# Impact of the Atlantic Ocean Beaches to the Economy of Suffolk County


**Budget Review Office**

**Suffolk County Legislature**

**May 13, 2003**

# SUFFOLK COUNTY LEGISLATURE

## *BUDGET REVIEW OFFICE*

May 13, 2003

Presiding Officer Maxine Postal
and Members of the Suffolk County Legislature
William H. Rogers Building
725 Veterans Memorial Highway
Smithtown, NY 11787

Dear Legislators:

The attached report was prepared pursuant to Resolution No. 853-01. This report has been a major undertaking, to which more staff time has been dedicated over the past year than any other project, with the exception of the operating and capital budget reviews.

A considerable amount of original economic analysis is included in this report. The conclusions and findings demonstrate that while south shore beaches are important to the tourism and local economy, the major advantage of beach restoration is in storm damage mitigation.

The erosion of south shore beaches impacts everyone in Suffolk County. Our report found that nearly 20% of the total property values in Suffolk County are located in south shore areas vulnerable to hurricane storm damage.

It is only a matter of time before a major storm will do significant damage to our south shore beaches. The Army Corps of Engineers has delayed the completion of their Fire Island to Montauk Point Reformulation Study numerous times. That report will be the framework for beach stabilization and restoration in Suffolk.

This is a complex report. The Budget Review Office is available to explain the methodology used and discuss the report's findings with Legislators.

Sincerely,

Frederick Pollert, Director
Budget Review Office

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# Impact of the Atlantic Ocean Beaches to the Economy of Suffolk County

## Table of Contents

# Executive Summary

In 2001, the Suffolk County Legislature adopted Resolution No. 853-2001, directing the Legislature's Budget Review Office (BRO) to determine the impact of the Atlantic Ocean beaches on the economy of Suffolk County. Specifically, the BRO was directed *(1)* to estimate the extent to which Suffolk County's Atlantic Ocean beaches generate spending within the County by its residents, tourists, and transients, and *(2)* to estimate the dollar value of the recreational benefit of the Atlantic Ocean beaches to residents, tourists, and travelers from around the world.

This report develops and provides original estimates for

- The overall size of the Suffolk County, Nassau County and Long Island economies.
- The economic impact of the tourism sector for each of these three areas.
- The economic impact of the south shore beaches on the economy of Suffolk County.

In addition, the report provides a discussion of the issues surrounding restoration of the south shore beaches. For the most part, this discussion constitutes a review of Army Corps studies that relate to the south shore of Suffolk County.

Any long-range plan to deal with beach erosion along the south shore of Suffolk County awaits completion of the Army Corps of Engineers' Fire Island to Montauk Point Reformulation Study, which is expected to be completed in 2005. It is not the intent of this report to preempt that study or offer a plan for beach restoration and stabilization, but rather to present the views of the Budget Review Office on the issues involved in such a plan.

**Estimating the Economic Benefits Associated with Suffolk County's Atlantic Ocean Beaches**

The value of spending generated by beaches is referred to in the literature as regional economic development (RED) benefits. These benefits are measured by the economic impact that beaches have on the gross regional product (GRP) of an area. GRP is the value added to the cost of goods and services [or wealth "created"] within the region.

Based on the Budget Review Office's estimate of Gross Regional Product (GRP), the regional economic development (RED) benefits of Suffolk County's south shore beaches is

- $158.6 million per year in 1999 dollars or
- $173.4 million per year in 2003 dollars.

The estimated impact of Suffolk County's Atlantic Ocean beaches is predicated on the following:

- An estimated 9.1 million tourists visit Long Island annually, with 3.6 million visiting Nassau County and 5.5 million visiting Suffolk County.
- 11.3 million people are estimated to visit Suffolk County's south shore beaches each year. Of these, more than 500,000 (or 4.6%) are estimated to be tourists.

It is also estimated that the local economy, as measured by gross regional product (GRP), in 1999 dollars, is calculated to be

- $105.5 billion for all of Long Island (the Nassau-Suffolk region),
- $57.7 billion for Nassau County and
- $47.8 billion for Suffolk County.

In terms of tourism,

- The GRP or "added regional wealth created" by tourism is estimated to be $1.316 billion in 1999 dollars for all of Long Island. This amounts to 1.25% of Long Island's total GRP.
- Tourism in Nassau is projected at $502 million or 0.87% of GRP in Nassau.
- In Suffolk, tourism accounts for $790 million or 1.65% of the county's economic activity.

As for Suffolk County's south shore beaches,

- Direct spending or output from Suffolk County's south shore beaches contributes an estimated $255.7 million annually in 1999 dollars to the county's economy.
- When the multiplier effect is included, this level of spending or output generates $341.0 million in total sales and supports 3,855 jobs.
- The gross regional product (GRP) contributed by Suffolk County's south shore beaches is estimated to be $158.6 million annually in 1999 dollars. This represents one-third of one-percent (0.33%) of the total $47.8 billion GRP in Suffolk County.

**Estimating the Dollar Value of the Recreational Benefit Received by Suffolk County's Atlantic Ocean Beach Users.**

- Recreational benefits received by beach users can be estimated by "willingness to pay", which is the dollar value that beach users place on a day at the beach.

- A November 1999 Army Corps study of the "Fire Island Inlet to Moriches Inlet reach" estimates a pre-project willingness-to-pay of $5.57. This represents the most recent data available on willingness-to-pay in our study area.
- Multiplying this figure by the estimate of 11,323,485 annual visits to Suffolk County's Atlantic Ocean beaches yields a total value for recreational benefits received by beach users of **$63.1 million** (11,323,485 x $5.57) annually.

**Review of Army Corps of Engineers Documents and Other Relevant Reports**

- The literature supports the conclusion that beach projects in the Fire Island to Montauk Point study area are often worth undertaking. In particular, the national economic development (NED) benefits associated with beach projects frequently exceed costs.
- The federal government is considering an increase in the local share of financing beach restoration and stabilization projects from 35% to 65%. This change, in conjunction with the ongoing financial commitment needed to maintain completed beach projects, makes the cost associated with projects a more important factor in the decision-making process of local governments.

In addition,

- It should be noted that the purpose of beach restoration and stabilization projects is to provide protection against damage created by storms that are less severe than Category 3 hurricanes. Beach projects will provide little to no protection against more severe hurricanes.
- Although beyond the scope of this report, a systems study of storm protection that encompasses stabilization and damage-prevention actions for the mainland should be undertaken.

In spite of favorable economic analysis by the Army Corps, considerable opposition to beach restoration projects remains. Opposition is due in part to

- Concern about the environmental impact of beach projects.
- Concern that beach projects protect the property of a few at the expense of all taxpayers.
- Concern that beach projects encourage increased development in vulnerable locations.
- Concern that beach renourishment does not go far enough in assuring public access to the beaches, since private development can limit public access to taxpayer-funded beaches.

These concerns persist despite the following findings:

- Recent reports by the Army Corps of Engineers found very little negative environmental impact resulting from beach restoration projects. Among other things, the practices employed by the Army Corps take into consideration environmental concerns so that potential adverse affects are minimized.
- Beach projects may appear to protect the property of a few at the expense of all taxpayers; however, experience data show that local flood insurance premiums exceed payouts. In addition, erosion control tax districts, such as those in Islip and Brookhaven towns, should go far to ensure that beach property owners pay their fair share of project costs.
- Beach projects may encourage increased development in vulnerable locations, but simultaneously protect mainland properties from increased damages associated with beach erosion and breaches. The merits of beach projects should not focus solely on the benefit to beach property owners, but on the greater benefit realized by reducing overall costs from storm damage. The impact of beach restoration on local economic activity should also be considered.
- Finally, while law requires public access to areas that have been addressed through government financed beach projects, a practical distinction remains between beach access and use. Unless parking and bathroom facilities are provided along with access, full use remains inconvenient. This does not, in and of itself, detract from the evidence in support of beach restoration.

# *Chapter 1*

# Introduction

This report has been prepared pursuant to Resolution Number 853 of 2001, as adopted by the Suffolk County Legislature.[1] Resolution 853-01 (see Appendix 1.1) directed the Budget Review Office (BRO) to prepare an economic study to determine the impact of the Atlantic Ocean beaches on the economy of Suffolk County. In addition, the BRO study was to: *(1)* estimate the extent to which Suffolk's Atlantic Ocean beaches generate spending within the County by residents, as well as by transients and tourists; and *(2)* estimate the dollar value of the recreational benefit of the Atlantic Ocean beaches to County residents, as well as to travelers and tourists from around the world. Recognizing that these study parameters would not present a complete picture of either the benefits of Suffolk County's Atlantic Ocean beaches or the issues surrounding beach restoration and stabilization, authorization to expand the scope of the report was granted by the sponsors of the original resolution and by the Budget Review Office Steering Committee.

The geographical parameters of this report coincide, for the most part, with the area to be covered in the upcoming U.S. Army Corps of Engineers' Fire Island to Montauk Point Reformulation Study. Table 1.1 breaks down this area by Army Corps project reach. A map of the subject area is provided at the end of this chapter.

In order to cover all Atlantic Ocean beaches in Suffolk County, this study includes Robert Moses State Park and Babylon town beaches (Cedar, Gilgo, and Overlook) in addition to the coastline included in the Reformulation Study.

Table 1.1: Project Reach Designation and Corresponding Physical Reaches and Economic Reaches

| Project Reach | Name | Location | Physical Reach | Economic Reach |
|---|---|---|---|---|
| 1 | Montauk Point | Montauk Point to Hook Pond | 1A-1C: Montauk Point, Napeague, Amagansett | 1-3 |
| 2 | Ponds | Hook Pond to Agawam Lake | 2A-2C: Georgica, Sagaponack, Mecox | 4-7 |
| 3 | Shinnecock | Agawam Lake to Quoque (Quantuck Canal) | 3A-3C: Southampton, Shinnecock Inlet, Tiana | 8-15, 29 |
| 4 | Moriches | Quoque (Quantuck Canal) to Smith Point | 4A-4D: Westhampton, Pikes, Moriches Inlet, Smith Point | 16-19, 30-31 |
| 5 | Fire Island | Smith Point to Fire Island Inlet | 5A-5E: Wilderness Area, Cherry Grove, Atlantique, USCGS, Robert Moses | 20-28, 32-33 |

Compiled by the Budget Review Office, Suffolk County Legislature, from "Work Order 1 – Interim Submission No. 6 – Draft: Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York – Storm Damage Reduction Reformulation Study – Alternative Screening", July 1999, prepared by URS Consultants/Moffatt & Nichol Engineers for the US Army Corps of Engineers, New York District.

Economic Reaches 25 and 26 are part of the Fire Island Inlet to Montauk Point "Reformulation Plan" even though they are west of Fire Island Inlet. This area represents the mainland beach communities on the Great South Bay that are in the western most part of Suffolk County, Town of Babylon.

It should be noted that the project reach designations in the above table, which are used by the Army Corps of Engineers for the Reformulation Study, differ from previous reach designations found in all other Army Corps documents for studies covering various portions of the Fire Island Inlet to Montauk Point, New York, area.

Areas covereed by the breach contingency plan (BCP) are Fire Island Inlet in the Great South Bay (Project Reach 5), Moriches Inlet in Moriches Bay (Project Reach 4) and Shinnecock Inlet in Shinnecocok Bay (Project Reach 3).

[1] Resolution 231 of 2002 extended the deadline for completion of this report.

Before addressing the economic issues specified by Resolution 853-01, it is important to become familiar with the subject matter and terminology of beach restoration and beach erosion. A guide to beach restoration is presented in *Chapter 2* and a guide to beach erosion presented in *Chapter 3*. Economic issues are covered in the remaining chapters. *Chapter 4* estimates the size of the overall local economy, the tourism sector of the economy, and the south shore beach economy of Suffolk County. *Chapter 5* estimates the benefits of beach restoration, which are based in part on the economic impact estimates from *Chapter 4*. The cost of affecting such beach restoration projects is discussed in *Chapter 6*. *Chapter 7* concludes with a cost-benefit analysis. To determine the merits of beach projects, relevant issues that go beyond the standard cost-benefit analysis are also considered. Finally, a *Glossary* of terms can be found at the end of this document.

This report provides original estimates of *(1)* the overall size of the Suffolk County, Nassau County and Long Island economies; *(2)* the economic impact of the tourism sector for each of these three areas; and *(3)* the economic impact of the south shore beaches on the economy of Suffolk County. In addition, it discusses the issues surrounding restoration of the south shore beaches. For the most part, this discussion constitutes a review of Army Corps' studies that relate to the south shore of Suffolk County. Any long range plan to deal with beach erosion along the south shore of Suffolk County must await completion of the Army Corps of Engineers' Fire Island to Montauk Point Reformulation Study, to be completed in 2005. It is not the intent of this report to preempt that study or offer a plan for beach restoration and stabilization, but to present views on the issues involved in a restoration plan.

Finally, although beyond the scope of this report, a systems study of storm protection that encompasses stabilization and damage-prevention actions for the mainland should be undertaken. Ideally, such a study would consider the entire County and include the north shore as well as the south shore.

