preceding construction of revetments at Montauk Point in the 1940's, all have an indentation at Turtle Cove, similar to the shoreline shape that exists now. This indicates that the Turtle Cove reach erodes at a faster rate than the point, and that this indented curvature was not caused by construction of the revetment. Shorelines also show that the Atlantic shore west of the point has been generally erosive over the 1870-1995 period. The existing and the proposed revetment alternative will act to hold or anchor the eastern most end of the Turtle Cove area. While the proposed revetment alternative will continue to limit the coastal erosion at the Point protecting the Lighthouse complex, forces such as the tidal currents and waves will continue to erode the north and south downdrift shores continuing the curvature process, especially immediately adjacent to the revetment.

Downdrift Effects. The erosion of the areas just west of the Point tends to make up for the material covered by the existing revetment that is prevented from entering the littoral system. Since the proposed revetment alternative will extend over virtually the same lineal extent of the shoreline as the existing revetment, the proposed revetment will continue this trend. The effect of both the existing revetment and the proposed revetment on the downdrift, unprotected shoreline is to reduce the amount of sand moving alongshore by a small amount estimated to be approximately 3,000 cy/yr for the south shore. The sediment deficit would tend to increase the erosion rate of shoreline immediately adjacent to the revetment by a similar increment, over a short distance downdrift. Shoreline change mapping for the Turtle Cove area shows approximately a 2-ft/yr increase in retreat rate in the post-revetment period (1938-to 1995) as compared to the pre-revetment period (1870-1938), which may be due in part to the construction of the existing revetment, as well as to all other factors contributing to shoreline erosion. Indications from the shoreline change mapping are that any sediment deficits caused by the revetment are made up within approximately 2,500 feet of the end of the structure, at which point the shorelines changes to one of fluctuation of erosion and accretion. Shorelines north of the existing revetment have a similar response, which would continue with the proposed structure in place. At the same time, the relative impact of the small amount of reduced littoral material due to the revetment also diminishes because the net amount of littoral material moving westerly along the shores gradually increases as the waves and currents act upon the more westerly shores.

The curvature of the immediately downdrift or westerly shore areas will continue but will not pinch off or cause flanking of the protected area during the 50 year project evaluation period. It is also likely that as the curved recession due to waves and currents continues, there would be a tendency toward stabilization as the landform adjusts to the prevailing coastal forces. Subject to the occurrence of future storm events, the rate of erosion observed in relatively recent years could be somewhat reduced.

The following paragraphs give an indication of the volumes of littoral material involved in determining downdrift impacts of the project:

Contribution to Littoral Drift. Erosion of bluffs and beach fronting the Montauk Lighthouse does contribute a small amount of material to the littoral drift that moves along the Atlantic shore southwest of the lighthouse as well as along the Block Island Sound shore northwest of the lighthouse. Based on measurement over the period of record (1868-1993) the average annual erosion rate of bluff and beach as stated in the Feasibility Report, is estimated at 6 cubic yards per year per foot of shoreline. This average includes periods of time when the bluff was covered by a revetment, as well as prior to the construction of protective works. As such, this long-term average is a reasonable estimate for shoreline loss for periods of time covering conditions when the protective works are intact and limit loss, and periods of time when the protective works have lost integrity, resulting in greater amounts of erosion.

The proposed revetment covers approximately 840 linear feet of shoreline, which is virtually identical to the length of the existing revetment. Using the long-term erosion rate of 6 cubic yards(cy) per linear foot per year, approximately 5,000 cy of material can be assumed lost from the beach and bluff per year. Note that the material comprising the bluff is a mix of sand, gravel, and silt, based on boring logs. Some percentage of the eroded material is lost to the net longshore sand transport as it is either too fine, or too coarse. This percentage could be in the 10-30% range, but for this discussion no reduction has been taken for loss of fines or coarse material to the quantity of sediment transport.

The estimated volume of material per year will move either northwest or southwest of the point, except for some finer sediment moved permanently offshore or larger material that settles out. Based on the shape of the point and the length of the revetment, approximately 60% of the eroded material can be expected to move southwest, and approximately 40% can be expected to move northwest, i.e. approximately 3,000 cy/year will be contributed to the littoral drift along the

Atlantic shore and approximately 2,000 cy/year along the Block Island Sound shore from the revetted shoreline. The shores to the northwest and southwest tend to make up for the effects of the revetment by contributing substitute littoral material over a relatively short distance downdrift.

For comparative purposes along the Atlantic shore, sediment budget estimates of the net longshore sand transport rate moving westward at Ditch Plains is approximately 70,000 cy per year. At the Montauk beaches, the net longshore transport rate increases to approximately 100,000 cy/yr. There is considerable uncertainty in sediment budget calculations, such that the given amount may differ by +/-40,000 cy/yr. Effects of both the existing structure at Montauk and the proposed structure on the littoral sand transport are small and are expected to be local, i.e. are not likely to extend as far alongshore to developed areas such as Ditch Plains or more developed points further west, especially in view of the variable shoreline shape and materials in between.

The amount of material that would be contributed downdrift if the proposed revetment alternative was not constructed is very small relative to the total sediment budget and this small amount is added back by some equally minor increase in erosion, a relatively short distance west of the revetment.. Any adverse impacts from the proposed revetment alternative are not considered to be significant, and would not materially effect areas being considered for protection under the Fire Island Inlet to Montauk Point Reformulation Study.

Surfing Effects. There is a revetment in place at Montauk Point now, and the surfing is considered to be good. The proposed revetment will be in the same place as the existing revetment, made of similar rock material, and will be similar to it in all particulars which might effect waves. As shown in the Feasibility Report, Table 10, and discussed in Section 4.0 – Recreation, wave reflection coefficients are estimated at 13-19 percent less for the proposed revetment alternative than for the existing revetment. The proposed plan will not change wave conditions in any perceivable way.

Comment L08b: Don't hard structures contribute to scalping of the beaches?

Response L08b: In some cases, particularly with vertical structures, but not in every case, such as Montauk Point, where both the structure, slope and wave reflection are mild. Generalizations about hard shoreline structures are just that. Depending on the site specifics conditions, hard structures can contribute to desired shore protection results, while minimizing adverse downdrift effects.

Comment L08c: No mention of this "truism" in the report

Response L08c: Refer to the response to Comment 2.

Comment L08d: Town of Easthampton will not allow hardened structures – why haven't they said anything about this?

Response L08d: The Town of East Hampton has been aware of the project and alternatives throughout this process.

Comment L08e: Wants an explanation

ResponseL08e: See responses to Points 1 through 4.

Comments of Christopher Manthey Concerning
The Montauk Point Storm Damage Reduction Project (MPSDRP)

Monday, October 03, 2005

L09a

## 1) Exclusion of the Fire Island to Montauk Point study from the MPSDRP Study Constitutes Prohibited Segmentation under NEPA

“Segmentation is to be avoided in order to insure that interrelated projects, the overall effect of which is environmentally significant, not be fractionalized into smaller, less significant actions." <=101> Town of Huntington v. Marsh, 859 F.2d 1134, 1142 (2d Cir. 1988) (internal quotation marks omitted). A project is properly segmented if it (1) connects logical termini and is of sufficient length to address environmental matters of a broad scope; (2) has independent utility or independent significance; and (3) ***will not restrict consideration of alternatives for other reasonably foreseeable transportation improvements***. <=102> 23 C.F.R. @ 771.111(f)[**35] (FHA NEPA regulations); <=103> 40 C.F.R. @ 1508.25(a) (CEQ regulations).

As acknowledged within the MPSDRP Feasibility Study and DEIS, actions at Montauk Point have significant effects on the geology of westward beaches, trapping “sediment that would have become littoral supply for westward beaches”. [1] In addition to the sand directly behind the revetment, the Feasibility study notes on p18 that the “beach recession rate adjacent to the revetment has actually decreased to one half of the pre-1946 rate, and bluff recession is one-quarter of the pre-1945 rate due to terracing construction.” A US Geological Service document at http://3dparks.wr.usgs.gov/nyc/parks/loc65.htm notes “Today, the sand and gravel eroded from the headlands at Montauk and from the massive sand reservoir offshore (originally derived from the moraine and outwash) are the primary sources for sand on the beaches along southern Long Island.”

The FIMP will not have access to the sand that would be provided by Montauk Point in absence of a revetment, and thus will be restricted to other means to address landward shoreline movement and other issues. Construction of the improved revetment at Montauk Point thus **will** “restrict consideration of the alternatives” for the Fire Island to Montauk Point (FIMP) project, whose completion is scheduled in 2006 and is thus “reasonable foreseeable.” Thus, the project is does not fit the definition of proper segmentation.

It should be noted that the US Fish & Wildlife Service appears to have had a similar view. In its July 2003 Fish & Wildlife Coordination Act Section 2(b) report they note “*The Corps is currently conducting the planning phase of the (FIMP). The FIMP overlaps the (MPSDRP) area. The FIMP Environmental impact statement is scheduled for completion in 2005. Until the Corps has completed its analysis and selected an alternative, the service will be unable to complete a comprehensive assessment of the*

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[1] P 60 Feasibility “sediment that would have become littoral supply for westward beaches has been stabilized at the point via the revetment.

*cumulative impacts of the proposed action and the FIMP. Accordingly, the Corps should include the FIMP in its cumulative impact assessment of the MPSDPP (sic) and likewise, the FIMP should analysis should include the MPSDPP."*

## L09b **2) Sediment Reduction May Have Adverse Environmental Impact Which Would Require Mitigation**

As noted above, the Feasibility Report acknowledges the existing and proposed revetments prevent sediment from moving westward. The width and height of beaches has a direct impact upon the environment e.g. numbers and types of species on beaches. Unless the Feasibility Report and the DEIS estimate the amount of sand trapped, it is not possible to estimate the environmental impact and any related mitigation. The reports should estimate sediment reduction and related mitigation costs, if any.

## L09c **3) Sediment Reduction on Beaches as a result of Revetment may have Endangered & Threatened Species Act Implications**

The beaches immediately west of Montauk have numerous endangered and threatened species[2]. As a resident of this area, it appears to me the width of stretches of it are approximately ½ the mid-1990s distances; the actual distances should be familiar to the

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[2] From http://training.fws.gov/library/pubs5/necas/web_link/9_montauk.htm

The maritime moorlands and forest communities of the Montauk Peninsula are not only regionally significant and noteworthy for their uniqueness and restricted geographical occurrence, but because of the relatively pristine condition in which they are found here. These communities, which are in themselves rare, provide essential habitat for a number of regionally and globally rare plant species, including sandplain gerardia (*Agalinis acuta*), a U.S. Endangered species found here in maritime grasslands, Nantucket serviceberry (*Amelanchier nantucketensis*) and New England blazing-star (*Liatris borealis*), both candidates for listing under the U.S. Endangered Species Act (Act), and bushy rockrose (*Helianthemum dumosum*). The Walking Dunes area, just east of Napeague Harbor, is of regional significance and contains outstanding examples of maritime interdunal swales. The rare curly grass fern (*Schizaea pusilla*) is found in this community. Sandy and gravelly beaches along the Atlantic Ocean and Block Island Sound shorelines are important nesting areas for a diversity of colonial nesting birds of special emphasis in the region, including roseate tern (*Sterna dougallii*), a U.S. Endangered species, piping plover (*Charadrius melodus*), a U.S. Threatened species, least tern (*Sterna antillarum*), common tern (*Sterna hirundo*), black skimmer (*Rynchops niger*) and American oystercatcher (*Haematopus palliatus*). Sea-beach knotweed (*Polygonum glaucum*) and sea-beach pigweed (*Amaranthus pumilis*), the latter a candidate plant species for listing under the Act, have also been reported from beaches in this same area. Barrier beaches in the Napeague Harbor system have been designated under the national Coastal Barriers Resources Act.