# Appendix 1.1

## Resolution to directing the Budget Review Office to estimate the economic impact of Suffolk County's Atlantic Ocean beaches

Intro. Res. No. 1521-2001 Laid on the Table 6/5/2001
Introduced by Legislators Carpenter, Bishop

**RESOLUTION NO. 853 - 2001, DIRECTING THE LEGISLATIVE OFFICE OF BUDGET REVIEW TO CONDUCT AN ECONOMIC ANALYSIS OF THE BENEFIT TO SUFFOLK COUNTY OF ITS ATLANTIC OCEAN BEACHES**

**WHEREAS**, Suffolk County's Atlantic Ocean beaches are a principal generator of economic and recreational benefits to the residents of the County; and

**WHEREAS**, the extent of these benefits has not been quantified for elected County officials; and

**WHEREAS**, erosion from natural and manmade causes threatens to impact the ability of said beaches to continue to provide these benefits; and

**WHEREAS**, the cost of countering erosion may be significant to the County, despite the fact that a major portion of such cost may be paid at the State and federal levels; and

**WHEREAS**, the Legislative Office of Budget Review, together with other County offices, has the ability to gather economic data and make projections as to the benefit of Atlantic Ocean beaches to the County's economy; now, therefore be it

**1st** **RESOLVED**, that the Legislative Office of Budget Review (BRO), in cooperation with such other County offices as are requested by BRO, under Section 2-19(E) of the SUFFOLK COUNTY CHARTER, to provide assistance, is hereby authorized, empowered, and directed, pursuant to Section 2-19(D)(6) of the SUFFOLK COUNTY CHARTER, to perform or contract for an economic study and analysis and to provide the County Legislature with information about the extent to which the County's Atlantic Ocean Beaches generate spending within the County by residents as well as by transients and tourists; and be it further

**2nd** **RESOLVED**, that such study shall estimate a dollar value of the recreational benefit of such beaches to County residents as well as to travelers and tourists from around the world; and be it further

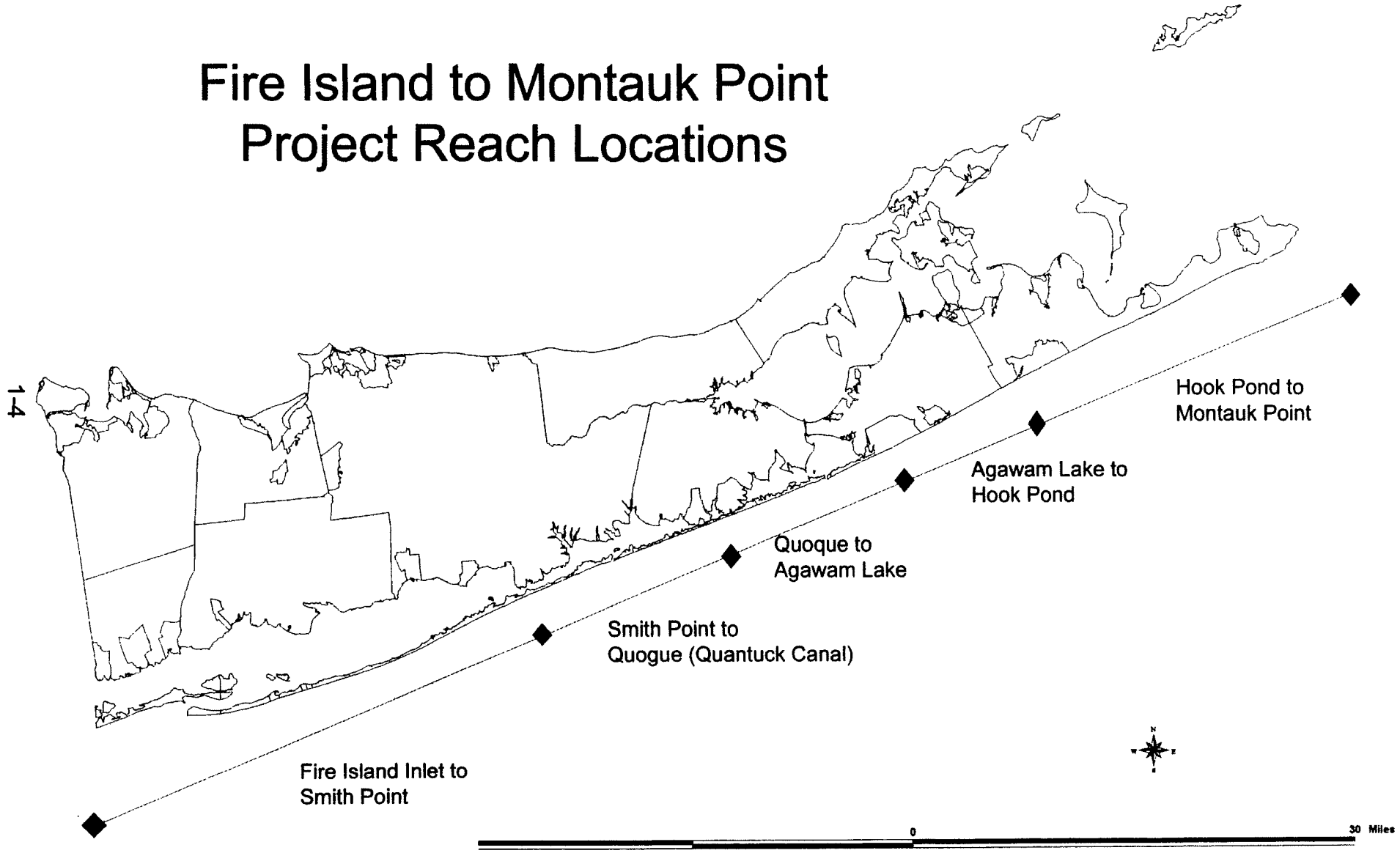
**3rd** **RESOLVED**, that the Legislative Office of Budget Review shall submit a written report of its findings to the County Executive and to each member of the County Legislature no later than one hundred eighty (180) days subsequent to the effective date of this resolution; and be it further

**4th** **RESOLVED**, that the study authorized by this resolution shall not be performed by any outside consultant or consulting firm unless explicit approval and authorization for such consultant or consulting firm is granted pursuant to a duly enacted resolution of the County Legislature.

DATED: August 28, 2001

EFFECTIVE PURSUANT TO SECTION 2-15(A) OF THE SUFFOLK COUNTY CHARTER

# Fire Island to Montauk Point
# Project Reach Locations



# *Chapter 2*

# A Guide to Beach Restoration

This chapter presents an overview of beach restoration, broken down into four sections. The first of these reviews various beach restoration and stabilization methods; the second describes projects that have been undertaken by the Army Corps of Engineers in Suffolk County; the third provides an overview of Suffolk County government's investment in beach restoration through its dredging program; and the fourth presents an outline of legislation relevant to beach restoration projects. This is important to those wanting to advance beach projects, since compliance with numerous laws and regulations is required prior to commencing a project.

## *A. Beach Restoration & Stabilization Methods*

The following beach restoration and stabilization methods and coastal engineering methods are in use or are under consideration for utilization on Long Island's Atlantic coast:

1. Beach renourishment process (Restoration and Stabilization Methods)

Dredged and/or excavated sand, obtained from off site locations, is transported and utilized to reduce the water depth near the shoreline and to build up, shape, and align beach berms and dunes in areas vulnerable to barrier island "overwash"[2] The initial quantity of sand dredged and/or excavated is intended to provide for the maintenance of the beach design, and has a sacrificial amount factored in to account for natural erosion. Beach renourishment also requires a commitment for regular maintenance in future years due to the geographical coastal environment. In addition, modest amounts of dredged and/or excavated sand are required to mend damaged beach areas caused by coastal storm activity.[3]

The two common sources for sand used in the beach renourishment process are on-site coastal dredging and inland sand mining.

1.a. On-site coastal dredging

This method dredges suitable sand (spoil) from offshore, which can include bays and inlets. The dredged sand is then transported to the beach renourishment site through a system of dredge pumps and directional tubes. At times the dredged sand material utilized for beach renourishment can be malodorous when first applied, but the odor fades after a brief period of time. This method historically has been less expensive than inland sand mining.

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[2] www.nap.usace.army.mil/cenap-dp/projects/absecon/absecon.htm

[3] www.usace.army.mil/inet/functions/cw/hot_topics/shorelineprotect.htm

1.b. Inland sand mining

This method excavates suitable sand from authorized sand mines and/or removes suitable sand from construction sites. The excavated sand is then transported to the beach renourishment site. This method is generally more expensive than the on-site coastal dredging method.

2. Beachfill with dunes (Restoration and Stabilization Methods)

The "Beachfill with Dunes" method includes beach renourishment with sand, plus the planting of dune grass on dunes and the installation of sand fencing to safeguard the dunes. This enhanced method is designed to provide protection from storm surges similar to that from bulkheading, but at lower cost.[4] The United States Army Corps of Engineers, Philadelphia District, and the New Jersey Department of Environmental Protection selected the "Beachfill With Dunes" renourishment method for its Absecon Island Shore Protection project (AISP). This was selected as the best method, from economic, environmental and social perspectives, to protect this coastal location.

3. Beach restoration and headland[5] (Restoration and Stabilization Methods)

"Beach Restoration and Headlands" includes the restoration and preservation of the elevated topography next to the coastline. The nearby headlands may include cliffs, bluffs and open space that provide a habitat for a diversity of native plants and coastal animals.

4. Inlet stabilization and sand bypassing[6] (Restoration and Stabilization Methods)

To maintain a navigational inlet, two parallel jetties are constructed on opposite sides of an inlet, leaving inlet openings on the bay and ocean sides. This type of jetty system is designed to help maintain the channel's depth by flushing sand out of the channel. (See item #11, Groins and Jetties.)

To mitigate beach erosion caused when the inlet channel disrupts near shore sand movements, a sand bypassing plant or sand bypassing is employed. Modifying and extending the two jetties away from the shoreline on the ocean side typically accomplishes this. As sand moves along the shoreline, it is collected and builds up on the incoming side of the primary jetty. Sand is then transferred across the inlet opening down coast by prevailing currents and/or with the use of various types of dredging equipment.

Presently there is a debate over the amount of sand flushed out to sea and the amount of beach erosion created down coast of the secondary jetty. To minimize and/or prevent beach erosion occurring down coast of the secondary jetty, a groin field is sometimes installed.

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[4] See www.nap.usace.army.mil/cenap-dp/projects/absecon/absecon.htm *and* Absecon Island Shore Protection, U.S. Army Corps of Engineers, Philadelphia District.

[5] For more in-depth analysis of headlands restoration, see www.erosion.com, http://www.yni.org/hi/resources_teacher/maps.html, http://www.mcn.org/1/mendoparks/mndhdld.htm, and http://www.cnps.org/discussion7/_disc7/00000008.htm

[6] www.erosion.com/document11.htm

5. Sandscraping (Restoration and Stabilization Methods)

Sandscraping is a method where the top layer (12 inches) of sand is removed from the front beach between the first dune and the coastline and deposited on the face of the first dune to increase the level of protection against wave surges. Sandscraping has typically been employed to protect beach homes that are susceptible to coastal storm damage. There is disagreement on the level of protection provided by this method: it is argued that this type of scraping diminishes the supportive vegetation on the surf side of the first dune, thus decreasing the outer (ocean side) dune's ability to protect the middle dune area from storm surges.

6. Non-structural flood recovery and floodplain management alternatives[7] (Restoration and Stabilization Methods)

Non-structural approaches to floodplain management are currently wide-ranging in design. The Federal government has grouped non-structural approaches to floodplain management into three primary strategies as follows:

1. Acquisition, relocation, elevation, and floodproofing of existing structure;
2. Rural land easements and acquisitions; and
3. Restoration of wetlands.

7. Breakwaters (Restoration and Stabilization Methods)

"Breakwaters" are structures which protect beaches from wave action by dissipating wave energy before it reaches the beach."[8] Structures range from rocks placed in the surf zone just under the surface of the water, to an arrangement of floating canisters connected to strips of rubber that are fixed to the sea bottom. It has been theorized that this displaces wave energy, reducing the sediment transport rate along with the coastal erosion rate. This reduction of the sediment transport rate results in a more stable coastal zone.

8. Revetment (Restoration and Stabilization Methods)

A revetment is a layering of erosion resistant material, frequently quarried rocks, which is placed on top of shorelines, berms and dunes. This layering or blanket is intended to protect the underlying surface from erosion.

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[7] For more in-depth discussion on non-structural approaches, see http://www.fema.gov/pdf/hazards/ombflood.pdf

[8] Ibid, 2-3

9. Whisprwave® (Restoration and Stabilization Methods)

"Whisprwave" is a recently developed system that utilizes manufactured modules that have been designed to decrease a shoreline's erosion rate and assist in stabilization. Individual modules have a polygon shape and are made of high-density polyethylene. Standard modules weigh approximately 36 pounds each. The design of the module enables it to be precisely adjusted for buoyancy. Modules can be "puncture proofed" by filling them with marine buoyant foam. Typical applications include the lashing of individual modules together using a system of rubber cables. Marine grade hardware holds the lashed modules off the coastline and in the surf zone. The manufacturer promotes the simplicity of installation and the capability to reposition or redistribute modules.[9] One of the common objections to this type of system is the loss of the natural look of the beach and loss of public swimming areas.

10. Bulkheading at berms and dunes (Restoration and Stabilization Methods)

A coastline bulkhead structure is an upright wall typically constructed of wood, synthetic composites, concrete or steel. This type of bulkheading is located at the base of a berm and/or dune on the surf side to assist in protecting the coastal shoreline, as well as the mainland shoreline, from tidal erosion and tidal storm surges. Because this type of bulkheading does not extend into the surf area, it will not reduce the flow of sand along the shoreline. Construction and long-term maintenance require periodic replacement of beachfill in front and in back of the structure to limit washouts of the bulkheading. The U.S. Army Corps of Engineers acknowledged in their Absecon Island Shore Protection project study that this type of bulkheading offered little more protection than a more natural dune.[10] However, on Shelter Island construction of bulkheads was determined to be the appropriate course of action. In 1998-99 bulkheads were built to protect Ram Island Drive, a two-lane causeway, against flooding from a 15-year storm.

11. Groins and Jetties (Restoration and Stabilization Methods)

Groins and jetties may appear to be indistinguishable from each other. The general purpose of a jetty is to maintain a navigational inlet, while groins are generally constructed to slow down "longshore" sediment transport (littoral drift) and minimize beach erosion. Groins are constructed perpendicular to the shoreline, with a starting point at the "back beach" and extending outward into the water.[8] If properly designed for an appropriate location and installed correctly, groins and groin fields on coastal shores have been found to accumulate beach sand and enhance and stabilize the shoreline. Groins, if not designed properly or if not suitable for a location, will diminish a beach by destabilizing and eroding the shoreline (down current). The county found itself in litigation over this issue

[9] www.whisprwave.com/web2/preview.htm, Whisprwave.

[10] Absecon Island Shore Protection, U.S. Army Corps of Engineers, Philadelphia District.

regarding the installation of a groin field in Westhampton Beach. In the case of "Property Owners in the Village of Westhampton Dunes versus the US Army Corps of Engineers, New York State and Suffolk County," a 1994 settlement resulted in a $25 million project to modify the incomplete groin field and rebuild the beach with 4.5 million cubic yards of sand for protection against a 40-year storm.

12. Seawalls (Restoration and Stabilization Methods)

Seawalls are usually employed on the "upland" (mainland) side to prevent erosion, and to provide an extra buffer of protection from flooding caused by storm surges. Seawalls present several problems: according to the U.S. Army Corps of Engineers, a curved face seawall or massive stone seawall would provide a limited degree of protection from coastal storms.[11] Construction and long-term maintenance costs are reported to be high. Seawalls often result in increased erosion at adjacent beaches. The appropriate response would then be to develop a plan to protect adjacent beaches from scouring.

13. Closure gates[12] (Restoration and Stabilization Methods)

Closure Gates are part of a levee flood control system designed to prevent lowland areas from storm surges. A wall/levee/berm is constructed to protect inhabited lowland areas from storm surges. The height of the levee depends on the terrain. Roadways are raised (on ramps) near the levee to permit traffic to move freely. Decorative fencing or vegetation can be employed to screen the exposed faces of the levee. Closure gates are built into the levee, and are located at streams and manmade waterways as gates. The gates are left open under normal conditions to permit water flow and drainage. Prior to an anticipated storm surge, the gates are closed to prevent water from flowing inward to the inhabited lowland area. One of the designed factors in this type of project that needs to be addressed is the need to store or redirect the water from the streams and manmade waterways inside the protected levee area when the gates are closed.

14. Existing and emerging technology (Restoration and Stabilization Methods)

There are numerous existing methods and many emerging technologies in the area of beach restoration and stabilization. This report reviews the common methods that are currently employed and two innovative methods, the Whisprwave and an artificial rubberized "breakwater" structure. There is no consensus as to which method(s) is (are) most appropriate. Often a determination is made on a case-by-case basis.

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[11] Absecon Island Shore Protection, U.S. Army Corps of Engineers, Philadelphia District.

[12] For more in-depth analysis on closure gates, see http://www.longhillnj.org/lht/floodctl.htm and Department of the Army, U.S. Army Corps of Engineers CECW-EG, Washington, D.C. 20314-1000 Report Dated April 30, 2000, EM 1110-2-1913, Appendix F, Emergency Flood Protection.

15. Coastal emergency evacuation planning (Restoration and Stabilization Methods)

Coastal emergency evacuation planning is designed to limit the loss of life. In contrast, beach restoration projects are designed to minimize the level of damage or loss of property from coastal storm activity. Preventative improvements to stabilize and/or strengthen destabilized coastal shorelines have lowered the number of individuals negatively affected by severe weather conditions. In Suffolk County, as in all coastal communities, it is reasonable to expect the federal, state and local governments to have comprehensive emergency evacuation strategies prepared in advance of major storm events.

On Long Island, as the category level of a hurricane's classification increases, so does the need for coastal evacuation. An increase in barrier island stabilization resulting from beach restoration projects reduces the need for coastal evacuation. One of the many issues that government leaders need to evaluate is the level of beach restoration vs. coastal emergency evacuation. The requirement for coastal emergency evacuation planning cannot be eliminated completely with barrier island stabilization, only the scale of evacuation can be impacted. In addition, with a Category 3 or higher hurricane, beach restoration will have a limited benefit in decreasing the degree of coastal emergency evacuation required.

### *B. United States Army Corps of Engineers Beach Restoration Projects in Suffolk County*

In this section, examples of actual projects undertaken by the United States Army Corps of Engineers (USACE) in our area are presented. These projects are listed in geographic order, from west to east. The last project reviewed will be the all-encompassing Fire Island to Montauk Point study area.

1. Great South Bay (USACE Project)

This project is located in the Town of Babylon, and is in the pre-feasibility (preliminary planning) phase. It encompasses a 3.4-mile stretch of shoreline that experiences frequent flooding in low-lying areas. The purpose of the study is to identify potential solutions to flooding problems. The Army Corps completed the collection of data for this project in September of 1998 at a cost of $100,000, all of which was federally funded.

2. Fire Island Inlet and Shore westerly to Jones Inlet (USACE Project)

This project entails maintenance dredging of Fire Island Inlet and the placement of sand along the shoreline west of the Fire Island Inlet. The original federal project included plans for a 1.8-mile, 450-foot wide channel, 14-feet deep at mean low water (MLW) in the Fire Island Inlet. The project was modified in August of 1988, allowing for the maintenance of a realigned channel in the vicinity of the natural channel to a depth of 14 feet plus 2 feet of allowable overdepth. A contract was award to Great Lakes Dock and Dredge on September 21, 2001. Between 1,000,000 and 1,700,000 cubic yards of sand are expected to be dredged and placed along Gilgo Beach and Robert Moses Beaches. During fiscal year 1999/2000, 972,337 cubic yards of sand were dredged and placed as nourishment along Gilgo Beach. The contract cost of $8,859,975 was shared between the federal government and the New York State Department of Environmental Conservation (NYSDEC). In addition, 135,381 cubic yards of dredged sand was placed as nourishment along Robert Moses State Park Beaches, at a direct cost to the NYSDEC of $991,995.

3. Mattituck Inlet (USACE Project)

This project includes a 2-mile long 7-foot (MLW) channel, entrance jetties, and an anchorage area. The jetties and creek flow tend to inhibit some of the long shore sediment transport, which typically nourishes the area and replaces beach material lost due to normal shoreline erosion. The Army Corps states that the barrier remaining between the Long Island Sound and Mattituck Creek in Southold has narrowed and could be breached by coastal storms. This would render the inlet useless and would immediately create severe navigation problems and economic hardship. The project is reportedly in the feasibility phase, where alternative plans are being reviewed to determine the most appropriate solution. The feasibility study has an estimated cost of $400,000, half of which is federally funded, the other half of which may be funded by the NYSDEC. The NYSDEC requested a study be performed on the eroded down drift shorefront in the vicinity of Bailey's Beach in order to determine whether any changes should be made to reduce the adverse affects to the shoreline. The USACE study focuses on the cause and effect relationship between flow from the creek and shoreline jetties, as well as sediment transport along the shore. Potential solutions will be identified.

4. Shelter Island (USACE Project)

This project focused on an area southeast of Orient Harbor and west of Gardiners Bay, or more specifically Ram Island Drive. Ram Island Drive is a two-lane causeway on Shelter Island that provides the only access to Ram Island Peninsula. In December 1992, the causeway was rendered impassable after a northeaster caused washovers from Gardiners Bay. A feasibility study was performed and multiple alternative plans were considered, including a stone revetment and beach replenishment. A stone/sheet pile bulkhead was determined to be the most cost-effective alternative to provide protection to the area for a 15-year storm event. The construction consists of two structures, one on the eastern section and one on the western section of Ram Island Drive. The eastern and western sections are approximately 600 feet apart, and protect approximately 973 feet and 600 feet respectively. The construction phase of this project began in the fall of 1998 and was completed in March of 1999. The project cost $1.98 million, $1.287 million of which was federally funded. The remaining portion was funded by the NYSDEC, which is responsible for future maintenance.

5. Lake Montauk Harbor (USACE Project)

This project in the Town of East Hampton is in the pre-feasibility (preliminary planning) phase. It provides for a 12 foot deep, 150-foot wide channel at mean low water (MLW), extending about 0.7 miles from the 12-foot contour in Block Island Sound to the same depth in the yacht basin east of Star Island. This project also calls for a boat basin that is 10 feet deep, with 400-foot long jetties to keep the inlet open. The project was undertaken in large part due to local interests expressing their concerns over inadequate channel depth on larger

commercial fishing vessels. The project would allow for the deepening of the channel to 16 feet MLW in the outer channel and 14 feet MLW in the inner channel. Also included in the plan is the dredging of areas around the inlet, rehabilitation of 355 feet of the east jetty, 65 feet of the west jetty, and sand bypassing from the eastern shoreline to the western shoreline. The Army Corps completed the data collection for the project in May of 1995, and identified an environmentally acceptable and economically feasible improvement plan. The pre-feasibility work cost $1.6 million, half of which was federally funded. The New York State Department of Environmental Conservation (NYSDEC) and the Town of East Hampton funded the remainder.

6. Montauk Point (USACE Project)

This project aims to mitigate erosion from hurricane and storm damage at Montauk Point. The lighthouse was originally 300 feet from the eastern tip of Long Island, but storm and long-term erosion have left less than 75 feet of land in front of the structure. The pre-feasibility report's recommended plan includes the placement of a 770-foot long stone revetment to cover the area most vulnerable to erosion. The U.S. Army Corps of Engineers states that the entire State Park, which surrounds the Coast Guard property and the lighthouse, is increasingly being threatened. The feasibility study is scheduled for completion in 2003, at a cost of $900,000. The total cost of the study will be split 50/50 between the federal government and the NYSDEC, as per the Feasibility Cost Sharing Agreement signed in April 2000.

7. Fire Island Inlet to Montauk Point (USACE Project)

This project focuses on storm protection and erosion control along five reaches of the South Shore of Long Island between Fire Island Inlet and Montauk Point, a distance of approximately 83 miles. The project has many facets, one of which is the widening of beaches along the developed areas between Kismet and Mecox Bay to a minimum width of 100 feet and an elevation of 14 feet above mean sea level (MSL). Another sub-project is the raising of dunes to an elevation of 20 feet above MSL from Fire Island Inlet to Hither Hills State Park in Montauk, by artificial placement of sand. Grass planting on dunes and interior drainage structures at Mecox Bay, Sagaponack Lake, and Georgica Pond are also planned.

The Army Corps has completed some of the work included in this project. In 1965, the Army Corps constructed two groins at Georgica Pond, located between Southampton and Beach Hampton. The Corps also constructed 11 groins in the Westhampton Beach area, located between Moriches Inlet and Shinnecock Inlet. An additional 4 groins, with beach and dune fill, were placed west of the 11$^{th}$ groin in 1969-1970. The Westhampton Interim Project, which included groin modification and beach fill west of the 15$^{th}$ groin, was substantially completed in December 1997.

7.a. Interim Projects within the Reformulation Study Area

Interim projects include several smaller projects intended to address critical, potential storm damage areas from Fire Island to Montauk Point. These projects require immediate action, and may not be able to wait until the completion of the reformulation study. The interim projects would provide limited storm damage protection along critical areas for the time period prior to the completion and implementation of the reformulation study. These projects would be reversible, based upon the outcome of the reformulation study.

7.b. Breach Contingency Plan

A breach is an opening or gap that develops in a barrier island, allowing the ocean water and bay water to meet. This plan provides an emergency response to close breaches rapidly and is in effect throughout the barrier island portion of the project area (approximately 57 miles). Under this plan, breach closure activities will be initiated within 72 hours of a breach.

7.c. Westhampton Interim Project

This project protects dunes in the Westhampton area and affected mainland communities north of Moriches Bay. Regular sand replenishment will be undertaken to prevent dune erosion.

The Westhampton interim project is a modification of the existing 15-groin field to allow sand to transport more readily to the down drift beaches. In addition, this interim project includes beach renourishment with dunes at an elevation of +15 feet, and a beach with a width of 90 feet at an elevation of +9.5 feet.

7.d. West of Shinnecock Interim Study

This project will prevent breaching in the area immediately west of Shinnecock Inlet in the Town of Southampton. Regular sand replenishment will take place as needed.

The West of Shinnecock Inlet Interim Study addresses the 3,000-foot area immediately west of Shinnecock Inlet, which is subject to severe erosion and frequent emergency remedial action by the town, county, and state. Currently, the plan for this area includes beach fill in a configuration similar to that for Westhampton and Fire Island.