Corps via their or other government surveys. The sediment reduction caused by the revetment, even if the Corps estimates it to be a minimal amount, is critical in maintaining habitat which is diminishing, whatever the primary reason for the width and height reduction.

The impact is not limited to the immediate area, and includes at a minimum the stretch from Montauk to Fire Island. This interrelationship is both implicit and explicit in the FIMP study, which states it "looks at the study area as a comprehensive coastal system and evaluates alternatives for their impacts at specific locations and on the entire system." http://www.nan.usace.army.mil/fimp/reform.htm.

L09d

### 4)Environmental and Economic Benefit from Relocation Alternative Not Included in Feasibility Analysis

Just as the possible environmental and related mitigation cost of trapping sediment via a revetment is not calculated, the failure to account for the environmental benefit and the avoided mitigation costs under the relocation alternative thereby underestimates the attractiveness of relocation in the Feasibility report.

### 5)Life Expectancy of Lighthouse not Addressed in Feasibility Report

L09e

The Feasibility Report assumes the lighthouse has the structural integrity to last for the project's 73-year life span. However, as noted at a public hearing held at Montauk Firehouse on September 19th, 2005, the structural integrity of the lighthouse is now being investigated by a consultant to the Montauk Historical Society (MHS). The results of this investigation should be incorporated into the Feasibility study. Moreover, even if it is conceivably possible to maintain the structure, the ability of the MHS to pay for the necessary engineering work is not guaranteed. Therefore, the estimated cost of this work should be added to the estimated costs and related cost/benefit analyses.

### 6)Misuse of Statistical Methods in Feasibility Report

L09f

The following appears on p. 18

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> Since the last storm experienced at Montauk Point of this significance was in 1993, there is a likelihood (with a 60% probability) that this 15-year return period storm will occur by the year 2006 and cause significant damage (at least 25% damage level) to the revetment itself.

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As of preparation date of this report (July 2005), there was only 1 ½ years till the end of 2006. Given that the chance of a 15 year storm is 6.7 % in any year, the probability of the storm described above occurring by the end of the year 2006 is actually closer to 10% than 60%.

L09g

## 7)Reduction of Sediments and Related Beach Widths May be Grounds for Class Action Suit on Behalf of Homeowners/Beachgoers

Corps projects that have significant impact on someone's beach and/or home near the beach can be grounds for a lawsuit. This standard was clearly met in Westhampton, NY where groins led to beach erosion and eventually a multimillion settlement in the form of a beach building project. This cost, including the cost to defend the Corps against this lawsuit --even if the Corps should ultimately prevail in Court -- should be included in cost/benefit analysis of the revetment alternative.

Chris Manthey
80 Osprey Road/POB 1636
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Cmanthey@backtrackreports.com
917-763-8854

Comment in Letter Number 09:

Chris Manthey
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L09a: Exclusion of the Fire Island to Montauk Point study from the MPSDRP Study Constitutes Prohibited Segmentation under NEPA

Response L09a: The Fire Island Inlet to Montauk Point Project, which was authorized in 1960 based a report in 1958, did not include protective works at Montauk Point. It is likely that the Congress was cognizant of that when it authorized a separate study for the protection of Montauk Point.

The Fire Island to Montauk Point Reformulation Study is premised on the existence of the present revetment at Montauk Point that was constructed by the U.S. Coast Guard and the Montauk Historical Society in 1992-1993. In the absence of a project decision at the Point, the Reformulation Study has assumed that local interests would likely maintain some form of the present revetment for the foreseeable future and there is no reason to expect it to be removed. Accordingly, the FIMP Reformation Study has conservatively estimated that no littoral material is generated into the south shore of Long Island littoral system from the Montauk Point area that is protected by the existing revetment. The small amount of material that potentially could enter the south shore littoral system upon the failure of the existing revetment would not significantly affect the evaluation of without and with-project alternatives in the FIMP Reformulation Study. With regard to coastal and littoral processes, the revetment selected for a potential Montauk Point Storm Damage Reduction Project would tend to continue the effects of the existing revetment and the nearly 60 year history of efforts to reduce erosion. These effects are small and diminish with distance from the revetment well before, or east of, any area where the FIMP Reformulation Study would be evaluating protection measures.

In summary, the proposed alternative has independent utility and does not foreclose any alternatives being considered under the FIMP Reformulation Study. If the Montauk Point Feasibility Report is approved and the proposed alternative is recommended for construction, the FIMP Reformulation Study will include analysis of this project in its cumulative effects analysis.

L09b: Sediment Reduction May Have Adverse Environmental Impact Which Would Require Mitigation

Response L09b: At the recent public information session, the Corps representatives agreed to develop additional explanation for the Feasibility Report regarding the potential project effects on coastal and littoral processes. The following explanation, though lengthy, provides a fairly simple, yet thorough, discussion regarding the coastal and littoral process considerations involved in the plan formulation evaluation.

Coastal Processes. The proposed project alternative to protect Montauk Point will essentially continue the coastal process impacts of the 1992-1993 revetment over the 50 year planning horizon. The effects on coastal processes at the Point from the man made intervention date back nearly 60 years. Shoreline erosion rates are a function of many factors including the type of material at each shoreline location, total mass of material at each location, and the wave energy impinging upon it. The Long Island shoreline both north and south of Montauk Point consists of a series of concave and convex shoreline reaches, indicating a variation in erodability alongshore. Historic shoreline mapping shows that the 1870, 1933 and 1938 shorelines, preceding construction of revetments at Montauk Point in the 1940's, all have an indentation at Turtle Cove, similar to the shoreline shape that exists now. This indicates that the Turtle Cove reach erodes at a faster rate than the point, and that this indented curvature was not caused by construction of the revetment. Shorelines also show that the Atlantic shore west of the point has been generally erosive over the 1870-1995 period. The existing and the proposed revetment alternative will act to hold or anchor the eastern most end of the Turtle Cove area. While the proposed revetment alternative will continue to limit the coastal erosion at the Point protecting the Lighthouse complex, forces such as the tidal currents and waves will continue to erode the north and south downdrift shores continuing the curvature process, especially immediately adjacent to the revetment.

Downdrift Effects. The erosion of the areas just west of the Point tends to make up for the material covered by the existing revetment that is prevented from entering the littoral system. Since the proposed revetment alternative will extend over virtually the same lineal extent of the shoreline as the existing revetment, the proposed revetment will continue this trend. The effect of both the existing revetment and the proposed revetment on the downdrift, unprotected shoreline is to reduce the amount of sand moving alongshore by a small amount estimated to be approximately 3,000 cy/yr for the south shore. The sediment deficit would tend to increase the erosion rate of shoreline immediately adjacent to the revetment by a similar increment, over a short distance downdrift. Shoreline change mapping for the Turtle Cove area shows approximately a 2-ft/yr increase in retreat rate in the post-revetment period (1938-to 1995) as compared to the pre-revetment period (1870-1938), which may be due in part to the construction of the existing revetment, as well as to all other factors contributing to shoreline erosion. Indications from the shoreline change mapping are that any sediment deficits caused by the revetment are made up within approximately 2,500 feet of the end of the structure, at which point the shorelines changes to one of fluctuation of erosion and accretion. Shorelines north of the existing revetment have a similar response, which would continue with the proposed structure in place. At the same time, the relative impact of the small amount of reduced littoral material due to the revetment also diminishes because the net amount of littoral material moving westerly along the shores gradually increases as the waves and currents act upon the more westerly shores.

The curvature of the immediately downdrift or westerly shore areas will continue but will not pinch off or cause flanking of the protected area during the 50 year project evaluation period. It is also likely that as the curved recession due to waves and currents continues, there would be a tendency toward stabilization as the landform adjusts to the prevailing coastal forces. Subject to the occurrence of future storm events, the rate of erosion observed in relatively recent years could be somewhat reduced.

The following paragraphs give an indication of the volumes of littoral material involved in determining downdrift impacts of the project:

Contribution to Littoral Drift. Erosion of bluffs and beach fronting the Montauk Lighthouse does contribute a small amount of material to the littoral drift that moves along the Atlantic shore southwest of the lighthouse as well as along the Block Island Sound shore northwest of the lighthouse. Based on measurement over the period of record (1868-1993) the average annual erosion rate of bluff and beach as stated in the Feasibility Report, is estimated at 6 cubic yards per year per foot of shoreline. This average includes periods of time when the bluff was covered by a revetment, as well as prior to the construction of protective works. As such, this long-term average is a reasonable estimate for shoreline loss for periods of time covering conditions when the protective works are intact and limit loss, and periods of time when the protective works have lost integrity, resulting in greater amounts of erosion.

The proposed revetment covers approximately 840 linear feet of shoreline, which is virtually identical to the length of the existing revetment. Using the long-term erosion rate of 6 cubic yards(cy) per linear foot per year, approximately 5,000 cy of material can be assumed lost from the beach and bluff per year. Note that the material comprising the bluff is a mix of sand, gravel, and silt, based on boring logs. Some percentage of the eroded material is lost to the net longshore sand transport as it is either too fine, or too coarse. This percentage could be in the 10-30% range, but for this discussion no reduction has been taken for loss of fines or coarse material to the quantity of sediment transport.

The estimated volume of material per year will move either northwest or southwest of the point, except for some finer sediment moved permanently offshore or larger material that settles out. Based on the shape of the point and the length of the revetment, approximately 60% of the eroded material can be expected to move southwest, and approximately 40% can be expected to move northwest, i.e. approximately 3,000 cy/year will be contributed to the littoral drift along the Atlantic shore and approximately 2,000 cy/year along the Block Island Sound shore from the revetted shoreline. The shores to the northwest and southwest tend to make up for the effects of the revetment by contributing substitute littoral material over a relatively short distance downdrift.