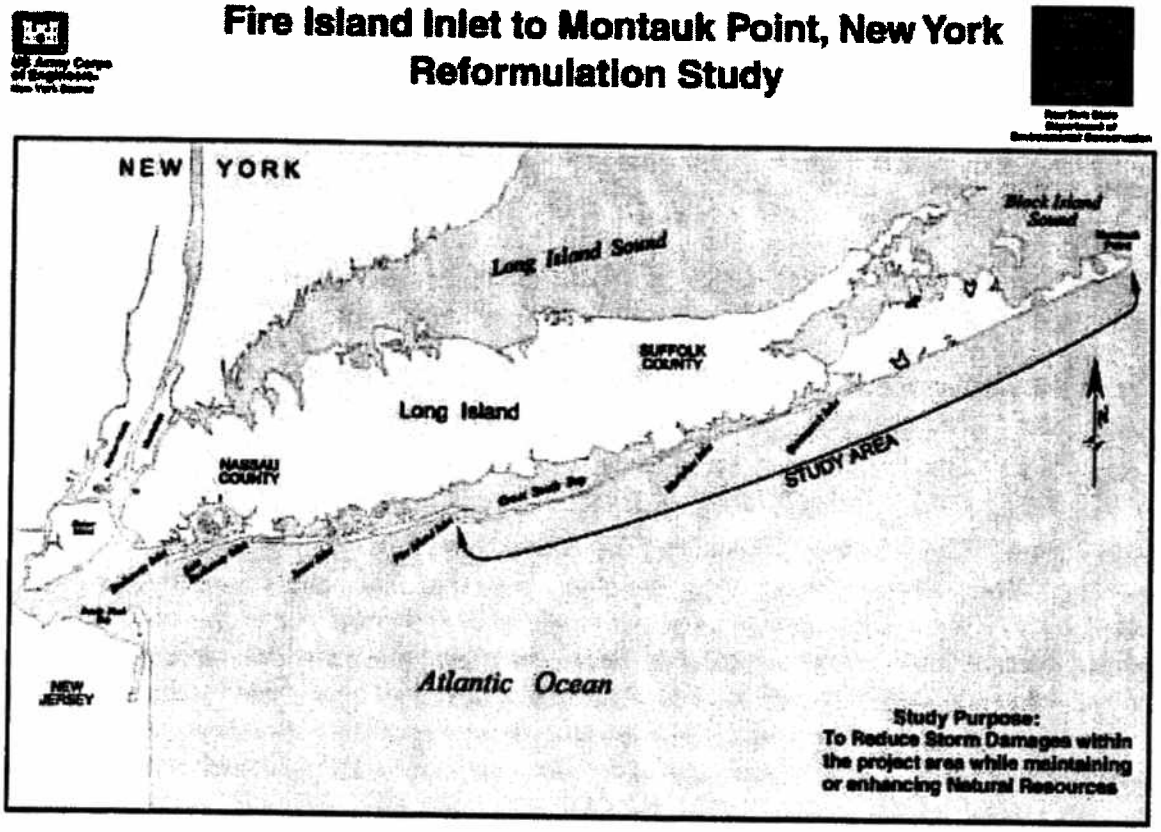
7.e. The Fire Island to Montauk Point (FIMP) Reformulation Study

The expected completion date of the Fire Island to Montauk Point (FIMP) Reformulation Study is some time in 2005. The purpose of the on-going study is to identify, evaluate and recommend long-term solutions to reduce hurricane and storm damage to homes and businesses within the floodplain that extends 83-miles along ocean and bay shorelines from Fire Island Inlet to Montauk Point. This area extends as far landward in some locations as Sunrise Highway and Montauk Highway. The study considers all areas within the maximum estimated

limit of flooding within Suffolk County. This encompasses the Atlantic and bay shores of the Towns of Babylon, Islip, Brookhaven, Southampton, and East Hampton and of several incorporated villages. The study area also includes 26 miles of the Fire Island National Seashore, which is under the jurisdiction of the National Park Service.

Congress and New York State have asked the United States Army Corps of Engineers to develop a comprehensive long-term plan of protection for areas that are prone to flooding, erosion and other storm damage. This plan would replace the numerous uncoordinated measures that have been used to protect individual properties with a comprehensive management approach that considers the entire coastal system. The objective of the study is to evaluate and recommend a long-term, comprehensive plan for storm damage reduction, which maintains, preserves or enhances natural resources. The New York State Department of Environmental Conservation (DEC) is the Corps' non-Federal partner.

In April of 2001 the National Parks Conservation Association indicated that the Fire Island National Seashore is one of the ten most endangered Federal parks in the Country. This study area has experienced serious erosion over the years. As a result of a 1938 hurricane, 45 lives were lost, 265 homes destroyed, eleven new inlets (including the Shinnecock Inlet) were formed, and twenty square miles of the mainland were flooded. A recurrence of these flood stages under today's level of development would flood approximately 8,500 mainland structures up to a depth of 6 feet. The Corps estimates that under current conditions this would result in damages of over $70 million.



7.f. The Study Process

The Fire Island Inlet to Montauk Point study area contains many different physical environments and distinct geographic areas, each with individual problems and needs. While specific solutions will vary, the following basic components are being evaluated at all locations:

- Coastal Management Measures (inlet modifications or breach contingency plans);
- Storm Damage Reduction Options; and
- Locally Implemented Floodplain Management Plans.

Coastal management measures will address issues such as the condition of inlets, including the need for sand bypassing and emergency response to storm events. This assessment may result in the adoption of new procedures for maintaining navigation inlets or responding to breaches in the barrier system.

Storm damage reduction options may include structural and non-structural options, and may supplement the effectiveness of coastal management measures. The study approach will identify cost-effective regional or coastal protection features, such as beach and dune fill and groin modification. Concurrently, the direct protection of flood plain development through measures such as flood proofing or structure acquisition will be evaluated and ultimately integrated into a comprehensive plan.

In addition, the FIMP project will include a floodplain management plan to ensure the future effectiveness of the coastal management measures or the storm damage reduction features. The elements of the floodplain management plan will be developed in tandem with the development of the coastal management measures and storm damage reduction features. While coastal management and storm damage reduction features may be implemented with federal funding support, the floodplain management plan is to be implemented at the state, county and local level.

### *C. Beach Related Projects by Suffolk County Government*

Suffolk County government funds an extensive dredging program to ensure that county waterways remain open for navigation.

Suffolk County waterways are dredged by contract through capital project 5200: Dredging of County Waters. Smaller dredging projects (under $100,000) are funded with operating budget transfers or undertaken with the county dredge and a crew of county employees.

The 2003-2005 adopted capital budget and program includes $1,000,000 in annual funding through bonds to finance various dredging projects. This is exclusive of projects funded with operating budget transfers. Capital funding includes survey costs, as well as dredging costs.

A list of projects proposed by the Department of Public Works for 2003-2005 is as follows:

**2003**

| Location | Town | Leg. District | Survey | Dredge | Total |
|---|---|---|---|---|---|
| Three Mile Harbor | East Hampton | 2 | $20,000 | $500,000 | $520,000 |
| Coecles Harbor | Shelter Island | 1 | $20,000 | $300,000 | $320,000 |
| Old Fort Pond | Southampton | 2 | $0* | $250,000 | $250,000 |
| Davis Park | Brookhaven | 7 | $20,000 | $150,000 | $170,000 |
| East/West Channel | Babylon | 14 | $40,000 | $0 | $40,000 |
| Amityville Channel | Babylon | 14 | $30,000 | $0 | $30,000 |
| Napeague Harbor | East Hampton | 2 | | $440,000 | $440,000 |
| | | | | **2003 Total** | **$1,770,000** |

** Southampton College Marine Sciences program hired a consultant to complete the survey*

**2004**

| Location | Town | Leg. District | Survey | Dredge | Total |
|---|---|---|---|---|---|
| Mt. Sinai Harbor | Brookhaven | 6 | $30,000 | $1,000,000 | $1,030,000 |

**2005**

| Location | Town | Leg. District | Survey | Dredge | Total |
|---|---|---|---|---|---|
| Amityville Channel | Babylon | 14 | $0 | $1,000,000 | $1,000,000 |

**Subsequent Years**

| Location | Town | Leg. District | Survey | Dredge | Total |
|---|---|---|---|---|---|
| East/West Channel | Babylon | 14 | $0 | $1,000,000 | $1,000,000 |
| | | | | | |
| | | | | **2003-2005 Total** | **$3,360,000** |

- Capital project 5201: Replacement of Dredge Support Equipment also provides funding for dredging activities. However, no funding is included for capital project 5201 from 2003 through 2005.
- Over the last six years the County has spent an average of $758,667 per year for these two capital projects, including operating budget transfers.
- As of July 2, 2002 the County had five employees in the Waterways Operations & Maintenance Division (001-1490-0203) in the Department of Public Works. This division is responsible for smaller dredging projects that are undertaken in-house. The 2002 annual cost for these five positions, including salary and fringe benefits, is $255,443.

**Waterways O&M - Dredge Staff (001-1490-0203) as of 07-Jul-02**

| Title | GR | ST | 2002 Salary | Benefits | Total |
|---|---|---|---|---|---|
| DREDGE CAPTAIN | 22 | 08 | $57,733 | $14,129 | $71,862 |
| DREDGE ENGINE OPERATOR | 17 | 08 | $46,197 | $13,000 | $59,197 |
| WATERWAYS MAINT MECH II | 13 | 06 | $35,157 | $11,920 | $47,077 |
| SENIOR CLERK TYPIST | 12 | 02 | $29,650 | $11,382 | $41,032 |
| DREDGE DECKHAND | 11 | S | $25,317 | $10,958 | $36,275 |
| | | | | | |
| TOTAL | | | $194,054 | $61,389 | $255,443 |

Suffolk County spends approximately $1 million per year on dredging and beach restoration, based on the cost of the dredge staff and the six-year average of expenditures through dredging capital projects.

### *D. Legal Compliance*

Local municipal governments are required to comply with numerous laws and regulations prior to taking actions to maintain existing Atlantic Ocean beaches or undertaking restoration projects. This section presents an overview of laws and regulations relevant to beach restoration projects.

1. The U.S. Army Corps of Engineers Fire Island Inlet to Montauk Point project (Legal Compliance)

This project is anticipated to provide hurricane protection and beach erosion control from Fire Island Inlet to Montauk Point. The project is authorized by the Rivers and Harbors Act of 14 July 1960 in accordance with House Document 425 (subsequently modified by the River & Harbor Act of 1962), and by the Water Resources Development Acts of 1974, 1986 and 1992. The project includes:

- widening of developed beach areas between Kismet and Mecox Bay to a minimum width of 100 feet, with an elevation of 14 feet above mean sea level;
- raising of dunes to an elevation of 20 feet above mean sea level from Fire Island Inlet to Hither Hills State Park;
- placement of sand at Montauk and opposite Lake Montauk Harbor;
- planting of grass on dunes;

- interior drainage structures at Mecox Bay, Sagaponack Lake and Georgica Pond;
- construction of up to 50 groins subject to future determination of their actual need; and
- Federal participation in periodic nourishment.

The project's non-federal sponsor is the New York State DEC.[13]

1.a. Progress of the Fire Island Inlet to Montauk Point project

In 1978, the Council on Environmental Quality recommended the reformulation of the original project based on an unacceptable Environmental Impact Statement. A reformulation study was initiated in 1980 and is scheduled for completion in 2005. Until the reformulation study is finalized, state, local and congressional interests have requested that the New York District of the Army Corps of Engineers evaluate plans to provide immediate remedial action for vulnerable areas. The request is made with the understanding that any interim actions taken would be modified, as necessary, based on the recommendations of the reformulation study. In addition, as of February 1996, the "Beach Contingency Plan" provides a mechanism for rapid breach closures of the barrier islands throughout the project area after an occurrence of a damaging coastal storm(s).[14]

2. Financing Beach Projects (Legal Compliance)

Generally, projects under the Water Resources Development Act of 1999 have had a cost-sharing formula of 65 percent and 35 percent for the federal and non-federal sponsor(s), respectively. While this cost sharing arrangement remains in effect, the proposed 2003 Federal budget amends this formula to 35 percent and 65 percent for the federal and non-federal sponsor(s), respectively. The reason given for the proposed change was to "more appropriately reflect the distribution of economic benefits that shore protection projects provide to State(s) and local sponsor(s)." It should be pointed out that a draft report prepared by the U.S. Army Corps of Engineers for the Office of Management and Budget (OMB)[15] concludes that the current 65 percent federal share should remain in effect. OMB has criticized this finding.[16]

With the establishment of Erosion Control Districts, a number of local governments in Suffolk County (Brookhaven, Islip) have moved forward with hurricane protection and beach erosion control measures. Given the potential for beach erosion and/or the results of beach erosion, additional affected local governments and residents are giving consideration to establishing Erosion Control Districts to preserve and/or enhance their interests. Furthermore, if the

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[13] http://www.nan.usace.army.mil/project/newyork/factsh/pdf/fimp.pdf

[14] Ibid.

[15] Draft report prepared by the U.S. Army Corps of Engineers Institute for Water Resources, for the Office of Management and Budget (OMB), dated November of 2001,"The Distribution of Shore Protection Benefits: A Preliminary Examination".

[16] Draft report prepared by the U.S. Army Corps of Engineers Institute for Water Resources, for the Office of Management and Budget (OMB), November of 2001, "The Distribution of Shore Protection Benefits: A Preliminary Examination".

county decides to participate in forthcoming hurricane protection and beach erosion control measures, it will need to determine who will benefit from its expenditures in order to appropriately apportion hurricane protection and beach erosion control funds.

3. Precautions

The county, with the best intentions of safeguarding and protecting it's residents, economy, and natural resources, has found itself involved in a variety of lawsuits related to dredging and beach stabilization. This litigation has resulted in delays and increased costs and modification of projects as first proposed. A case in point is the property owners in the Village of Westhampton Dunes versus the US Army Corps of Engineers, New York State and Suffolk County, discussed earlier. Legal problems have contributed to making it more difficult to gain approval for beach projects. As a result, the Army Corps of Engineers' Fire Island to Montauk Point Reformulation Study has become a focal point for all future projects.

4. Shared Jurisdictions in Waterways & Wetlands – Separate Permit Requirements from the Army Corps and the DEC (Legal Compliance)

The U.S. Army Corps of Engineers regulates dredging, the discharge of dredged or fill material, and the construction of certain structures in waterways and wetlands. The New York State Department of Environmental Conservation (DEC) is under the jurisdiction of the New York District Office of the Corps. When an applicant files a "Joint Application" with the DEC for a permit, a copy is forwarded to the Corps. Because the two agencies' requirements are different, the Corps may contact the applicant for additional information. If a determination is made that a DEC permit is not required, it does not necessarily mean that no permit is required from the Corps. Additionally, having obtained a DEC permit does not relieve the applicant from the obligation to comply with federal laws.

5. Coastal Consistency Certification (Legal Compliance)

Applicants for a permit from the Army Corps of Engineers and/or the DEC in the coastal consistency program area of the Atlantic Ocean will need the New York State Department of State to issue a Coastal Consistency Certification to the Army Corps of Engineers or the DEC. The Corps and the DEC are required to include the Coastal Consistency Certification as part of their permit decision in the coastal consistency program area. If it is determined that the land is owned by the State of New York it will be necessary to obtain approvals or easements for projects from the New York State Office of General Services (OGS).[17]

[17] New York State Department of Environmental Conservation, http://www.dec.state.ny.us/website/dcs/tidalwet/tidalwet07.html and Office of General Services, Division of Land Utilization, Bureau of Land Management, Corning Tower, Empire State Plaza, Albany, New York 12242, (516) 474-2195.

6. Relevant New York State Legislation and Permits: (Legal Compliance)

Tidal Wetlands Act, Article 25, Environmental Conservation Law, and 6 NYCRR-PART 661

New York State has set forth the Tidal Wetlands Act to preserve and protect wetlands. The New York State Department of Environmental Conservation (DEC) administers the Tidal Wetlands Regulatory Program, which was designed to prevent the despoliation and destruction of tidal wetlands by establishing and enforcing regulations. These regulations are intended to: a) preserve, protect, and enhance the present and potential values of tidal wetlands; b) protect the public health and welfare; and c) give due consideration to the reasonable economic and social development of the state.

In Suffolk County, tidal wetlands line salt-water shorelines, bays, inlets, canals, and estuaries and include numerous marshes, shoals, bars, mudflats, and littoral zones that appear on New York State's Tidal Wetland Inventory. Tidal wetland regulations apply anywhere tidal inundation occurs on a daily, monthly or intermittent basis including, but not exclusively within the, "salt wedge" where fresh and salt waters converge. The categories of wetlands and the restrictions placed on activities in and around them are defined in detail in Part 661 of 6 NYCRR. Official tidal wetlands maps showing the exact locations of New York's regulated wetlands are on file at DEC regional offices in Regions 1, 2, and 3, and in the County Clerk's Office of Suffolk County, as well as in local assessing agencies in the regulated areas.[18]

6.a. Fundamental Regulated Activities (Tidal Wetlands Act, Article 25, Part 661.5)

The following activities are regulated under the provisions of the Tidal Wetlands Act:

- construction of groins, bulkheads, or other shoreline stabilization structures.
- placement of fill, dredging, and excavation, including beach re-grading.
- construction of buildings, septic systems, bulkheads, docks, catwalks, piers and floating docks.
- mooring of a vessel to be used as a dwelling or commercial or public use building.
- restoration, reconstruction, expansion, or modification of existing functional structures.
- drainage.
- installation of underground utilities.

[18] New York State Department of Environmental Conservation http://www.dec.state.ny.us/website/dcs/upa/upa_permits.html, (www.dec.state.ny.us)

6.b. Tidal Wetlands Act, Article 70, Uniform Procedures Act, Environmental Conservation Law and Regulation – NYCRR PART 621.12

*6.b.i.* Uniform Procedures Act

The Uniform Procedures Act specifies DEC project review, procedures and time frames for:

- determining the adequacy of applications;
- seeking public involvement;
- resolving issues;
- final decisions on environmental permit applications; and,
- appealing DEC decisions.

*6.b.ii.* Emergency Authorizations[19]

NYCRR PART 621.12 provides for expedited project review and issuance of Emergency Authorization (EA) to state or local government agencies in events that immediately threaten life, health, property or natural resources. This section of the law requires that:

- the state or local government agency must notify the DEC within 24 hours of taking action.
- the state or local government agency must provide additional information (supporting) within 24 hours after the initial notification to the DEC.
- the DEC must make a decision within two business days of receipt of the above information.
- the DEC must state why immediate "Finding of Emergency" action is needed (usually a emergency declaration by NYS or a local government fulfills this criteria).
- the DEC can summarily order a suspension of work if no Emergency Authorization has been granted or it finds the emergency no longer applies.
- the project will to be carried out in a manner which causes the least change, modification or adverse impact to life, property or natural resources.
- conditions may be placed on the Emergency Authorization and enforced to assure compliance with the EA and other regulatory standards normally applicable absent an emergency.
- emergency Authorizations can only be issued for a period of up to 30 days.
- if necessary, the Emergency Authorization can be renewed one time for up to an additional 30-days.
- project continuation beyond the 60-day period can only be accomplished by submitting a complete application for the project and receiving a regular permit.

[19] New York State Department of Environmental Conservation Http://www.dec.state.ny.us/website/dcs/tidalwet06.html, (www.dec.state.ny.us & New York State Department of Environmental Conservation Http://www.dec.state.ny.us/website/dcs/tidalwet/, (www.dec.state.ny.us)

7. Additional Permits (Legal Compliance)

It is important to note that projects or activities may require additional permits. For example:

- "Protection of Waters" permits are required by the DEC for certain activities such as dredging or filling that take place in navigable waters, or for activities that may result in disturbance to the bed or banks of protected streams.
- A section 401 Water Quality Certification by DEC may also be needed if the activity will require a permit from the Corps of Engineers.
- Freshwater Wetlands permits are required by the DEC for areas designated on the freshwater wetlands maps. In many cases, these areas are near tidal wetlands, and their adjacent areas may overlap.
- Coastal Erosion Hazard Area permits are required along sensitive shorelines in structural hazard areas or natural protective feature areas, which are indicated on Coastal Erosion Hazard Area Maps.
- The majority of projects or activities will require a SEQRA (State Environmental Quality Review Act)[20] determination.
- County, town or village permits may be required in addition to state & federal approvals

[20] U.S. Army Corps of Engineers, New York District, 26 Federal Plaza, New York, New York 10278 (212) 264-2055, http://www.nan.usace.army.mil/business/prjlinks/coastal/fireisl/index.htm

# *Chapter 3*

# A Guide to Beach Erosion

This chapter presents information on storm damage in general, and its impact on Suffolk County in particular. The chapter is broken down into the following four sections: *(A)* hurricane categories and storm surges; *(B)* flood plains of Suffolk County; *(C)* SLOSH zones; and *(D)* an historic overview of coastal storms in Suffolk County.

## *A. Hurricane Categories and Storm Surges*

Rapid periodic beach erosion on the south shore barrier islands in Suffolk County is fundamentally attributable to seasonal storm activity. Both time duration and storm intensity influence the damaging affects of a storm. When a storm achieves hurricane strength, the Saffir-Simpson scale (shown below) is commonly used to classify the storm's intensity. In addition, when projecting the level of damage and/or the need for coastal evacuation, the speed with which a storm travels needs to be considered.

**Saffir-Simpson Scale for Hurricane Classification**

| Strength | Wind Speed (mph) | Pressure (Millibars) | Pressure (Inches Hg) | Storm Surge (ft.) |
|---|---|---|---|---|
| **Category 1** | 74 to 95 mph | 980 mb and above | 28.94 in. and above | 4 to 5 feet |
| **Category 2** | 96 to 110 mph | 965 to 979 mb | 28.50 to 28.91 in. | 6 to 8 feet |
| **Category 3** | 111 to 130 mph | 945 to 964 mb | 27.91 to 28.47 in. | 9 to 12 feet |
| **Category 4** | 131 to 155 mph | 920 to 944 mb | 27.17 to 27.88 in. | 13 to 18 feet |
| **Category 5** | 156 mph and above | 919 mb and below | 27.16 in. and below | 19 and above |

As a point of reference, in the past 64 years, the storm with the highest level of intensity when it reached Long Island was the hurricane of 1938, referred to as "The Long Island Express". This storm was classified as a Category 3. Prior to landfall on September 21, the storm had been a Category 5.[21] On September 21, 1938 at 3:30 PM this storm:

- made landfall at Bellport, New York.
- was a 500-mile wide hurricane.
- had an eye that was 50 miles across.
- had a forward speed of 70 mph.
- occurred at high tide during the Autumnal Equinox and a full moon.
- had wind speeds ranging from 81 to 127 m.p.h. east of the eye, moving from south to north.
- exhibited coastal waves on the south shore that reached heights of 30 to 50 feet.

[21] The Long Island Express, The Great Hurricane of 1938 – Hurricane of '38 Storm Track, Scott A. Mandia, http://www2.sunysuffolk.edu/mandias/38hurricane/track.html

- had typical inland storm surge heights of 14 to 18 feet across sections of Suffolk County.
- resulted in flooding of 20 square miles of the mainland (non-barrier island).[22]
- caused downtown Westhampton Beach (one-mile inland) to be under 6 to 8 feet of oceanic water.[23]
- created twelve new inlets on the barrier Islands. Two (Moriches & Shinnecock) remain navigable today with the assistance of dredging.
- recorded a low atmospheric pressure of 27.94 inches (the atmospheric pressure reading assists in classifying the category of a storm).

It is estimated that if the hurricane of 1938's forward speed were slower on September 21, the level of damage would have been greater. The rapid forward speed of the hurricane (70 mph) shortened the duration time over land, thereby reducing the damaging effects of the cyclone wind currents (81 to 127 mph).

### *B. Flood plains of Suffolk County*

Commonly, when individuals visualize a flood plain, they describe a river overflowing its banks. The leading characteristic associated with Suffolk's flood plain is its topography and the surge of the Atlantic Ocean inland above the normal high tide level. The majority of Suffolk's coastal south shore is comprised of interconnecting flood plains that were formed as the glaciers receded north and ocean sea levels changed. The periodic formation and advancement, followed by the melting and regression, of glaciers in North America helped create and shape Long Island. As the glaciers melted, they created stream systems, valleys, lakes, bays, inlets and delta plains of sand on Long Island. Ocean storm surges now flow in reverse of these ancient glacier stream systems, inundating lowlands as they advance inland.

Hurricanes are the leading cause of major storm surges in Suffolk County. The category level of a hurricane, location of the hurricane eye, tide level at time of landfall, land elevation and speed of storm are all principal factors influencing the degree to which an area will be inundated from a storm surge.[24]

Scientists at the National Oceanic and Atmospheric Administration (NOAA), Climate Prediction Center (CPC), Hurricane Research Division, and National Hurricane Center (NHC) jointly forecasted that the 2002 Atlantic Hurricane Season had a 35 percent probability of producing an above normal hurricane season.

It is impossible to predict the exact number of hurricanes that will occur during a hurricane season, or which localities they will impact. It is also important to

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[22] U.S. Army Corps of Engineers, New York District, Fire Island Inlet to Montauk Point N.Y., http://www.nan.usace.army.mil/business/prjlinks/coastal/fireisl/index.htm

[23] The Great Hurricane of 1938 – Weather History of the Hurricane, Scott A. Mandia, http://www2.sunysuffolk.edu/mandias/38hurricane/weather_history_38.html

[24] Long Island Storm Surge Maps, Scott A. Mandia, http://www2.sunysuffolk.edu/mandias/38hurricane/storm_surge_maps.html

understand that far more damage will occur from one major hurricane hitting a heavily populated area than from several hurricanes hitting sparsely populated areas. Recognizing the possibility of substantial destruction from a major hurricane hitting a heavily populated coastal region, governments and residents should formulate short and long-term strategies designed to prepare for such an occurrence.[25]

### *C. SLOSH Zones*

Many flood hazard areas on Suffolk County's south shore can be identified by analyzing NOAA's National Weather Service SLOSH ("Sea-Lake Overland Surge from Hurricanes") model for the New York City region.[26,27,28,29] SLOSH maps are produced by blending data from 200-300 hypothetical hurricanes. A SLOSH map illustrates projected risk areas for each of the five Saffir-Simpson hurricane categories. Astronomical tides, rainfall, river flow, and wind-driven waves are not incorporated into this model. The primary use of the SLOSH model is to define flood-prone areas for evacuation planning.[30] SLOSH zones are also important to this study because the tax revenue data used in Chapter 5 of this report is apportioned to the south shore beaches based on the extent to which revenues are generated within SLOSH zones. In the description of SLOSH zones that follows, SLOSH zones correspond to hurricane categories (i.e. SLOSH zone 1 equals hurricane Category 1).[31]

**SLOSH Zone 1**

Areas vulnerable to ocean surges in Suffolk County with a Category 1 hurricane include all of Suffolk County's outer barrier islands from Gilgo Beach to Southampton, along with smaller islands within the Great South, Moriches and Shinnecock Bays. In addition, areas on the south shore of the mainland are equally at risk of experiencing flooding with tidal surges. In the vicinity of a washover or breach on the barrier island, tidal flooding beyond the customary tidal influences will occur on the mainland in stream corridors. Damage is anticipated to be considerable for coastal structures that are within 10 feet of the high tide (sea) level and in a stream corridor. In addition, there is likely to be significant damage to unanchored mobile homes, shrubbery, and trees. Coastal road flooding and minor pier damage is also projected.[32]

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[25] Climate Prediction Center – Expert Assessments: Atlantic Hurricane Outlook Update, http://www.cpc.ncep.noaa.gov/products/outlooks/hurricane.html

[26] Climate Prediction Center – Expert Assessments: Atlantic Hurricane Outlook Update, http://www.cpc.ncep.noaa.gov/products/outlooks/hurricane.html

[27] Hurricane damage mitigation plan for the south shore of Nassau and Suffolk counties New York, Long Island Regional Planning Board, Dr. Lee Koppelman, October 1984. LOCCC No. 84-82242.

[28] Draft Map, Fall 2000 SLOSH Zones, produced at Suffolk County MIS, Suffolk County Geographic Information Systems.

[29] (SLOSH zones) National Weather Service's Sea-Lake Overland Surge from Hurricanes model.