For comparative purposes along the Atlantic shore, sediment budget estimates of the net longshore sand transport rate moving westward at Ditch Plains is approximately 70,000 cy per year. At the Montauk beaches, the net longshore transport rate increases to approximately 100,000 cy/yr. There is considerable uncertainty in sediment budget calculations, such that the given amount may differ by +/-40,000 cy/yr. Effects of both the existing structure at Montauk and the proposed structure on the littoral sand transport are small and are expected to be local, i.e. are not likely to extend as far alongshore to developed areas such as Ditch Plains or more developed points further west, especially in view of the variable shoreline shape and materials in between.

The amount of material that would be contributed downdrift if the proposed revetment alternative was not constructed is very small relative to the total sediment budget and this small amount is added back by some equally minor increase in erosion, a relatively short distance west of the revetment. Any adverse impacts from the proposed revetment alternative are not considered to be significant, and would not materially effect areas being considered for protection under the Fire Island Inlet to Montauk Point Reformulation Study.

Surfing Effects. There is a revetment in place at Montauk Point now, and the surfing is considered to be good. The proposed revetment will be in the same place as the existing revetment, made of similar rock material, and will be similar to it in all particulars which might effect waves. As shown in the Feasibility Report, Table 10, and discussed in Section 4.0 – Recreation, wave reflection coefficients are estimated at 13-19 percent less for the proposed revetment alternative than for the existing revetment. The proposed plan will not change wave conditions in any perceivable way.

L09c: Sediment Reduction on Beaches as a result of Revetment may have Endangered & Threatened Species Act Implications

Response L09c: Please see Responses 1 and 2 above.

L09d: Environmental and Economic Benefit from Relocation Alternative Not Included in Feasibility Analysis

Response L09d: Please see Responses 1 and 2 above.

L09e: Life Expectancy of Lighthouse not Addressed in Feasibility Report

Response L09e: Your comment is incorrect regarding the Feasibility Report. The report does not address the structural integrity of the lighthouse. The projects life span for evaluation is 50 years, and the project is designed to protect against a 73 year storm event. You also did not mention that a representative from the Montauk Historical Society said at the meeting that the lighthouse would be maintained. As stated on page 9 of the Feasibility Report the Society must maintain the Montauk Light Station in accordance with the provisions of the National Historic Preservation Act.

L09f: Misuse of Statistical Methods in Feasibility Report

Response L09f: The commenter is correct to say that the fact that a 15 year or greater storm has not occurred for 13 years says nothing about the probability of such an event occurring in the coming year. The past, through, is not the issue being considered in the economic analysis to which, presumably, the commenter is referring. The issue is the most likely future pattern of storm damage. The commenter evidently has confused two aspects of the process of damage. One process is the progressive deterioration of the armor stone (see the 4th column of Table 7 of the Economic Appendix). After that process has progressed, a subsequent 15 year return period storm would directly affect the bluff on which the lighthouse is situated.

The commenter is correct when he points out the fact that a 15 year return period storm has not occurred for 13 years says nothing about the probability of such a storm occurring in the next year. That is not the event whose probability is being cumulated to 59.2% in 2006. The probability that is being cumulated is the probability of failure of the revetment by that date. The failure of the revetment does not require the occurrence of a storm event of any given magnitude. Indeed, its deterioration has already progressed substantially, and actual observation of the revetment reveals that its deterioration has progressed as predicted.

L09g: Reduction of Sediments and Related Beach Widths May be Grounds for Class Action Suit on Behalf of Homeowners/Beachgoers

Response L09g: Your comment is noted. It provides no grounds for modifying the benefit/cost analysis.

L09h: What amount of the $27 million relocation estimate represents moving the lighthouse and what remainder represents the cost of archeological investigations? Can you provide the original documents, including price quotes from contractors, used to derive these estimates?

Response L09h: Feasibility Report Appendix B, Paragraph 9 and Table 4 provides a breakout of the costs.

Christopher Ricciardi
Army Corps of Engineers
Planning Division-Environmental Branch
26 Federal Plaza, Room 2151
New York, NY 10278-0090

September 30. 05

Dear Christopher Ricciardi, Army Corps of Engineers (Planning Division-Environmental Branch)

L10a I can't imagine that the Army Corps would consider any "hard" erosion control to protect the Montauk Lighthouse that would affect all the coast west of the lighthouse. I'm sure you are aware of what percentage of the coast is now without beach due to hard erosion control measures. In particular I can't imagine how you might consider a hard erosion proposal without taking into account FIMP.

L10b I thought the Army Corps was well aware of how many beaches and coasts have been negatively affected by seawalls, jetties, and all the hard systems that protect one little area. The Lighthouse is indeed an historic building but ruining the coast to the west of it is not an option to my mind. I'm also sure you are aware of the speed of the erosion at Montauk point and on the cliffs west of the lighthouse. Nature will have its due.

L10c I hope you consider my letter a clear message saying, don't do anything more at the Lighthouse site that would be in addition to the existing rock sea wall.

Yours sincerely,

Gay Leonhardt

Amagansett, NY

Comment in Letter Number 10:

Gay Leonhardt
Amagansett, New York

Comment L10a: In light of FIMP how you the Corps consider a hard structure?

Response L10a: The Fire Island Inlet to Montauk Point Project, which was authorized in 1960 based a report in 1958, did not include protective works at Montauk Point. It is likely that the Congress was cognizant of that when it authorized a separate study for the protection of Montauk Point.

The Fire Island to Montauk Point Reformulation Study is premised on the existence of the present revetment at Montauk Point that was constructed by the U.S. Coast Guard and the Montauk Historical Society in 1992-1993. In the absence of a project decision at the Point, the Reformulation Study has assumed that local interests would likely maintain some form of the present revetment for the foreseeable future and there is no reason to expect it to be removed. Accordingly, the FIMP Reformation Study has conservatively estimated that no littoral material is generated into the south shore of Long Island littoral system from the Montauk Point area that is protected by the existing revetment. The small amount of material that potentially could enter the south shore littoral system upon the failure of the existing revetment would not significantly affect the evaluation of without and with-project alternatives in the FIMP Reformulation Study. With regard to coastal and littoral processes, the revetment selected for a potential Montauk Point Storm Damage Reduction Project would tend to continue the effects of the existing revetment and the nearly 60 year history of efforts to reduce erosion. These effects are small and diminish with distance from the revetment well before, or east of, any area where the FIMP Reformulation Study would be evaluating protection measures.

In summary, the proposed alternative has independent utility and does not foreclose any alternatives being considered under the FIMP Reformulation Study. If the Montauk Point Feasibility Report is approved and the proposed alternative is recommended for construction, the FIMP Reformulation Study will include analysis of this project in its cumulative effects analysis.

Comment L10b: Hard structures further the erosion of beaches

Response L10b: At the recent public information session, the Corps representatives agreed to develop additional explanation for the Feasibility Report regarding the potential project effects on coastal and littoral processes. The following explanation, though lengthy, provides a fairly simple, yet thorough, discussion regarding the coastal and littoral process considerations involved in the plan formulation evaluation.

Coastal Processes. The proposed project alternative to protect Montauk Point will essentially continue the coastal process impacts of the 1992-1993 revetment over the 50 year planning horizon. The effects on coastal processes at the Point from the man made intervention date back nearly 60 years. Shoreline erosion rates are a function of many factors including the type of material at each shoreline location, total mass of material at each location, and the wave energy impinging upon it. The Long Island shoreline both north and south of Montauk Point consists of a series of concave and convex shoreline reaches, indicating a variation in erodability alongshore. Historic shoreline mapping shows that the 1870, 1933 and 1938 shorelines, preceding construction of revetments at Montauk Point in the 1940's, all have an indentation at Turtle Cove, similar to the shoreline shape that exists now. This indicates that the Turtle Cove reach erodes at a faster rate than the point, and that this indented curvature was not caused by construction of the revetment. Shorelines also show that the Atlantic shore west of the point has been generally erosive over the 1870-1995 period. The existing and the proposed revetment alternative will act to hold or anchor the eastern most end of the Turtle Cove area. While the proposed revetment alternative will continue to limit the coastal erosion at the Point protecting the Lighthouse complex, forces such as the tidal currents and waves will continue to erode the north and south downdrift shores continuing the curvature process, especially immediately adjacent to the revetment.

Downdrift Effects. The erosion of the areas just west of the Point tends to make up for the material covered by the existing revetment that is prevented from entering the littoral system. Since the proposed revetment alternative will extend over virtually the same lineal extent of the shoreline as the existing revetment, the proposed revetment will continue this trend. The effect of both the existing revetment and the proposed revetment on the downdrift, unprotected shoreline is to reduce the amount of sand moving alongshore by a small amount estimated to be approximately 3,000 cy/yr for the south shore. The sediment deficit would tend to increase the erosion rate of shoreline immediately adjacent to the revetment by a similar increment, over a short distance downdrift. Shoreline change mapping for the Turtle Cove area shows approximately a 2-ft/yr increase in retreat rate in the post-revetment period (1938-to 1995) as compared to the pre-revetment period (1870-1938), which may be due in part to the construction of the existing revetment, as well as to all other factors contributing to shoreline erosion. Indications from the shoreline change mapping are that any sediment deficits caused by the revetment are made up within approximately 2,500 feet of the end of the structure, at which point the shorelines changes to one of fluctuation of erosion and accretion. Shorelines north of the existing revetment have a similar response, which would continue with the proposed structure in place. At the same time, the relative impact of the small amount of reduced littoral material due to the revetment also diminishes because the net amount of littoral material moving westerly along the shores gradually increases as the waves and currents act upon the more westerly shores.

The curvature of the immediately downdrift or westerly shore areas will continue but will not pinch off or cause flanking of the protected area during the 50 year project evaluation period. It is also likely that as the curved recession due to waves and currents continues, there would be a tendency toward stabilization as the landform adjusts to the prevailing coastal forces. Subject to the occurrence of future storm events, the rate of erosion observed in relatively recent years could be somewhat reduced.

The following paragraphs give an indication of the volumes of littoral material involved in determining downdrift impacts of the project:

Contribution to Littoral Drift. Erosion of bluffs and beach fronting the Montauk Lighthouse does contribute a small amount of material to the littoral drift that moves along the Atlantic shore southwest of the lighthouse as well as along the Block Island Sound shore northwest of the lighthouse. Based on measurement over the period of record (1868-1993) the average annual erosion rate of bluff and beach as stated in the Feasibility Report, is estimated at 6 cubic yards per year per foot of shoreline. This average includes periods of time when the bluff was covered by a revetment, as well as prior to the construction of protective works. As such, this long-term average is a reasonable estimate for shoreline loss for periods of time covering conditions when the protective works are intact and limit loss, and periods of time when the protective works have lost integrity, resulting in greater amounts of erosion.

The proposed revetment covers approximately 840 linear feet of shoreline, which is virtually identical to the length of the existing revetment. Using the long-term erosion rate of 6 cubic yards(cy) per linear foot per year, approximately 5,000 cy of material can be assumed lost from the beach and bluff per year. Note that the material comprising the bluff is a mix of sand, gravel, and silt, based on boring logs. Some percentage of the eroded material is lost to the net longshore sand transport as it is either too fine, or too coarse. This percentage could be in the 10-30% range, but for this discussion no reduction has been taken for loss of fines or coarse material to the quantity of sediment transport.