[30] An Overview of the NHC Prediction Models, Bernard N. Meisner, Scientific Services Division, National Weather Services Southern Region, revised 5-14-2002. http://www.srh.noaa.gov/ftproot/ssd/nwpmodel/html/nhcmodel.htm

[31] Acknowledged is that a hurricane's initial landfall location can only be at one site. Therefore, the following illustrations have a comprehensive influence delineation.

[32] New York State, Emergency Management Office, Hurricane Preparedness 2002, Hurricane Awareness Week May 19-25, 2002 Source: U.S. DEPARTMENT OF COMMERCE, NOAA, National Weather Service.

## SLOSH Zone 2

With a Category 2 hurricane, coastal outer barrier islands and coastal areas of the south shore of Suffolk County that are at 2 feet or less above the mean sea level have an elevated possibility of flooding 2-4 hours before the hurricane makes landfall. Roads in this zone may not be safe for travel. Some roofing material, door, and window damage to buildings is forecasted. Considerable damage to vegetation, mobile homes, and piers is also expected. Small craft in unprotected anchorages are likely to break their moorings.[33]

## SLOSH Zone 3

Increased flooding will occur at and north of the barrier islands (mainland) as a result of a Category 3 hurricane. Smaller coastal structures will be destroyed, with larger structures damaged by floating wreckage. Inland topography planes that are at 5 feet or less above the mean sea level have a high probability of inundating inland 8 miles or more. A variety of structural damages will occur to residences and out buildings, with a number of residences experiencing structural wall failures. Mobile homes will be destroyed.[34]

## SLOSH Zone 4

Should a Category 4 hurricane hit the south shore, considerable barrier island erosion will occur, along with the formation of new inlets. Inland topography planes that are at 10 feet or less above the mean sea level may be inundated, requiring evacuation of populated areas as far as 6 miles inland. Major damage to structures near the shore will occur, as will an increase in the number of residences experiencing structural wall failures and complete roof failure.[35]

## SLOSH Zone 5

A Category 5 hurricane would require massive evacuation in low-lying areas within 5 to 10 miles of the coastline. Major damage to coastal structures is anticipated within 1,500 feet of the coastline and less than 15 feet above mean sea level. Complete roof failure on many residences and industrial buildings can be expected across the county. In some cases complete building failure will take place, as out buildings (hangars, barns, sheds, coops) are blown over or away.[36]

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[33] Ibid
34 Ibid
35 Ibid
36 Ibid

### *D. Historical Overview of Coastal Storms in Suffolk County*

Suffolk County has experienced numerous storms that have damaged its Atlantic coastline and are commonly categorized as either northeasters or hurricanes. These storms often cause extensive flooding and erosion within barrier islands and mainland communities. When breaching and/or inundation of the barrier islands occurs, it can lead to increased flood damage, especially along the mainland communities bordering the Shinnecock, Moriches and Great South Bays.[37]

Typically, Long Island's northeasters occur in the months of October to March, while hurricanes in this region occur in the months of July to October. Northeasters, on average, are less concentrated and are of longer duration then a hurricane. The prolonged time frame allows the storm to cause coastal damage that is equal to or exceeds that of a hurricane. From 1869 to 1969, sixty-five moderate to severe northeasters have negatively impacted the New York coastal region.[38] The two most recent damaging northeasters occurred in March of 1962 and December of 1992, and persisted for two to three days. The following table lists the hurricanes and northeasters that have had a negative impact on Suffolk County's ocean coastline from 1901 to 2000.[39]

The accompanying table also lists the time intervals between significant coastal storms. From 1904 to 1992, there have been nineteen significant coastal storms. Over this 88-year period Suffolk County has experienced, on average, a significant coastal storm every 5-years. The greatest interval between significant coastal storms has been twenty-seven years. The last recorded occurrence of a significant coastal storm in Suffolk County was in 1993. In addition, the county regularly experiences low to moderate coastal storms that are destructive to the south shore's coastline, but are not considered severe enough to be listed.

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[37] See Executive Summary, p. ES-1, in "Work Order 1 – Interim Submission No. 6 – Draft: Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York – Storm Damage Reduction Reformulation Study – Alternative Screening", July 1999, prepared by URS Consultants/Moffatt & Nichol Engineers for the US Army Corps of Engineers, New York District.

[38] See Section 3.3 Storm History, p.25, in "Work Order 1 – Interim Submission No. 6 – Draft: Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York – Storm Damage Reduction Reformulation Study – Alternative Screening", July 1999, prepared by URS Consultants/Moffatt & Nichol Engineers for the US Army Corps of Engineers, New York District.

[39] Individual hurricane names obtain from the National Hurricane Center, 11691 South West 17th Street, Miami, FL 33165-2149, Public Affairs Office, http://www.nhc.noaa.gov

| Month | Year | Categorization | Time Interval from Last Storm Occurrence (years) |
|---|---|---|---|
| September | 1904 | Hurricane | - |
| March | 1931 | Northeaster | 27 |
| September | 1934 | Hurricane | 3 |
| March | 1935 | Northeaster | 1 |
| September | 1938 | Hurricane New England, AKA The Long Island Express | 3 |
| September | 1944 | Hurricane Great Atlantic | 6 |
| November | 1950 | Northeaster | 6 |
| November | 1953 | Northeaster | 3 |
| August | 1954 | Hurricane Carol | 1 |
| September | 1960 | Hurricane Donna | 6 |
| March | 1962 | Northeaster | 2 |
| August | 1976 | Hurricane Belle | 14 |
| February | 1978 | Northeaster | 2 |
| March | 1984 | Northeaster | 6 |
| September | 1985 | Hurricane Gloria | 1 |
| August | 1991 | Hurricane Bob | 6 |
| October | 1991 | Northeaster | 0 |
| December | 1992 | Northeaster | 1 |
| March | 1993 | Northeaster | 1 |

# *Chapter 4*
# The Local Economy, Tourism and Suffolk County's South Shore Beaches

## *A. The Approach Used to Estimate the Long Island Economy and the Impact of Tourism and Beaches*

This chapter estimates the economic impact of Suffolk County's south shore beaches. This was accomplished by first calculating the size of the Nassau-Suffolk region's economy, and then attributing amounts to Nassau and Suffolk counties. Survey data on overall tourism was then utilized to estimate the size of the tourism sector of the economy. Based on information from tourism surveys and data on numbers of beach visits, the portion of the economy that is generated by Suffolk County's south shore beaches was then estimated.

Potentially, either of two approaches could have been used to estimate the size of the tourism and beach economies: a demand-side approach and a supply-side approach. Based on the availability of data for this study, a demand-side approach was used. The demand for goods and services by tourists and beach users is captured by the spending profiles in our analysis. The specifics of the methodology used are discussed below.[40]

In a supply-side approach, the value of production by industries that are identified with tourism or beach use would be calculated. A problem arises because often no allowance is made for the portion of these industries that is associated with tourists, as opposed to local residents. This could result in a gross overestimate of the size of the tourist sector. For example, airlines, restaurants, and entertainment are typically associated with tourism; however, a large portion of spending on these services is attributable to local residents, not tourists. Since estimates of the tourism or beach portions of relevant industries were unavailable, the supply-side approach was not used.

The following sections on "Tourism on Long Island" are based on data found in Tables 4.1 through 4.9, and are numbered to correspond to those tables. These sections are followed by "Table 4 Summary," a master table that compiles data from Tables 4.3, 4.4, and 4.6 – 4.9. This master table references the "source" table (4.1 - 4.9) from which each data item was extracted. These "source" tables can be found at the end of the chapter, prior to appendices 4.1 and 4.2.

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[40] The data needed to estimate the size of the tourist sector and the economic impact of our south shore beaches is limited. The methodology discussed in this chapter provides a recipe for how to estimate the tourism and beach sectors. Our methodology also suggests the type of data, such as surveys, that are needed to refine the estimates made in this report.

## *B. Tourism on Long Island*

### Table 4.1: Tourism Spending

Survey data made available by the Long Island Convention and Visitors Bureau (LICVB) was used to gauge the tourism sector of the local economy. The LICVB contracted with D.K. Shifflet & Associates to conduct surveys of domestic tourism on Long Island. Typical of tourism spending surveys, the D.K. Shifflet surveys provide information on six expenditure categories: *(1)* transportation; *(2)* food; *(3)* shopping; *(4)* room; *(5)* entertainment; and *(6)* miscellaneous. Separate spending profiles exist for domestic overnight leisure visitors[41], domestic day-trip visitors, and domestic overnight business visitors[42]. To capture the foreign tourist market, it was assumed that international leisure visitors have the same spending habits as domestic overnight leisure visitors and that international business visitors have the same spending habits as domestic overnight business visitors[43].

The spending profiles of these categories of visitors are presented in Table 4.1. In 1999, the average overnight leisure visitor spent $262.96 over the course of a 3.8-day visit to Long Island. The average spending by day-trip tourists was $85.85, and the average spending by overnight business visitors was $468.60 over the course of 3.01 days.

### Table 4.2: Revised Tourism Spending

In order to estimate the impact of tourism spending, Implan Pro[44] software and databases were employed. Implan is an input-output (I-O) regional economic model, with data available for counties, states, and the United States economy as a whole. The Implan model includes regional estimates of production

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[41] See "1999 Domestic Travel Report", pp. 7-8 of Data Tables, prepared by D.K. Shifflet & Associates Ltd. for the Long Island Convention and Visitors Bureau and Sports Commission.
[42] Data for domestic day-trip visitors and domestic overnight business visitors was made available by D.K. Shifflet & Associates Ltd. Data provided was for 1998-99 two-year averages for Long Island domestic trip expenditures per person per day by spending category and for length-of-stay.
[43]There are no direct estimates for the number of international tourists on Long Island; we base our estimate on national averages. One data source that tracks both domestic and foreign tourists is the Travel Industry Association of America, Tourism Industries/International Trade Administration (http://www.tia.org/). Averaging available national data for 2000 and 2001, foreign tourists comprised 4.57% of all U.S. tourists, with domestic tourists accounting for the remaining 95.43%. To arrive at a distribution of international tourists between leisure and business, the "2000 Profile of Overseas Travelers to the U.S. – Inbound, reported from Survey Of International Air Travelers (IFS)"was used (http://tinet.ita.doc.gov/view/f-2000-07-001). The breakdown is 67% leisure visitors and 33% business visitors. In terms of spending profiles for international tourists, available national surveys represent total spending in the U.S across all areas visited. For a more appropriate and conservative approach, local domestic spending profiles, which include only the portion of tourist spending that is made on Long Island, were employed. Spending on Long Island by international leisure tourists assumed to be the same as spending by domestic overnight tourists, and spending by international business tourists is assumed to be the same as spending by domestic overnight business tourists.
[44] Implan is an acronym for "IMpact analysis for PLANning". A description of the Implan model can be found at http://www.implan.com/

relationships plus intermediate and final demands for 528 different industries. This data provided the ability to analyze both Nassau and Suffolk counties.

The procedure used to convert local tourism spending data into Implan sectors is described in Appendix 4.1. The results of this process are presented in the spending profiles found in Table 4.2. Total spending is the same in Table 4.2 as in Table 4.1, however, Table 4.2 expands the number of spending categories from six to thirteen. As noted in Appendix 4.1, the revised spending profile allows apportionment of spending among a large number of industry and commodity sectors found in the Implan model.

### Table 4.3: Number of Tourists

To estimate the impact of tourism on the economy, data on the number of tourists is needed for use with the per-visit spending profiles found in Table 4.2. Statistics on the number of domestic tourists visiting the Nassau-Suffolk region are found in the D.K. Shifflet surveys cited above. Table 4.3 lists this data, supplements it with estimates of foreign tourism, and estimates the split of Long Island tourism between Nassau and Suffolk counties. The footnotes accompanying Table 4.3 explain how these estimates were made. In total, it is calculated that 9.1 million tourists visit the Nassau-Suffolk region annually. Based on the number of hotel/motel room nights in each county, it is estimated that 3.6 million tourists visit Nassau and 5.5 million visit Suffolk.

### Table 4.4: Long Island's Economy and the Impact of Tourism

The impact of tourism on the local economy can be estimated by multiplying the tourism spending profiles in Table 4.2 by the number of tourists in Table 4.3 (for each of the appropriate tourist categories). The results of doing so are presented in Table 4.4.

Total tourist spending in the Nassau-Suffolk region is estimated at $1.836 billion in 1999 dollars. This generates $2.557 billion in economic activity, which supports an estimated 31,307 jobs. These jobs account for $0.822 billion in labor income. The gross regional product (GRP) contributed by tourism activity is $1.316 billion. (GRP is the value added to the cost of goods and services, or wealth created, by economic activity in the region.) Tourism accounts for 1.25% of Long Island 's $105.5 billion GRP.

In Nassau County, tourism resulted in spending estimated at $0.721 billion in 1999 dollars. This results in a $0.982 billion in economic activity being generated. A total of 11,923 jobs and $0.313 billion in labor income are associated with this activity. The gross regional product (GRP) contributed by tourism is $0.502 billion. (GRP is the value added to the cost of goods and services, or wealth created, by economic activity in Nassau County.) Tourism accounts for 0.87% of Nassau County's $57.7 billion GRP.

In Suffolk County, tourist spending is estimated at $1.114 billion in 1999 dollars. This results in $1.548 billion in economic activity being generated. There are 19,019 jobs supported by this activity, which accounts for $0.492 billion in labor income. The gross regional product (GRP) contributed by this economic activity is $0.790 billion. GRP is the value added to the cost of goods and services, or wealth created, by economic activity in Suffolk County. Tourism accounts for 1.65% of Suffolk County's $47.8 billion GRP.

## C. Suffolk County's South Shore Beaches and Beach Tourism

### Table 4.5: Beach Spending

No direct survey data for beach spending on Long Island was available. To arrive at reasonable estimates, the per-visit tourist spending profiles found in Table 4.2 are used as a starting point. Since the data on beach visits is stated in number of day trips to the beach (see Table 4.6), spending per visit in Table 4.2 must be converted to spending per day.

Profiles for four classes of beach visitors are presented in Table 4.5. Business tourists (both domestic and foreign) are excluded from consideration as beach users because their primary reason for coming to Long Island was business, not beach activities.

The first category of beach visitors is comprised of two classes of visitors: domestic overnight leisure tourists and international leisure beach visitors. Both classes include only tourists who consider beaches to be their primary activity on Long Island. All local spending for these tourists is considered to be beach-related: any non-beach spending is considered a by-product of the purpose of their trip, which is to enjoy the beaches of the region. The spending listed here is the same as in Table 4.2, except that the average spending per visitor has been divided by the average number of days (3.8-days for overnight leisure trips, see Table 4.1) to arrive at beach spending per visit. Total spending per visit is $69.19 per day for these beach visitors. Relative to other estimates found in the literature, we believe this to be a conservative figure.[45]

The second category of beach visitors is domestic day-trip leisure tourists. The spending profile used is an adjusted version of that used for overnight leisure tourists: the lodging component is netted from the $69.19 total, leaving an adjusted total of $59.34 for day trip tourists. This approach was chosen because data was not available to separate day-trip spending into business and leisure amounts. Combining business and leisure day-trips would lead to an unacceptable spending level ($86.28), since it exceeds spending for overnight leisure travelers ($69.19). The selected level of beach spending appears conservative relative to other studies.[46]

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[45] A survey of beaches in Texas by Fesenmaier et. al. (1987) found beach spending to be $88 per day. In an Army Corps study by Robinson et. Al. (2001), the same $88 value was adopted for the "typical" beach region, while a higher spending level, $128.77, was used for "urban" regions.
[46] Ibid.

The final category of beach visitors is day-trip leisure residents. Spending by local residents using the beach should be lower than the $59.34 in spending by tourists. The figure used here for local day-trips to the beach is $17.09 per visit. Although no survey data was available for day-trips to the beach by residents, the cost to local beachgoers would be higher for those who patronize restaurants, shops and concessions, than for those bringing food from home. The cost would also be higher for those who go to beaches with parking fees, who take ferries to Fire Island, or who go boating. Taking all these beach uses into account, an average of $17.09 per resident appears reasonable. The actual spending profile used in this case was obtained from the Recreation Economic Assessment System (REAS) Model, which was developed for the Army Corps of Engineers at Michigan State University's. Department of Park, Recreation and Tourism Resources.[47] The REAS model offers a practical option, since it provides survey data on tourism spending at all Army Corps lakes, and also provides a framework for converting spending profiles into Implan industry and commodity sectors.

## Table 4.6: Total Beach Visits
### *and accompanying Pie Chart*

The total number of visits to Suffolk County's south shore beaches is estimated to be over 11.3 million per year. Data sources used to derive this number are cited in the footnotes accompanying Table 4.6. The total number of visits is comprised of almost 6.8 million (59.8%) visits to State parks, 1.6 million (14.3%) visits to County parks, 2.2 million (19.6%) visits to the Fire Island communities, almost 0.5 million (4.1%) visits to town and village beaches, and less than 0.25 million (2.2%) visits to non-municipal beaches. The *pie chart* immediately following Table 4.6 provides a visual presentation of this data.

## Table 4.7: Tourist Beach Visits

To calculate the number of tourist visits to Suffolk County's south shore beaches, the total number of tourists on Long Island are multiplied by three factors: (1) the percent that Suffolk County tourists comprise of all tourists coming to Long Island; (2) the percent of tourists whose primary attraction to Long Island is the beach; and (3) the percent of beach visits within Suffolk County that are to south shore beaches. A description of the derivation of each of these factors can be found in the footnotes accompanying Table 4.7.

Analysis indicates that, of the estimated 11,323,485 visitors to Suffolk County's south shore beaches, 522,995 or 4.6% are tourists.

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[47] A description of the Recreation Economic Assessment System (REAS) Model can be found at http://corpslakes.usace.army.mil/employees/economic/reas.html. The chosen spending profile is believed to be the one that best represents this region. It is based on *(1)* a generic spending profile set at high spending (30% higher than average); *(2)* spending corresponding to all Army Corps projects in the North Atlantic Division (NAD); and *(3)* spending profiles for day-trip visits that is made up of a combination of 3.7% boaters and 96.3% non-boaters.

## Table 4.8: Breakdown of Local Resident Beach Visits

The number of beach visits made by local residents (10,800,490), is equal to the total number of beach visits (11,323,485) less those attributed to tourists (522,995). In Table 4.8, local resident beach visits are broken down to differentiate between higher spending levels by local residents on vacation (694,820 beach visits) and lower spending by either those making beach trips from home or those vacationers who happen to go to the beach but are primarily vacationing for non-beach reasons (10,105,670 beach visits). The methodology used to make this breakdown can be found in the notes accompanying Table 4.8.

## Table 4.9: The Long Island Economy and the Impact of Suffolk County's South Shore Beaches

The economic impact of Suffolk County's south shore beaches is presented in Table 4.9. It is estimated that visitors to Suffolk County's south shore beaches spend $255.7 million in 1999 dollars. This figure was derived by taking the number of south shore beach visits for the various categories in Tables 4.7 and 4.8, and multiplying them by the appropriate spending profiles listed in Table 4.5.

The $255.7 million in south shore beach spending generates economic activity that totals $341.0 million. The number of jobs supported by this activity is estimated at 3,855. These jobs account for $99.0 million in labor income. The gross regional product (GRP) contributed by Suffolk County's south shore beaches is estimated to be $158.6 million. (GRP is the value added to the cost of goods and services, or wealth created, by economic activity in Suffolk County.) South shore beaches account for one-third of one-percent (0.33%) of Suffolk County's $47.8 billion GRP.

**Table 4 Summary:** Analysis Related to The Local Economy, Tourism and Suffolk County's South Shore Beaches

| | Long Island | Nassau County | Suffolk County | Table Referenced |
|---|---|---|---|---|
| **The Overall Economy** | | | | |
| Gross Regional Product (GRP), All Industries Total | $105.466 billion | $57.705 billion | $47.762 billion | Table 4.4 |
| **Total Tourism** | | | | |
| Total Number of Tourists | 9,136,287 | 3,590,561 | 5,545,726 | Table 4.3 |
| Direct Output or Spending on Tourism | $1.836 billion | $0.721 billion | $1.114 billion | Table 4.4 |
| Total Output or Spending on Tourism with Multiplier Effect | $2.557 billion | $0.982 billion | $1.548 billion | Table 4.4 |
| Employment | 31,307 | 11,923 | 19,019 | Table 4.4 |
| Labor Income | $0.822 billion | $0.313 billion | $0.492 billion | Table 4.4 |
| Gross Regional Product (GRP), Tourism | $1.316 billion | $0.502 billion | $0.79 billion | Table 4.4 |
| *Tourism as a Percent of Total GRP* | *1.25%* | *0.87%* | *1.65%* | Table 4.4 |
| **Suffolk County's South Shore Beaches** | | | | |
| Total Number of Visitors to South Shore Beaches | | | 11,323,485 | Table 4.6 & 4.7 |
| *South Shore Beach Visits by Tourists* | | | *522,995* | Table 4.7 & 4.8 |
| *South Shore Beach Visits by Local Residents* | | | *10,800,490* | Table 4.7 & 4.8 |
| Local Resident Beach Visits Associated with the Higher Tourism Spending Profile | | | 694,820 | Table 4.8 |
| Local Resident Beach Visits Associated with the Lower Non Tourism Spending Profile | | | 10,105,670 | Table 4.8 |
| Direct Output or Spending on Tourism | | | $255.7 million | Table 4.9 |
| Total Output or Spending on Tourism with Multiplier Effect | | | $341.0 million | Table 4.9 |
| Employment | | | 3,855 | Table 4.9 |
| Labor Income | | | $99.0 million | Table 4.9 |
| Gross Regional Product (GRP), Tourism | | | $158.6 million | Table 4.9 |
| *Tourism as a Percent of Total GRP* | | | *0.33%* | Table 4.9 |

| Table 4.1: Tourism Spending<br>Estimated Tourism Spending per Visitor on Long Island |
|---|

| | Spending per Visitor | | |
|---|---|---|---|
| Spending Categories | Domestic Overnight Leisure Visitors [1] *and* International Leisure Visitors [2] | Domestic Day-Trip Visitors [3] | Domestic Overnight Business Visitors [3] *and* International Business Visitors [2] |
| Transportation | $78.47 | $16.52 | $134.91 |
| Food | $60.61 | $23.90 | $65.95 |
| Shopping | $39.33 | $25.33 | $23.81 |
| Room | $37.43 | $0.00 | $196.88 |
| Entertainment | $34.01 | $16.00 | $26.25 |
| Miscellaneous | $13.11 | $4.10 | $20.80 |
| Total | $262.96 | $85.85 | $468.60 |
| Average Length-of-Stay [4] | 3.8-days | 1-day | 3.01-days |

1. 1999 Domestic Overnight Leisure Average Expenditures per Person per Day, in 1999 Domestic Travel Report, pp. 7-8 of Data Tables, prepared by D.K. Shifflet & Associates Ltd. for the Long Island Convention and Visitors Bureau and Sports Commission.

2. There are no direct estimates for the number of international tourists on Long Island: estimates here are based on national averages. One data source that tracks both domestic and foreign tourists is the Travel Industry Association of America, Tourism Industries/International Trade Administration, http://www.tia.org/. Averaging available national data for 2000 and 2001, foreign tourists were 4.57% of all U.S. tourists, with domestic tourists accounting for the remaining 95.43%. To arrive at a distribution of international tourists between leisure and business, the "2000 Profile of Overseas Travelers to the U.S. - Inbound: Reported From: Survey Of International Air Travelers (IFS)", was used (http://tinet.ita.doc.gov/view/f-2000-07-001). The breakdown used is 67% leisure visitors and 33% business visitors. In terms of spending profiles for international tourists, available national surveys represent total spending in the U.S. In a more appropriate and conservative approach, local domestic spending profiles that include only the portion of tourist spending that is made on Long Island are employed. Spending on Long Island by international leisure tourists is assumed to be the same as spending by domestic overnight tourists, and spending by international business tourists is assumed to be the same as spending by domestic overnight business tourists.

3. D.K. Shifflet & Assoc., 1998-99 two-year average for Long Island Domestic Trip Expenditures per person per day and length-of-stay.

4. Average length-of-stay was obtained from the D.K. Shifflet & Associates documents as noted above in footnotes 1 and 3. Spending per visitor was derived by taking the spending per person per day expenditure profiles and multiplying by the average length-of-stay. Length-of-stay was used instead of length-of-trip to arrive at a more appropriate figure for local spending, as opposed to total trip spending, which includes expenditures made outside the Long Island region.

Table 4.2: Revised Tourism Spending
Converting the 6 Tourism Spending Categories from Table 4.1 into 13 Spending Profiles Used to Model the Impact of Tourism on the Long Island Economy

| | Spending per Visitor | | |
|---|---|---|---|
| Spending Categories | Domestic Overnight Leisure Visitors [1] *and* International Leisure Visitors [2] | Domestic Day-Trip Visitors [3] | Domestic Overnight Business Visitors [3] *and* International Business Visitors [2] |
| Lodging | $37.43 | $0.00 | $196.88 |
| Restaurant | $41.21 | $16.25 | $44.85 |
| Groceries | $19.40 | $7.65 | $21.10 |
| Gas & Oil | $70.46 | $14.83 | $121.14 |
| Other Auto Expense | $2.17 | $0.46 | $3.74 |
| Local Transportation | $0.72 | $0.15 | $1.24 |
| Water Transportation | $4.35 | $0.92 | $7.47 |
| Boat Building & Repairing | $0.77 | $0.16 | $1.32 |
| Recreation & Amusements | $25.51 | $12.00 | $19.69 |
| Other Recreation/Services | $8.50 | $4.00 | $6.56 |
| Sporting Goods | $29.00 | $16.27 | $24.67 |
| Apparel | $9.39 | $5.27 | $7.99 |
| Misc. Expenses/Souvenirs | $14.05 | $7.89 | $11.96 |
| Total | $262.96 | $85.85 | $468.60 |

1, 2, 3. See notes accompanying Table 4.1.

Table 4.3: Number of Tourists
Estimated Number of Tourists Visiting Long Island

| | Number of Tourists | | |
|---|---|---|---|
| | Long Island | Nassau County [3] | Suffolk County [3] |
| | 100.0% | 39.3% | 60.7% |
| **All Tourists** | | | |
| Domestic Overnight Leisure Visitors [1] | 3,757,895 | 1,476,853 | 2,281,042 |
| Domestic Day-Trip Visitors (leisure & business) [1] | 4,220,000 | 1,658,460 | 2,561,540 |
| Domestic Overnight Business Visitors [1] | 740,864 | 291,160 | 449,704 |
| International Leisure Visitors [2] | 279,728 | 109,933 | 169,795 |
| International Business Visitors [2] | 137,800 | 54,155 | 83,645 |
| Total Number of Visitors | **9,136,287** | **3,590,561** | **5,545,726** |

1. Data for the number of domestic tourists were taken from the same D.K. Shifflet & Associates noted in Table 4.1. Number of tourist visits is also referred to as number of person-days (or visitor-days), which equals the number of visitors times the average length-of-stay.