The estimated volume of material per year will move either northwest or southwest of the point, except for some finer sediment moved permanently offshore or larger material that settles out. Based on the shape of the point and the length of the revetment, approximately 60% of the eroded material can be expected to move southwest, and approximately 40% can be expected to move northwest, i.e. approximately 3,000 cy/year will be contributed to the littoral drift along the Atlantic shore and approximately 2,000 cy/year along the Block Island Sound shore from the revetted shoreline. The shores to the northwest and southwest tend to make up for the effects of the revetment by contributing substitute littoral material over a relatively short distance downdrift.

For comparative purposes along the Atlantic shore, sediment budget estimates of the net longshore sand transport rate moving westward at Ditch Plains is approximately 70,000 cy per year. At the Montauk beaches, the net longshore transport rate increases to approximately 100,000 cy/yr. There is considerable uncertainty in sediment budget calculations, such that the given amount may differ by +/-40,000 cy/yr. Effects of both the existing structure at Montauk and the proposed structure on the littoral sand transport are small and are expected to be local, i.e. are not likely to extend as far alongshore to developed areas such as Ditch Plains or more developed points further west, especially in view of the variable shoreline shape and materials in between.

The amount of material that would be contributed downdrift if the proposed revetment alternative was not constructed is very small relative to the total sediment budget and this small amount is added back by some equally minor increase in erosion, a relatively short distance west of the revetment. Any adverse impacts from the proposed revetment alternative are not considered to be significant, and would not materially effect areas being considered for protection under the Fire Island Inlet to Montauk Point Reformulation Study.

Surfing Effects. There is a revetment in place at Montauk Point now, and the surfing is considered to be good. The proposed revetment will be in the same place as the existing revetment, made of similar rock material, and will be similar to it in all particulars which might effect waves. As shown in the Feasibility Report, Table 10, and discussed in Section 4.0 – Recreation, wave reflection coefficients are estimated at 13-19 percent less for the proposed revetment alternative than for the existing revetment. The proposed plan will not change wave conditions in any perceivable way.

Comment 10c: Don't do anything more to the site that would be in addition to the existing rock sea wall.

Response L10c: The current recommended project answers your comment in that the proposal is nothing essentially more than a re-strengthening of the existing stone revetment wall and not the construction of a newly proposed wall.

Mail to: Christopher Ricciardi
Army Corps of Engineers
Planning Division-Environmental Branch
26 Federal Plaza, Room 2151
New York, NY 10278-0090

**Must be received by Tuesday, October 4, 2005**

US Army Corps of Engineers
New York District

# MONTAUK POINT, NEW YORK STORM DAMAGE REDUCTION FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

## Comment Card

NYS Department of Environmental Conservation

PLEASE PRINT CLEARLY!

Name: DR. SUSAN CHRISTOFFERSEN
Address: ~~16~~ 14 HUNTERS LANE and 689 VALLEY VIEW
City, State, Zip: SOUTHAMPTON, NY 11968 WAYNE PA 19087
Phone: 631-680-8308 610-902-0749
Email: CHRISTOFFERSENS@PHILAU.EDU
Affiliation, if any: PHILADELPHIA UNIVERSITY

Comment(s):

L11a Do not take any further steps forward with the proposed configuration of the structure due to the imminent negative effects to the surfing waves, plus the long-term environmental effects from down drift erosion and scouring.

L11b We request more information on the stated failure of the current revetment.

L11c Incorporate the MPSRP with the FIMP. Have one comprehensive plan for protecting the coast of Long Island.

L11d Create a plan that will protect the Lighthouse without doing damage to the local environment and surf breaks.

338

**Mail to:** **Christopher Ricciardi**
**Army Corps of Engineers**
**Planning Division-Environmental Branch**
**26 Federal Plaza, Room 2151**
**New York, NY 10278-0090**

**Must be received by Tuesday, October 4, 2005**

**US Army Corps of Engineers.**
New York District

NYS Department of Environmental Conservation

# MONTAUK POINT, NEW YORK
# STORM DAMAGE REDUCTION
# FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

## Comment Card

PLEASE PRINT CLEARLY!

Name: Derrick T. Galen
Address: 26 Richards Drive
City, State, Zip: Sag Harbor NY 11963
Phone: 631 725 7253
Email: derrick@galenmarine.com
Affiliation, if any:

Comment(s):

**Do not take any further steps forward with the proposed configuration of the structure due to the imminent negative effects to the surfing waves, plus the long-term environmental effects from down drift erosion and scouring.** L12a

**We request more information on the stated failure of the current revetment.** L12b

**Incorporate the MPSRP with the FIMP. Have one comprehensive plan for protecting the coast of Long Island.** L12c

**Create a plan that will protect the Lighthouse without doing damage to the local environment and surf breaks.** L12d

Mail to: Christopher Ricciardi
Army Corps of Engineers
Planning Division-Environmental Branch
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New York, NY 10278-0090

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New York District

NYS Department of Environmental Conservation

# MONTAUK POINT, NEW YORK STORM DAMAGE REDUCTION FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

## Comment Card

PLEASE PRINT CLEARLY!

Name: MICHAEL HASTALIS
Address: 285 GERARD DRIVE
City, State, Zip: EAST HAMPTON N.Y 11937
Phone: 631 324 6178
Email: SHASTALIS @ HOT MAIL . COM
Affiliation , if any: SURFRIDER FOUNDATION MEMBER

Comment(s): HAVEN'T YOU DONE ENOUGH DAMAGE

**Do not take any further steps forward with the proposed configuration of the structure due to the imminent negative effects to the surfing waves, plus the long-term environmental effects from down drift erosion and scouring.** L13a

**We request more information on the stated failure of the current revetment.** L13b

**Incorporate the MPSRP with the FIMP. Have one comprehensive plan for protecting the coast of Long Island.** L13c

**Create a plan that will protect the Lighthouse without doing damage to the local environment and surf breaks.** L13d

**Mail to:** Christopher Ricciardi
Army Corps of Engineers
Planning Division-Environmental Branch
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New York, NY 10278-0090

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of Engineers.
New York District

# MONTAUK POINT, NEW YORK STORM DAMAGE REDUCTION FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

## Comment Card

PLEASE PRINT CLEARLY!

Name: Jake Lesnik
Address: 1131 Walk Circle
City, State, Zip: Santa Cruz, CA 95060
Phone: (973) 986-5875
Email: jakelesnik@gmail.com
Affiliation, if any: seasonal resident in Springs, NY

Comment(s):

L14a Do not take any further steps forward with the proposed configuration of the structure due to the imminent negative effects to the surfing waves, plus the long-term environmental effects from down drift erosion and scouring.

L14b We request more information on the stated failure of the current revetment.

L14c Incorporate the MPSRP with the FIMP. Have one comprehensive plan for protecting the coast of Long Island.

L14d Create a plan that will protect the Lighthouse without doing damage to the local environment and surf breaks.

Mail to: Christopher Ricciardi
Army Corps of Engineers
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# MONTAUK POINT, NEW YORK
# STORM DAMAGE REDUCTION
# FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

## Comment Card

PLEASE PRINT CLEARLY!

Name: Sheryl Hastales
Address: 285 Gerard Drive
City, State, Zip: E Hampton NY 11937
Phone: 516 318 5790
Email: shastales@hotmail.com
Affiliation, if any:

Comment(s):

**Do not take any further steps forward with the proposed configuration of the structure due to the imminent negative effects to the surfing waves, plus the long-term environmental effects from down-drift erosion and scouring.** L15a

**We request more information on the stated failure of the current revetment.** L15b

**Incorporate the MPSRP with the FIMP. Have one comprehensive plan for protecting the coast of Long Island.** L15c

**Create a plan that will protect the Lighthouse without doing damage to the local environment and surf breaks.** L15d

**Mail to:** **Christopher Ricciardi**
**Army Corps of Engineers**
**Planning Division-Environmental Branch**
**26 Federal Plaza, Room 2151**
**New York, NY 10278-0090**

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# MONTAUK POINT, NEW YORK
# STORM DAMAGE REDUCTION
# FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

## Comment Card

PLEASE PRINT CLEARLY!

Name: Robert Mirsky
Address: 796 Bretton Woods Road
City, State, Zip: Coram, NY 11737
Phone:
Email: murielbob@aol.com
Affiliation , if any:

Comment(s):

**Do not take any further steps forward with the proposed configuration of the structure due to the imminent negative effects to the surfing waves, plus the long-term environmental effects from down-drift erosion and scouring.** L16a

**We request more information on the stated failure of the current revetment.** L16b

**Incorporate the MPSRP with the FIMP. Have one comprehensive plan for protecting the coast of Long Island.** L16c

**Create a plan that will protect the Lighthouse without doing damage to the local environment and surf breaks.** L16d

Mail to: Christopher Ricciardi
Army Corps of Engineers
Planning Division-Environmental Branch
26 Federal Plaza, Room 2151
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US Army Corps
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New York District

NYS Department of Environmental Conservation

# MONTAUK POINT, NEW YORK
# STORM DAMAGE REDUCTION
# FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

## Comment Card

PLEASE PRINT CLEARLY!

Name: Philip O'Connell, Esq.
Address: 132 Newtown Lane
City, State, Zip: East Hampton New York 11937
Phone: (917) 287-6419
Email:
Affiliation, if any: SurfRider, NY BAR

Comment(s):

**Do not take any further steps forward with the proposed configuration of the structure due to the imminent negative effects to the surfing waves, plus the long-term environmental effects from down drift erosion and scouring.** L17a

**We request more information on the stated failure of the current revetment.** L17b

**Incorporate the MPSRP with the FIMP. Have one comprehensive plan for protecting the coast of Long Island.** L17c

**Create a plan that will protect the Lighthouse without doing damage to the local environment and surf breaks.** L17d

**Mail to:** Christopher Ricciardi
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of Engineers
New York District

NYS
Department of
Environmental
Conservation

# MONTAUK POINT, NEW YORK
# STORM DAMAGE REDUCTION
# FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

## Comment Card

PLEASE PRINT CLEARLY!

Name: Stephan Roussan
Address: 415 Third St.
City, State, Zip: New Suffolk NY 11956
Phone: 631-734-2083
Email: sr@vm1.com
Affiliation , if any:

Comment(s):

**Do not take any further steps forward with the proposed configuration of the structure due to the imminent negative effects to the surfing waves, plus the long-term environmental effects from down drift erosion and scouring.** L18a

**We request more information on the stated failure of the current revetment.** L18b

**Incorporate the MPSRP with the FIMP. Have one comprehensive plan for protecting the coast of Long Island.** L18c

**Create a plan that will protect the Lighthouse without doing damage to the local environment and surf breaks.** L18d

**Mail to: Christopher Ricciardi**
**Army Corps of Engineers**
**Planning Division-Environmental Branch**
**26 Federal Plaza, Room 2151**
**New York, NY 10278-0090**

**Must be received by Tuesday, October 4, 2005**

US Army Corps of Engineers
New York District

# MONTAUK POINT, NEW YORK STORM DAMAGE REDUCTION FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

## Comment Card

PLEASE PRINT CLEARLY!

Name: Bruce Lieberman
Address: 115 Narrow lane S
City, State, Zip: water Mill NY 11972
Phone:
Email: bRupaint@optonline.net
Affiliation (if any): East Hampton H.S. Surf Club
Comment(s): Enclosed are our student Surfer who support the statements below.

L19a **Do not take any further steps forward with the proposed configuration of the structure due to the imminent negative effects to the surfing waves, plus the long-term environmental effects from down drift erosion and scouring.**

L19b **Do a long-term scientific study to prove the current revetment is sinking, shifting or moving.**

L19c **Incorporate the MPSRP with the FIMP. Have one comprehensive plan for protecting the coast of Long Island.**

L19d **Reconfigure the current revetment, making it strong enough to withstand a major storm and protect the Lighthouse without doing damage to the local environment and surf breaks.**

**Mail to:** Christopher Ricciardi
Army Corps of Engineers
Planning Division-Environmental Branch
26 Federal Plaza, Room 2151
New York, NY 10278-0090

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US Army Corps
of Engineers
New York District

# MONTAUK POINT, NEW YORK
# STORM DAMAGE REDUCTION
# FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

## Comment Card

PLEASE PRINT CLEARLY!

Name: Jay Levine
Address: Po Box 2150
City, State, Zip: Montauk, NY 11954
Phone 631-668-6319
Email:
Affiliation (if any): surfrider Foundation

Comment(s):

**Do not take any further steps forward with the proposed configuration of the structure due to the imminent negative effects to the surfing waves, plus the long-term environmental effects from down drift erosion and scouring.** L19a

**We request more information on the stated failure of the current revetment.** L19b

**Incorporate the MPSRP with the FIMP. Have one comprehensive plan for protecting the coast of Long Island.** L19c

**Create a plan that will protect the Lighthouse without doing damage to the local environment and surf breaks.** L19d

If the Fed Gov't. can put in a revetment, why am I not permited to put in a seawall to protect my home? L19e

Comment in Letter Numbers 11 through 19:

Dr. Susan Christoffersen
14 Hunters Lane
Southampton, New York 11968
(631) 680-8308
christoffersens@philau.edu

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Sag Harbor, New York 11963
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Michael Hastalis
285 Gerard Drive
East Hampton, New York 11937
(631) 324-6178
Shastalis@hotmail.com

Bruce Lieberman
115 Narrow Lane S.
Water Mill, New York 11972
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Jake Lesnick
1131 Walk Circle
Santa Cruz, California 95060
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Robert Mirsky
796 Bretton Wood Road
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Philip O'Connell, Esq.
132 Newtown Lane
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Stephan Roussan
415 Third Street
New Suffolk, New York 11956
(631) 734-2083

NOTE: The following nine (9) letters were form letters sent in with the only difference being the name of the individual sending in the comment. Therefore, all nine letters are answered once below.

Comment L11-19a: Do not proceed due to the imminent impact to surfing waves and the long term environmental effects from down drift erosion and scouring.

Response L11-19a: At the recent public information session, the Corps representatives agreed to develop additional explanation for the Feasibility Report regarding the potential project effects on coastal and littoral processes. The following explanation, through lengthy, provides a fairly simple, yet thorough, discussion regarding the coastal and littoral process considerations involved in the plan formulation evaluation.

Coastal Processes. The proposed project alternative to protect Montauk Point will essentially continue the coastal process impacts of the 1992-1993 revetment over the 50 year planning horizon. The effects on coastal processes at the Point from the man made intervention date back nearly 60 years. Shoreline erosion rates are a function of many factors including the type of material at each shoreline location, total mass of material at each location, and the wave energy impinging upon it. The Long Island shoreline both north and south of Montauk Point consists of a series of concave and convex shoreline reaches, indicating a variation in erodability alongshore. Historic shoreline mapping shows that the 1870, 1933 and 1938 shorelines, preceding construction of revetments at Montauk Point in the 1940's, all have an indentation at Turtle Cove, similar to the shoreline shape that exists now. This indicates that the Turtle Cove reach erodes at a faster rate than the point, and that this indented curvature was not caused by construction of the revetment. Shorelines also show that the Atlantic shore west of the point has been generally erosive over the 1870-1995 period. The existing and the proposed revetment alternative will act to hold or anchor the eastern most end of the Turtle Cove area. While the proposed revetment alternative will continue to limit the coastal erosion at the Point protecting the Lighthouse complex, forces such as the tidal currents and waves will continue to erode the north and south downdrift shores continuing the curvature process, especially immediately adjacent to the revetment.

Downdrift Effects. The erosion of the areas just west of the Point tends to make up for the material covered by the existing revetment that is prevented from entering the littoral system. Since the proposed revetment alternative will extend over virtually the same lineal extent of the shoreline as the existing revetment, the proposed revetment will continue this trend. The effect of both the existing revetment and the proposed revetment on the downdrift, unprotected shoreline is to reduce the amount of sand moving alongshore by a small amount estimated to be approximately 3,000 cy/yr for the south shore. The sediment deficit would tend to increase the erosion rate of shoreline immediately adjacent to the revetment by a similar increment, over a short distance downdrift. Shoreline change mapping for the Turtle Cove area shows approximately a 2-ft/yr increase in retreat rate in the post-revetment period (1938-to 1995) as compared to the pre-revetment period (1870-1938), which may be due in part to the construction of the existing revetment, as well as to all other factors contributing to shoreline erosion. Indications from the shoreline change mapping are that any sediment deficits caused by the revetment are made up within approximately 2,500 feet of the end of the structure, at which point the shorelines changes to one of fluctuation of erosion and accretion. Shorelines north of the existing revetment have a similar response, which would continue with the proposed structure in place. At the same time, the relative impact of the small amount of reduced littoral material due to the revetment also diminishes because the net amount of littoral material moving westerly along the shores gradually increases as the waves and currents act upon the more westerly shores.

The curvature of the immediately downdrift or westerly shore areas will continue but will not pinch off or cause flanking of the protected area during the 50 year project evaluation period. It is also likely that as the curved recession due to waves and currents continues, there would be a tendency toward stabilization as the landform adjusts to the prevailing coastal forces. Subject to the occurrence of future storm events, the rate of erosion observed in relatively recent years could be somewhat reduced.

The following paragraphs give an indication of the volumes of littoral material involved in determining downdrift impacts of the project:

Contribution to Littoral Drift. Erosion of bluffs and beach fronting the Montauk Lighthouse does contribute a small amount of material to the littoral drift that moves along the Atlantic shore southwest of the lighthouse as well as along the Block Island Sound shore northwest of the lighthouse. Based on measurement over the period of record (1868-1993) the average annual erosion rate of bluff and beach as stated in the Feasibility Report, is estimated at 6 cubic yards per year per foot of shoreline. This average includes periods of time when the bluff was covered by a revetment, as well as prior to the construction of protective works. As such, this long-term average is a reasonable estimate for shoreline loss for periods of time covering conditions when the protective works are intact and limit loss, and periods of time when the protective works have lost integrity, resulting in greater amounts of erosion.

The proposed revetment covers approximately 840 linear feet of shoreline, which is virtually identical to the length of the existing revetment. Using the long-term erosion rate of 6 cubic yards(cy) per linear foot per year, approximately 5,000 cy of material can be assumed lost from the beach and bluff per year. Note that the material comprising the bluff is a mix of sand, gravel, and silt, based on boring logs. Some percentage of the eroded material is lost to the net longshore sand transport as it is either too fine, or too coarse. This percentage could be in the 10-30% range, but for this discussion no reduction has been taken for loss of fines or coarse material to the quantity of sediment transport.

The estimated volume of material per year will move either northwest or southwest of the point, except for some finer sediment moved permanently offshore or larger material that settles out. Based on the shape of the point and the length of the revetment, approximately 60% of the eroded material can be expected to move southwest, and approximately 40% can be expected to move northwest, i.e. approximately 3,000 cy/year will be contributed to the littoral drift along the Atlantic shore and approximately 2,000 cy/year along the Block Island Sound shore from the revetted shoreline. The shores to the northwest and southwest tend to make up for the effects of the revetment by contributing substitute littoral material over a relatively short distance downdrift.

For comparative purposes along the Atlantic shore, sediment budget estimates of the net longshore sand transport rate moving westward at Ditch Plains is approximately 70,000 cy per year. At the Montauk beaches, the net longshore transport rate increases to approximately 100,000 cy/yr. There is considerable uncertainty in sediment budget calculations, such that the given amount may differ by +/-40,000 cy/yr. Effects of both the existing structure at Montauk and the proposed structure on the littoral sand transport are small and are expected to be local, i.e. are not likely to extend as far alongshore to developed areas such as Ditch Plains or more developed points further west, especially in view of the variable shoreline shape and materials in between.

The amount of material that would be contributed downdrift if the proposed revetment alternative was not constructed is very small relative to the total sediment budget and this small amount is added back by some equally minor increase in erosion, a relatively short distance west of the revetment. Any adverse impacts from the proposed revetment alternative are not considered to be significant, and would not materially effect areas being considered for protection under the Fire Island Inlet to Montauk Point Reformulation Study.

Surfing Effects. There is a revetment in place at Montauk Point now, and the surfing is considered to be good. The proposed revetment will be in the same place as the existing revetment, made of similar rock material, and will be similar to it in all particulars which might effect waves. As shown in the Feasibility Report, Table 10, and discussed in Section 4.0 – Recreation, wave reflection coefficients are estimated at 13-19 percent less for the proposed revetment alternative than for the existing revetment. The proposed plan will not change wave conditions in any perceivable way.

Comment L11-19b: More information is requested on the failure of the current revetment.

Response L11-19b: Surfrider Foundation requests information related to the stated failure of the current revetment. The Corp' DEIS claims that the current revetment is failing and is expected to be ineffective in 5-7 years, however, the report offers no field data related to this failure. In order for Surfrider Foundation to constructively contribute to the project, we will need all historical and current data on the existing revetment.

The DEIS does not claim that the existing revetment will be ineffective in 5-7 years. Evaluation of the existing revetment failure mechanisms was accomplished both analytically and through physical modeling techniques. These are discussed in the Feasibility Report Main Body and in Appendix A.

Comment L11-19c: Incorporate this project into FIMP.

Response L11-19c: The Fire Island Inlet to Montauk Point Project, which was authorized in 1960 based a report in 1958, did not include protective works at Montauk Point. It is likely that the Congress was cognizant of that when it authorized a separate study for the protection of Montauk Point.

The Fire Island to Montauk Point Reformulation Study is premised on the existence of the present revetment at Montauk Point that was constructed by the U.S. Coast Guard and the Montauk Historical Society in 1992-1993. In the absence of a project decision at the Point, the Reformulation Study has assumed that local interests would likely maintain some form of the present revetment for the foreseeable future and there is no reason to expect it to be removed. Accordingly, the FIMP Reformation Study has conservatively estimated that no littoral material is generated into the south shore of Long Island littoral system from the Montauk Point area that is protected by the existing revetment. The small amount of material that potentially could enter the south shore littoral system upon the failure of the existing revetment would not significantly affect the evaluation of without and with-project alternatives in the FIMP Reformulation Study. With regard to coastal and littoral processes, the revetment selected for a potential Montauk Point Storm Damage Reduction Project would tend to continue the effects of the existing revetment and the nearly 60 year history of efforts to reduce erosion. These effects are small and diminish with distance from the revetment well before, or east of, any area where the FIMP Reformulation Study would be evaluating protection measures.

In summary, the proposed alternative has independent utility and does not foreclose any alternatives being considered under the FIMP Reformulation Study. If the Montauk Point Feasibility Report is approved and the proposed alternative is recommended for construction, the FIMP Reformulation Study will include analysis of this project in its cumulative effects analysis.

Comment L11-19d: Create a plan that does not damage the environment or the surf breaks.

Response L11-19d: The proposed revetment alternative does just that.

Comment in Letter Number 20:

Jay Levine
P.O. Box 2150
Montauk, New York 11954
(631) 668-6319

Comment L20a: Do not proceed due to the imminent impact to surfing waves and the long term environmental effects from down drift erosion and scouring.

Response L20a: At the recent public information session, the Corps representatives agreed to develop additional explanation for the Feasibility Report regarding the potential project effects on coastal and littoral processes. The following explanation, through lengthy, provides a fairly simple, yet thorough, discussion regarding the coastal and littoral process considerations involved in the plan formulation evaluation.

Coastal Processes. The proposed project alternative to protect Montauk Point will essentially continue the coastal process impacts of the 1992-1993 revetment over the 50 year planning horizon. The effects on coastal processes at the Point from the man made intervention date back nearly 60 years. Shoreline erosion rates are a function of many factors including the type of material at each shoreline location, total mass of material at each location, and the wave energy impinging upon it. The Long Island shoreline both north and south of Montauk Point consists of a series of concave and convex shoreline reaches, indicating a variation in erodability alongshore. Historic shoreline mapping shows that the 1870, 1933 and 1938 shorelines, preceding construction of revetments at Montauk Point in the 1940's, all have an indentation at Turtle Cove, similar to the shoreline shape that exists now. This indicates that the Turtle Cove reach erodes at a faster rate than the point, and that this indented curvature was not caused by construction of the revetment. Shorelines also show that the Atlantic shore west of the point has been generally erosive over the 1870-1995 period. The existing and the proposed revetment alternative will act to hold or anchor the eastern most end of the Turtle Cove area. While the proposed revetment alternative will continue to limit the coastal erosion at the Point protecting the Lighthouse complex, forces such as the tidal currents and waves will continue to erode the north and south downdrift shores continuing the curvature process, especially immediately adjacent to the revetment.

Downdrift Effects. The erosion of the areas just west of the Point tends to make up for the material covered by the existing revetment that is prevented from entering the littoral system. Since the proposed revetment alternative will extend over virtually the same lineal extent of the shoreline as the existing revetment, the proposed revetment will continue this trend. The effect of both the existing revetment and the proposed revetment on the downdrift, unprotected shoreline is to reduce the amount of sand moving alongshore by a small amount estimated to be approximately 3,000 cy/yr for the south shore. The sediment deficit would tend to increase the erosion rate of shoreline immediately adjacent to the revetment by a similar increment, over a short distance downdrift. Shoreline change mapping for the Turtle Cove area shows approximately a 2-ft/yr increase in retreat rate in the post-revetment period (1938-to 1995) as compared to the pre-revetment period (1870-1938), which may be due in part to the construction of the existing revetment, as well as to all other factors contributing to shoreline erosion. Indications from the shoreline change mapping are that any sediment deficits caused by the revetment are made up within approximately 2,500 feet of the end of the structure, at which point the shorelines changes to one of fluctuation of erosion and accretion. Shorelines north of the existing revetment have a similar response, which would continue with the proposed structure in place. At the same time, the relative impact of the small amount of reduced littoral material due to the revetment also diminishes because the net amount of littoral material moving westerly along the shores gradually increases as the waves and currents act upon the more westerly shores.

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The amount of material that would be contributed downdrift if the proposed revetment alternative was not constructed is very small relative to the total sediment budget and this small amount is added back by some equally minor increase in erosion, a relatively short distance west of the revetment. Any adverse impacts from the proposed revetment alternative are not considered to be significant, and would not materially effect areas being considered for protection under the Fire Island Inlet to Montauk Point Reformulation Study.

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Comment L20b: More information is requested on the failure of the current revetment.

Response L20b: The DEIS does not claim that the existing revetment will be ineffective in 5-7 years. Evaluation of the existing revetment failure mechanisms was accomplished both analytically and through physical modeling techniques. These are discussed in the Feasibility Report Main Body and in Appendix A.

Comment L20c: Incorporate this project into FIMP.

Response L20c: The Fire Island Inlet to Montauk Point Project, which was authorized in 1960 based a report in 1958, did not include protective works at Montauk Point. It is likely that the Congress was cognizant of that when it authorized a separate study for the protection of Montauk Point.

The Fire Island to Montauk Point Reformulation Study is premised on the existence of the present revetment at Montauk Point that was constructed by the U.S. Coast Guard and the Montauk Historical Society in 1992-1993. In the absence of a project decision at the Point, the

Reformulation Study has assumed that local interests would likely maintain some form of the present revetment for the foreseeable future and there is no reason to expect it to be removed. Accordingly, the FIMP Reformation Study has conservatively estimated that no littoral material is generated into the south shore of Long Island littoral system from the Montauk Point area that is protected by the existing revetment. The small amount of material that potentially could enter the south shore littoral system upon the failure of the existing revetment would not significantly affect the evaluation of without and with-project alternatives in the FIMP Reformulation Study. With regard to coastal and littoral processes, the revetment selected for a potential Montauk Point Storm Damage Reduction Project would tend to continue the effects of the existing revetment and the nearly 60 year history of efforts to reduce erosion. These effects are small and diminish with distance from the revetment well before, or east of, any area where the FIMP Reformulation Study would be evaluating protection measures.

In summary, the proposed alternative has independent utility and does not foreclose any alternatives being considered under the FIMP Reformulation Study. If the Montauk Point Feasibility Report is approved and the proposed alternative is recommended for construction, the FIMP Reformulation Study will include analysis of this project in its cumulative effects analysis.

Comment L20d: Create a plan that does not damage the environment or the surf breaks.

Response L20d: The proposed revetment alternative does just that.

Comment L20e: Why am I not permitted to put in a seawall if the Government can do it at Montauk Point?

Response L20e: Questions with regard to New York State regulatory issues should be addressed to the appropriate State regulatory agency.

**Mail to: Christopher Ricciardi**
**Army Corps of Engineers**
**Planning Division-Environmental Branch**
**26 Federal Plaza, Room 2151**
**New York, NY 10278-0090**

**Must be received by Tuesday, October 4, 2005**

US Army Corps
of Engineers
New York District

# MONTAUK POINT, NEW YORK
# STORM DAMAGE REDUCTION
# FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

## Comment Card

PLEASE PRINT CLEARLY!

Name: Marilyn Levine
Address: PO Box 2150
City, State, Zip: Montauk, NY 11954
Phone 631-668-6319
Email:
Affiliation, if any: Surfrider

Comment(s):

**Do not take any further steps forward with the proposed configuration of the structure due to the imminent negative effects to the surfing waves, plus the long-term environmental effects from down drift erosion and scouring.** L20a

**We request more information on the stated failure of the current revetment.** L20b

**Incorporate the MPSRP with the FIMP. Have one comprehensive plan for protecting the coast of Long Island.** L20c

**Create a plan that will protect the Lighthouse without doing damage to the local environment and surf breaks.** L20d

It seems that this project could cause an increase in Beach erosion along Long Island's south shore.

L20e

Comment in Letter Number 21:

Marilyn Levine
P.O. Box 2150
Montauk, New York 11954
(631) 668-6319

Comment L21a: Do not proceed due to the imminent impact to surfing waves and the long term environmental effects from down drift erosion and scouring.

Response L21a: At the recent public information session, the Corps representatives agreed to develop additional explanation for the Feasibility Report regarding the potential project effects on coastal and littoral processes. The following explanation, through lengthy, provides a fairly simple, yet thorough, discussion regarding the coastal and littoral process considerations involved in the plan formulation evaluation.

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The proposed revetment covers approximately 840 linear feet of shoreline, which is virtually identical to the length of the existing revetment. Using the long-term erosion rate of 6 cubic yards(cy) per linear foot per year, approximately 5,000 cy of material can be assumed lost from the beach and bluff per year. Note that the material comprising the bluff is a mix of sand, gravel, and silt, based on boring logs. Some percentage of the eroded material is lost to the net longshore sand transport as it is either too fine, or too coarse. This percentage could be in the 10-30% range, but for this discussion no reduction has been taken for loss of fines or coarse material to the quantity of sediment transport.

The estimated volume of material per year will move either northwest or southwest of the point, except for some finer sediment moved permanently offshore or larger material that settles out. Based on the shape of the point and the length of the revetment, approximately 60% of the eroded material can be expected to move southwest, and approximately 40% can be expected to move northwest, i.e. approximately 3,000 cy/year will be contributed to the littoral drift along the Atlantic shore and approximately 2,000 cy/year along the Block Island Sound shore from the revetted shoreline. The shores to the northwest and southwest tend to make up for the effects of the revetment by contributing substitute littoral material over a relatively short distance downdrift.

For comparative purposes along the Atlantic shore, sediment budget estimates of the net longshore sand transport rate moving westward at Ditch Plains is approximately 70,000 cy per year. At the Montauk beaches, the net longshore transport rate increases to approximately 100,000 cy/yr. There is considerable uncertainty in sediment budget calculations, such that the given amount may differ by +/-40,000 cy/yr. Effects of both the existing structure at Montauk and the proposed structure on the littoral sand transport are small and are expected to be local, i.e. are not likely to extend as far alongshore to developed areas such as Ditch Plains or more developed points further west, especially in view of the variable shoreline shape and materials in between.

The amount of material that would be contributed downdrift if the proposed revetment alternative was not constructed is very small relative to the total sediment budget and this small amount is added back by some equally minor increase in erosion, a relatively short distance west of the revetment. Any adverse impacts from the proposed revetment alternative are not considered to be significant, and would not materially effect areas being considered for protection under the Fire Island Inlet to Montauk Point Reformulation Study.

Surfing Effects. There is a revetment in place at Montauk Point now, and the surfing is considered to be good. The proposed revetment will be in the same place as the existing revetment, made of similar rock material, and will be similar to it in all particulars which might effect waves. As shown in the Feasibility Report, Table 10, and discussed in Section 4.0 – Recreation, wave reflection coefficients are estimated at 13-19 percent less for the proposed revetment alternative than for the existing revetment. The proposed plan will not change wave conditions in any perceivable way.

Comment L21b: More information is requested on the failure of the current revetment.

Response L21b: The DEIS does not claim that the existing revetment will be ineffective in 5-7 years. Evaluation of the existing revetment failure mechanisms was accomplished both analytically and through physical modeling techniques. These are discussed in the Feasibility Report Main Body and in Appendix A.

Comment L21c: Incorporate this project into FIMP.

Response L21c: The Fire Island Inlet to Montauk Point Project, which was authorized in 1960 based a report in 1958, did not include protective works at Montauk Point. It is likely that the Congress was cognizant of that when it authorized a separate study for the protection of Montauk Point.

The Fire Island to Montauk Point Reformulation Study is premised on the existence of the present revetment at Montauk Point that was constructed by the U.S. Coast Guard and the Montauk Historical Society in 1992-1993. In the absence of a project decision at the Point, the

Reformulation Study has assumed that local interests would likely maintain some form of the present revetment for the foreseeable future and there is no reason to expect it to be removed. Accordingly, the FIMP Reformation Study has conservatively estimated that no littoral material is generated into the south shore of Long Island littoral system from the Montauk Point area that is protected by the existing revetment. The small amount of material that potentially could enter the south shore littoral system upon the failure of the existing revetment would not significantly affect the evaluation of without and with-project alternatives in the FIMP Reformulation Study. With regard to coastal and littoral processes, the revetment selected for a potential Montauk Point Storm Damage Reduction Project would tend to continue the effects of the existing revetment and the nearly 60 year history of efforts to reduce erosion. These effects are small and diminish with distance from the revetment well before, or east of, any area where the FIMP Reformulation Study would be evaluating protection measures.

In summary, the proposed alternative has independent utility and does not foreclose any alternatives being considered under the FIMP Reformulation Study. If the Montauk Point Feasibility Report is approved and the proposed alternative is recommended for construction, the FIMP Reformulation Study will include analysis of this project in its cumulative effects analysis.

Comment L21d: Create a plan that does not damage the environment or the surf breaks.

Response L21d: The proposed revetment alternative does just that.

Comment L21e: The project will increase erosion along the South Shore.

Response L21e: See Response L20a

US Army Corps of Engineers
New York District

# MONTAUK POINT, NEW YORK
# STORM DAMAGE REDUCTION
# FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

NYS Department of Environmental Conservation

### Comment Card

**PLEASE PRINT CLEARLY!**

Name: [illegible]
Address:
City, State, Zip:
Phone:
Email: [illegible]
Affiliation , if any: [illegible]

Comment(s):

Given the catastrophic impact of some of the Corps' previous efforts in this area [illegible] i.e. limited advance thought (very real consequences that have changed peoples' LIVES), ~~and~~ I hope more said about the likely changes to the shoreline/environment. Also, I heard nothing about the impact to the general economy of the area (No beach = less visitors). Good from one perspective, very very bad from another. If this is about cost, as seemed the case in the "moving the lighthouse vs. protecting it" cost comparison, then the economic impact should be better examined!

L21a

Comment in Letter Number 22:

Jesse Boone
jesseboone@hotmail.com

Comment L22a: Can the economic benefit of saving the lighthouse be better explained?

Response 22a: The Feasibility Report addresses the economic benefits of the project. Please review the sections on the Economic Benefits.

US Army Corps of Engineers.
New York District

# MONTAUK POINT, NEW YORK STORM DAMAGE REDUCTION FEASIBLITY STUDY

NYS Department of Environmental Conservation

## Public Information Session
## September 19, 2005

### Comment Card

**PLEASE PRINT CLEARLY!**

Name: HERMAN DAU

Address: 16 BERDEN LN.

City, State, Zip: E. HAMPTON, NY 11937

Phone: 631-329-9224

Email: h.dau@att.net.

Affiliation, if any:

Comment(s): Consider recreation and surfing as a priority to the light house

L22a

Comment in Letter Number 23:

Herman Dau
16 Borden Lane
East Hampton, New York 11937
(631) 329-9224
h.dau@att.ent

Comment L23a: Consider recreation and surfing as a priority to the lighthouse.

Response L23a: Thank you for your statement. U.S. Army Corps of Engineers' regulations and policy to do allow for Recreational Benefits to be considered as the main benefit cost category. However, recreation is taken into consideration during the Feasibility/Environmental Impact Statement phase of a project, as it has been done during this project. Issues relating to recreational use including hiking, scenic views, fishing, surfing and historical importance have been taken into account and discussed throughout the DEIS.

US Army Corps
of Engineers
New York District

# MONTAUK POINT, NEW YORK
# STORM DAMAGE REDUCTION
# FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

## Comment Card

PLEASE PRINT CLEARLY!

Name: Tony Filippelli
Address: 20 Bryant Ave
City, State, Zip: Roslyn, NY 11576
Phone: 516-625-2683
Email: sufr22@aol.com
Affiliation, if any:

Comment(s):

Please reconsider your plans of building a rock wall
L23a to protect the lighthouse. This wall may cause erosion
of nearby beaches. It will also likely destroy many
of the best surfing areas tyhe east coast has to offer.
L23b Peopole come from up and down the Atlantic coast to enjoy
the world class surfing spots at XMM Montauk Point.
L23c The lighthouse has withstood countless storms over the
years and does not need any further protection.

Thank You.

Comment in Letter Number 24:

Tony Filippelli
20 Bryant Avenue
Roslyn, New York 11576
(516) 625-2683

Comment L24a: Building the wall will cause erosion of the beaches.

Response L24a: At the recent public information session, the Corps representatives agreed to develop additional explanation for the Feasibility Report regarding the potential project effects on coastal and littoral processes. The following explanation, though lengthy, provides a fairly simple, yet thorough, discussion regarding the coastal and littoral process considerations involved in the plan formulation evaluation.

Coastal Processes. The proposed project alternative to protect Montauk Point will essentially continue the coastal process impacts of the 1992-1993 revetment over the 50 year planning horizon. The effects on coastal processes at the Point from the man made intervention date back nearly 60 years. Shoreline erosion rates are a function of many factors including the type of material at each shoreline location, total mass of material at each location, and the wave energy impinging upon it. The Long Island shoreline both north and south of Montauk Point consists of a series of concave and convex shoreline reaches, indicating a variation in erodability alongshore. Historic shoreline mapping shows that the 1870, 1933 and 1938 shorelines, preceding construction of revetments at Montauk Point in the 1940's, all have an indentation at Turtle Cove, similar to the shoreline shape that exists now. This indicates that the Turtle Cove reach erodes at a faster rate than the point, and that this indented curvature was not caused by construction of the revetment. Shorelines also show that the Atlantic shore west of the point has been generally erosive over the 1870-1995 period. The existing and the proposed revetment alternative will act to hold or anchor the eastern most end of the Turtle Cove area. While the proposed revetment alternative will continue to limit the coastal erosion at the Point protecting the Lighthouse complex, forces such as the tidal currents and waves will continue to erode the north and south downdrift shores continuing the curvature process, especially immediately adjacent to the revetment.

Downdrift Effects. The erosion of the areas just west of the Point tends to make up for the material covered by the existing revetment that is prevented from entering the littoral system. Since the proposed revetment alternative will extend over virtually the same lineal extent of the shoreline as the existing revetment, the proposed revetment will continue this trend. The effect of both the existing revetment and the proposed revetment on the downdrift, unprotected shoreline is to reduce the amount of sand moving alongshore by a small amount estimated to be approximately 3,000 cy/yr for the south shore. The sediment deficit would tend to increase the erosion rate of shoreline immediately adjacent to the revetment by a similar increment, over a short distance downdrift. Shoreline change mapping for the Turtle Cove area shows approximately a 2-ft/yr increase in retreat rate in the post-revetment period (1938-to 1995) as compared to the pre-revetment period (1870-1938), which may be due in part to the construction of the existing revetment, as well as to all other factors contributing to shoreline erosion.

Indications from the shoreline change mapping are that any sediment deficits caused by the revetment are made up within approximately 2,500 feet of the end of the structure, at which point the shorelines changes to one of fluctuation of erosion and accretion. Shorelines north of the existing revetment have a similar response, which would continue with the proposed structure in place. At the same time, the relative impact of the small amount of reduced littoral material due to the revetment also diminishes because the net amount of littoral material moving westerly along the shores gradually increases as the waves and currents act upon the more westerly shores.

The curvature of the immediately downdrift or westerly shore areas will continue but will not pinch off or cause flanking of the protected area during the 50 year project evaluation period. It is also likely that as the curved recession due to waves and currents continues, there would be a tendency toward stabilization as the landform adjusts to the prevailing coastal forces. Subject to the occurrence of future storm events, the rate of erosion observed in relatively recent years could be somewhat reduced.

The following paragraphs give an indication of the volumes of littoral material involved in determining downdrift impacts of the project:

Contribution to Littoral Drift. Erosion of bluffs and beach fronting the Montauk Lighthouse does contribute a small amount of material to the littoral drift that moves along the Atlantic shore southwest of the lighthouse as well as along the Block Island Sound shore northwest of the lighthouse. Based on measurement over the period of record (1868-1993) the average annual erosion rate of bluff and beach as stated in the Feasibility Report, is estimated at 6 cubic yards per year per foot of shoreline. This average includes periods of time when the bluff was covered by a revetment, as well as prior to the construction of protective works. As such, this long-term average is a reasonable estimate for shoreline loss for periods of time covering conditions when the protective works are intact and limit loss, and periods of time when the protective works have lost integrity, resulting in greater amounts of erosion.

The proposed revetment covers approximately 840 linear feet of shoreline, which is virtually identical to the length of the existing revetment. Using the long-term erosion rate of 6 cubic yards(cy) per linear foot per year, approximately 5,000 cy of material can be assumed lost from the beach and bluff per year. Note that the material comprising the bluff is a mix of sand, gravel, and silt, based on boring logs. Some percentage of the eroded material is lost to the net longshore sand transport as it is either too fine, or too coarse. This percentage could be in the 10-30% range, but for this discussion no reduction has been taken for loss of fines or coarse material to the quantity of sediment transport.

The estimated volume of material per year will move either northwest or southwest of the point, except for some finer sediment moved permanently offshore or larger material that settles out. Based on the shape of the point and the length of the revetment, approximately 60% of the eroded material can be expected to move southwest, and approximately 40% can be expected to move northwest, i.e. approximately 3,000 cy/year will be contributed to the littoral drift along the Atlantic shore and approximately 2,000 cy/year along the Block Island Sound shore from the revetted shoreline. The shores to the northwest and southwest tend to make up for the effects of the revetment by contributing substitute littoral material over a relatively short distance downdrift.

For comparative purposes along the Atlantic shore, sediment budget estimates of the net longshore sand transport rate moving westward at Ditch Plains is approximately 70,000 cy per year. At the Montauk beaches, the net longshore transport rate increases to approximately 100,000 cy/yr. There is considerable uncertainty in sediment budget calculations, such that the given amount may differ by +/-40,000 cy/yr. Effects of both the existing structure at Montauk and the proposed structure on the littoral sand transport are small and are expected to be local, i.e. are not likely to extend as far alongshore to developed areas such as Ditch Plains or more developed points further west, especially in view of the variable shoreline shape and materials in between.

The amount of material that would be contributed downdrift if the proposed revetment alternative was not constructed is very small relative to the total sediment budget and this small amount is added back by some equally minor increase in erosion, a relatively short distance west of the revetment. Any adverse impacts from the proposed revetment alternative are not considered to be significant, and would not materially effect areas being considered for protection under the Fire Island Inlet to Montauk Point Reformulation Study.

<u>Surfing Effects.</u> There is a revetment in place at Montauk Point now, and the surfing is considered to be good. The proposed revetment will be in the same place as the existing revetment, made of similar rock material, and will be similar to it in all particulars which might effect waves. As shown in the Feasibility Report, Table 10, and discussed in Section 4.0 – Recreation, wave reflection coefficients are estimated at 13-19 percent less for the proposed revetment alternative than for the existing revetment. The proposed plan will not change wave conditions in any perceivable way.

Comment L24b: Will destroy the surfing areas.

Response L24b: See Response L23a.

Comment L24c: The Lighthouse does not need any further protection.

Response L24c: Your statement is incorrect. The existing wall is nearing the end of its projected lifespan and has already shown signs of weakening as described at the Public Information Session.

US Army Corps
of Engineers.
New York District

# MONTAUK POINT, NEW YORK
# STORM DAMAGE REDUCTION
# FEASIBLITY STUDY

NYS Department of Environmental Conservation

## Public Information Session
## September 19, 2005

## Comment Card

**PLEASE PRINT CLEARLY!**

Name: Joseph Giannini

Address: 90 Isle of Wight

City, State, Zip: East Hampton, NY 11937

Phone: 631 324 4778

Email: Giannini43@Yahoo.com

Affiliation , if any: Surfrider

Comment(s): against revetment, for moving lighthouse back

L24a

Comment in Letter Number 25:

Joseph Giannini
90 Isle of Wight
East Hampton, New York 11937
(631) 324-4718
Giannini43@yahoo.com

Comment L25a: against building a revetment - just move the lighthouse

Response L25a: The moving of the Lighthouse was given considerable weight during the Feasibility phase of the project. However, several factors contributed to the decision not to make this proposal the preferred alternative. They included: a) the overall cost of the alternative b) the engineering requirements of having to build up land to meet the hill of Montauk Point to create a level moving surface, c) the destruction of a National Register Landmarked complex - by moving it, the setting is destroyed thus violating the spirit of the National Historic Preservation Act of 1966, as amended, d) the loss of value to the Town of Easthampton, Montauk Point and Montauk Point State Parks, as several hundred thousand visitors come to this area each year, in part to see "the end", i.e. Montauk Point Lighthouse, e) the New York State Office of Parks, Recreation and Historic Preservation (see Letter Number 01), the Regulatory Agency that would have to approve any move of a National Register structure has already stated, and has done so throughout the entire process, that they would not approve the moving of the Lighthouse, which would lead to the destruction of the Lighthouse complex area.

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New York District

# MONTAUK POINT, NEW YORK
# STORM DAMAGE REDUCTION
# FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

NYS Department of Environmental Conservation

## Comment Card

**PLEASE PRINT CLEARLY!**

Name: Robert H. Siegel Esq.
Address: 205 East 60th Street
City, State, Zip: New York NY 10022
Phone: (212) [illegible]-1000
Email:
Affiliation , if any: Surfrider Foundation and Montauk Locals Fishing

Comment(s): Naturally I support preserving the lighthouse because of its scenic and historical significance. However, part of the [illegible] cultural experience of Montauk lies in [illegible] long practiced by its inhabitants and guests. Therefore I stress that every effort should be made to preserve the fragile waters anglers have come to love, and to preserve not only the ocean bottom structure that attracts fish, but the actual look, feel and function we so popularly known as the rocks under the point. These rocks carry their own mystic and attraction unique to the Point and all who have visited and fished there. Building an unsightly (and unnatural) structure will destroy the natural beauty of Montauk Point. It will also make for an unpleasant structure to fish from. Putting a heavily cemented wall will destroy the magic. My suggestion is, if a wall or other structure must be built - then disguise it by making it Look like Natural Rock + Boulders - this at least would preserve the beauty AND maintain a suitable (+ even safer) platform for fishermen. If you have any questions about this - call me. Thanks

L25a

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Comment in Letter Number 26:

Robert A. Siegel, Esq.
205 East 60th Street
New York, New York 10022
(212) 750-1000

Comment L26a: Do not destroy the waves, the look, the feel and function of the area around Montauk Point. Building an unsightly and unnatural structure will destroy this. Can you make it look "more natural" if it has to be built?

Response L26a: The Corps is not proposing to build a new stone revetment wall at Montauk Point. The recommended alternative is to strengthen the existing stone revetment wall and to have the final product look much in the same way the wall is viewed now. By recreating what is already there, the recommended alternative seeks to minimize any additional changes to the project area.

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# MONTAUK POINT, NEW YORK
# STORM DAMAGE REDUCTION
# FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

NYS Department of Environmental Conservation

## Comment Card

**PLEASE PRINT CLEARLY!**

Name: Gerald Starr
Address: 30 A Race Lane
City, State, Zip: EH, 11937
Phone: 329-0295
Email:
Affiliation , if any: Surfrider

Comment(s):

L26a

something does need to be done bud all avenues should be explored

Comment in Letter Number 27:

Gerald Starr
30 A. Race Lane
Easthampton, New York 11937
(631) 329-0395

Comment L27a: Something does not need to be done - but all areas should be explored.

Response L27: As your comment suggested, several alternatives were considered and discarded during the Feasibility process. Please review the Alternatives section of the Feasibility Report.

# MONTAUK POINT, NEW YORK
# STORM DAMAGE REDUCTION
# FEASIBLITY STUDY

US Army Corps
of Engineers
New York District

NYS Department of Environmental Conservation

## Public Information Session
## September 19, 2005

## Comment Card

**PLEASE PRINT CLEARLY!**

Name: J. Albano
Address: 100 Deforest Rd #24
City, State, Zip: Montauk
Phone: 631 668 8433
Email:
Affiliation , if any:
Comment(s): I listened to the current presentation
of the [illegible] project and it seems as
if the answers they have are [illegible]
[illegible] — one major hurricane [illegible] [illegible]
[illegible] [illegible] will [illegible] can't [illegible] for a wave
and [illegible] [illegible] [illegible] [illegible], [illegible] 3 years
after New Orleans flooding and still there
[illegible] [illegible] [illegible] [illegible] [illegible] much
[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] and
[illegible] [illegible] you [illegible] [illegible] [illegible] of the NYC
and [illegible] [illegible] [illegible] [illegible] could [illegible] it
[illegible] [illegible] the fisherman [illegible]
[illegible] environmentalist and all the other may [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
I think you should [illegible] [illegible] it taking
[illegible] the things people hold dear and
[illegible] [illegible] [illegible] I'm [illegible] you [illegible]

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Build any & all things that are necessary to protect the people, homes and bodies and the [illegible] things for the quality of life.

L27a

US Army Corps
of Engineers.
New York District

# MONTAUK POINT, NEW YORK
# STORM DAMAGE REDUCTION
# FEASIBLITY STUDY

## Public Information Session
## September 19, 2005

### Comment Card

NYS Department of Environmental Conservation

**PLEASE PRINT CLEARLY!**

Name: [illegible]

Address:

City, State, Zip:

Phone:

Email:

Affiliation , if any:

Comment(s): The Surfriders are not being honest with their statements that they want to save the lighthouse — they are constantly [illegible] the newspapers asking that the [illegible] federal [illegible] so they can more easily access the [illegible]. So I don't believe they want to save the light house.

L27b

Comment in Letter Number 28:

J. Albano
100 Deforest Road - Apt. 24
Montauk, New York 1196
(631) 668-8933

Comment L28a: The lighthouse must be protected, the surfers are not the only user group of the area, and building this wall will only save what we already have.

Response L28a: Thank you for your comment and your acknowledgment of the assessment in the Draft EIS.

Comment L28b: The surfers do not want to save the lighthouse. They have not told the truth and the project should move forward.

Response L28b: Thank you for your comment.

NTK

No addresses

# HELP SAVE ALAMO, TURTLES, AND OTHER SURF BREAKS!

**We the undersigned agree with the statements and stance of the Eastern Long Island Chapter of the Surfrider Foundation.**

Name

1. [illegible]
2. Andrew Holden
3. Lauren [illegible]
4. Jillian [illegible]
5. Dan Restrepo
6. [illegible]
7. Mack [illegible]
8. [illegible]
9. Nicole Payne
10. [illegible]
11. [illegible]
12. Megan Marcangano
13. [illegible]
14. Andrew [illegible]
15. Danny Horwith
16. [illegible]
17. Corey Demmo
18. Jose Dickheartz
19. [illegible]
20. Dave Holden
21. Jessica Grecke
22. Alison Tierney
23. Alyssa Drew
24. Tyler Davis
25. [illegible]
26. James D[illegible]
27. Cayla Leland
28. Caitlin Brierley
29. Bryan Flannery

Gigi Colavito
Dylan Field
Luis Mancilla

Surf Club

High School

EAST Hampton

# HELP SAVE ALAMO, TURTLES, AND OTHER SURF BREAKS!

**We the undersigned agree with the statements and stance of the Eastern Long Island Chapter of the Surfrider Foundation.**

**East Hampton High School Students Surf Club Members**

1. Zachary Puglisi
2. Thomas Stauditser
3.
4.
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# SAVE THE ALAMO
# AND TURTLES
# SURF BREAKS!!!

Recognize

The Army Corps of Engineers have intentions of building around the base of the lighthouse in order to preserve it, consequently destroying several surf breaks. Please sign your name below if you have surfed, plan on surfing, or are concerned in any way and hope to prevent it from occurring.

1. Tommy Placentine
2. Mark Schmitt
3.
4. Brandon McCoy
5.
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THIS IS THE LAST PAGE OF THE
ENVIRONMENTAL IMPACT STATEMENT REPORT.