2. There are no direct estimates for the number of international tourists on Long Island: estimates are based on data from the Travel Industry Association of America, Tourism Industries/International Trade Administration, http://www.tia.org/. Averaging data for 2000 and 2001, foreign tourist were 4.57% of all U.S. tourists, with domestic tourists accounting for the remaining 95.43%. To arrive at the distribution of international tourists between leisure and business, the "2000 Profile of Overseas Travelers to the U.S. - Inbound: Reported From: Survey Of International Air Travelers (IFS), was used ( http://tinet.ita.doc.gov/view/f-2000-07-001). The breakdown used is 67% leisure visitors and 33% business visitors.

3. The tourism surveys conducted by D.K. Shifflet are for all of Long Island. In order to apportion tourism between Nassau and Suffolk counties the percent of hotel/motel room nights on Long Island that were occupied in each of the two counties was used. The data for this calculation was prepared by the Suffolk County Planning Dept. based on information for the year 2000 from Island-Metro Publications.

Table 4.4: The Long Island Economy and the Impact of Tourism [12.]

| | in billions of 1999 dollars | | | | | | in billions of 2003 dollars | | |
|---|---|---|---|---|---|---|---|---|---|
| | Long Island (Nassau-Suffolk) [11.] | Nassau County | Suffolk County | Long Island | Nassau County | Suffolk County | Long Island (Nassau-Suffolk) [11.] | Nassau County | Suffolk County |
| **All Industries** | | | | | | | | | |
| Value Added (GRP) [1.] | $105.5 | $57.7 | $47.8 | | | | | | |
| Labor Income [2.] | $63.0 | $33.6 | $29.5 | | | | | | |
| Employee Compensation [3.] | $55.4 | $29.3 | $26.1 | | | | | | |
| Proprietors Income [4.] | $7.6 | $4.2 | $3.4 | | | | | | |
| Other Property Type Income [5.] | $33.3 | $18.9 | $14.4 | | | | | | |
| Indirect Business Taxes [6.] | $9.2 | $5.2 | $3.9 | | | | | | |
| Employment [7.] | 1,486,315 | 761,601 | 724,714 | | | | | | |
| Total Output [8.] | $162.0 | $86.5 | $75.5 | | | | | | |
| **Tourism** | | | | Tourism as a % of All Industries | | | | | |
| Value Added (GRP) [1.] | $1.316 | $0.502 | $0.790 | 1.25% | 0.87% | 1.65% | $1.453 | $0.554 | $0.872 |
| Labor Income [2.] | $0.822 | $0.313 | $0.492 | 1.30% | 0.93% | 1.67% | $0.907 | $0.346 | $0.542 |
| Employee Compensation [3.] | $0.724 | $0.278 | $0.427 | 1.31% | 0.95% | 1.64% | $0.799 | $0.307 | $0.471 |
| Proprietors Income [4.] | $0.098 | $0.035 | $0.064 | 1.29% | 0.82% | 1.90% | $0.108 | $0.038 | $0.071 |
| Other Property Type Income [5.] | $0.336 | $0.128 | $0.202 | 1.01% | 0.68% | 1.41% | $0.373 | $0.142 | $0.224 |
| Indirect Business Taxes [6.] | $0.158 | $0.061 | $0.096 | 1.73% | 1.15% | 2.46% | $0.174 | $0.066 | $0.105 |
| Employment [7.] | 31,307 | 11,923 | 19,019 | 2.11% | 1.57% | 2.62% | 31,307 | 11,923 | 19,019 |
| Total Output [8.] | $2.557 | $0.982 | $1.548 | 1.58% | 1.13% | 2.05% | $2.769 | $1.062 | $1.676 |
| Direct Output (Total Spending on Tourism) [9.] | $1.836 | $0.721 | $1.114 | | | | $1.973 | $0.775 | $1.198 |
| Number of Tourists [10.] | 9,136,287 | 3,590,561 | 5,545,726 | | | | 9,136,287 | 3,590,561 | 5,545,726 |

Notes accompanying Table 4.4:

1. Value Added or Gross Regional Product (GRP) equals Labor Income plus Other Property Type Income plus Indirect Business Taxes.

2. Labor Income = Employee Compensation + Proprietors' Income.

3. Employee Compensation is wages & salaries. Income taxes are not netted out.

4. Proprietors Income is the income of sole proprietorships, partnerships, and tax-exempt cooperatives.

5. Other Property Type Income includes rental income, corporate profits, net interest, business transfer payments, subsidies, and capital consumption allowance (CCA).

6. Indirect Business Taxes are taxes on goods and services used by business, such as property taxes, sales taxes and excise taxes.

7. Employment is the total number employed directly as a result of economic activity at south shore beaches, as well as the number employed indirectly, related to support industries and activity generated by the multiplier effect.

8. Total Output is the total cost of goods and services produced. Output can be calculated by adding intermediate commodity demand to value added (GRP).

9. Total spending on tourism ($1.114 billion in Suffolk County) equals the number of tourists (5,545,726 in Suffolk) times spending per visitor ($200.93). "Spending per visitor" is separated into the three spending profiles listed in Table 4.2. The "number of tourists" is broken down in Table 4.3 to correspond to these three spending profiles. "Spending per visitor" from Table 4.2 averages $200.93. This average represents a weighted average, with weights equal to the appropriate number of tourists for each of the separate spending profiles from Table 4.3.

10. The "number of tourists" was derived in Table 4.3.

11. For all industries, the two counties should sum to the Nassau-Suffolk total, with a small difference due to rounding error. However, for tourism, or any other impact analysis, significant differences are expected between the sum of the two counties and the Nassau-Suffolk total. The discrepancy is attributed to the fact that output per worker and earnings per worker change from the individual county ratios to the combined average county ratios. In addition, there are differences in internalized imports between the two separate counties and the combined county totals.

12. Interpretation of Results (for Suffolk County): Tourist spending in 1999 dollars is estimated to be $1.114 billion in Suffolk County. This results in a total of $1.548 billion in economic activity being generated (referred to as "Total Output" in the above table). The number of jobs supported by this activity is estimated to be 19,019. These jobs account for $0.492 billion in labor income. The gross regional product (GRP) contributed by tourism activity is $0.790 billion. GRP is the value added to the cost of goods and services, or wealth created, by tourists in Suffolk County. Tourism accounts for 1.65% of Suffolk County's $47.8 billion GRP.

Table 4.5: Beach Spending
Estimated Spending per Beach Visit on Long Island

| Spending Categories | Spending per Beach Visit: Domestic Overnight Leisure Tourist *plus* Resident Vacationing Beach Visitors [1, 3] *and* International Leisure Beach Visitors [2, 3] | Domestic Tourist Day-Trip Beach Visitors [4] | Day-Trip Resident Beach Visitors [5] |
|---|---|---|---|
| Lodging | $9.85 | $0.00 | $0.00 |
| Restaurant | $10.84 | $10.84 | $3.88 |
| Groceries | $5.11 | $5.11 | $5.14 |
| Gas & Oil | $18.54 | $18.54 | $4.29 |
| Other Auto Expense | $0.57 | $0.57 | $0.32 |
| Local Transportation | $0.19 | $0.19 | $0.11 |
| Water Transportation | $1.14 | $1.14 | $0.08 |
| Boat Building & Repairing | $0.20 | $0.20 | $0.01 |
| Recreation & Amusements | $6.71 | $6.71 | $0.49 |
| Other Recreation/Services | $2.24 | $2.24 | $0.16 |
| Sporting Goods | $7.63 | $7.63 | $1.07 |
| Apparel | $2.47 | $2.47 | $0.62 |
| Misc. Expenses/Souvenirs | $3.70 | $3.70 | $0.92 |
| Total | $69.19 | $59.34 | $17.09 |

1., 2. See notes accompanying Table 4.1.

3. The beach spending profiles used for "domestic overnight leisure tourist plus resident vacationing beach visitors" and "international leisure beach visitors" is the domestic day-trip tourist spending profile, converted from total trip spending to spending per day. This spending profile relates only to tourists or residents vacationing near home who consider beaches as their primary activity in vacationing on Long Island. For these tourists, we consider all of their local spending as beach related, the justification being that any non-beach spending is a by-product of the purpose of their trip, to enjoy the beaches of this region. Total spending here is $67.13 per daily visit. Relative to some other estimates found in the literature, we believe this to be a conservative figure. In particular, a survey of beaches in Texas by Fesenmaier et. al. (1987) found beach spending to be $88 per day. In an Army Corps study by Robinson et. al. (2001), the same $88 value was adopted for the "typical" beach region, while a higher spending level, $128.77, was used for "urban" regions.

4. The spending profile chosen for day-trip leisure visits uses the overnight leisure profile less lodging ($59.34 per visit). We chose this approach because data were not available to separate day-trip spending into business and leisure. As a result, our domestic tourist spending profile per visitor per day was greater for day-trip ($85.85) than for overnight leisure ($69.19) travelers. Our chosen level of beach spending seems reasonable relative to other studies. In comparison to our $59.34 per visit, a survey of beaches in Texas by Fesenmaier et. al. (1987) uses $88. In an Army Corps study by Robinson et. al. (2001), the same $88 value was adopted as for the "typical" beach region, while a higher spending level used for "urban" regions, $128.77, and a lower level for rural regions, $66.74.

5. Resident beach visitor spending should be lower than the $57.28 we use for spending by leisure tourists that take day-trips to the beach. The figure used here for local day-trips to the beach is $17.09 per visit. Although we have no available survey data for day-trips to the beach by residents, the cost to local beachgoers would be higher for those who patronize restaurants, shops and concessions, as opposed to bringing food from home. The cost would also be higher for those who go to beaches with parking fess, take ferries to Fire Island or who go boating. The spending profile that we use here is from the Recreation Economic Assessment System (REAS) Model, which was developed for the Army Corps of Engineers at Michigan State University's Department of Park, Recreation and Tourism Resources. The chosen spending profile is based on (1) a generic spending profile set at high spending (30% higher than average), (2) spending corresponding to all Army Corps projects in the North Atlantic Division (NAD), and (3) spending profiles for day-trip visits that is made up of a combination of 3.7% boaters and 96.3% nonboaters.

Table 4.6: Total Beach Visits
Visits to Suffolk County's South Shore Beaches

| | | |
|---|---|---|
| **Total Number of Visitors to South Shore Beaches** | 11,323,485 | 100.0% |
| **State Parks** [1.] | 6,772,000 | 59.8% |
| Robert Moses State Park | 3,663,400 | |
| Hither Hills State Park | 392,600 | |
| Montauk Point | 918,800 | |
| Captree | 1,797,200 | |
| **County Parks** [2.] | 1,620,369 | 14.3% |
| Cupsogue | 73,500 | |
| Smith Point | 1,500,000 | |
| Shinnecock East | 46,869 | |
| **Fire Island Communities** [3.] | 2,214,868 | 19.6% |
| **Towns & Villages** [4.] | 469,752 | 4.1% |
| Babylon Town | 99,426 | |
| Southampton Town | 287,116 | |
| East Hampton Town | 50,000 | |
| Village of Westhampton Beach Dunes | 33,210 | |
| **Other** [5.] | 246,496 | 2.2% |

Sources:

1. State Parks: New York State Office of Parks, Recreation, and Historic Preservation (OPRHP). Excluded from the above table are State Parks that do not have beaches on the Atlantic Ocean: Sunken Meadow (beach is on the Long Island Sound), Montauk Downs State Park (golf), Sears Bellows (camping), and Shinnecock West (marina that is on the Peconic Bay side and is protected by locks, which control the amount of water from the ocean into the bay).
2. County Parks: The 1.5 million figure for visits to Smith Point was obtained from Table 3 in "Recreation and Access Plan for the Fire Island Beach Replenishment Program", July 1996, Ivan P. Vamos. The same 1.5 million figure can be found in several Army Corps documents, including their Appendix D: Benefit Appendix, in the Nov. 1999 Vol. II Technical Appendices document covering Reach 1 (Fire Island Inlet to Montauk Point) and Volume I Main Report and Draft Environmental Impact, Reach 1 Fire Island Inlet to Moriches Inlet, p. EIS3-27. The number of visits to Cupsogue and Shinnecock East was obtained from the Suffolk County Parks Dept. Excluded from our list are County Parks that do not have beaches on the Atlantic Ocean: Ronkonkoma Beach, Cedar Point County Park, Sears Bellows (camping facility located on a freshwater pond [Bellows Pond] not on the south shore), and Meschutt County Park (which is excluded from our study area because it is on the bay side of the Peconic Bay not facing the ocean). In addition, Shinnecock West, located on the west end of the Shinnecock Inlet, is not included because no information on number of beach visits is available for this County Park.
3. Fire Island Communities: The above estimate for beach visits was derived from Table 3 in "Recreation and Access Plan for the Fire Island Beach Replenishment Program", July 1996, Ivan P. Vamos. The number used is net of visits to Robert Moses State Park and Smith Point Suffolk County Park, which are listed separately in the above table.
4. Towns & Villages: The municipalities listed here include beaches that are on the south shore of Suffolk County and are not part of the Fire Island National Seashore (FINS).
5. Other: This represents an estimate of beach use along the Atlantic Ocean that is not included elsewhere in the table. For the most part, it accounts for access points to beaches that are not monitored by any municipality and also hotels/motels that provide beach access to their guests. Although no data were available to estimate this figure, it was important to recognize that many people do access the beach in these undocumented ways. Based on hotel-motel tax revenue in Suffolk County, and reasonable estimates for the charge per room, the percent hotel/motel rooms in Suffolk that have access to the Atlantic Ocean, average number of guests per room, and the percent of hotel quests that go to the beach, 246,496 beach visits by hotel/motel guests were estimated. Given that no additional visits to account for unmonitored access points to beaches were added, this represents a conservative estimate.

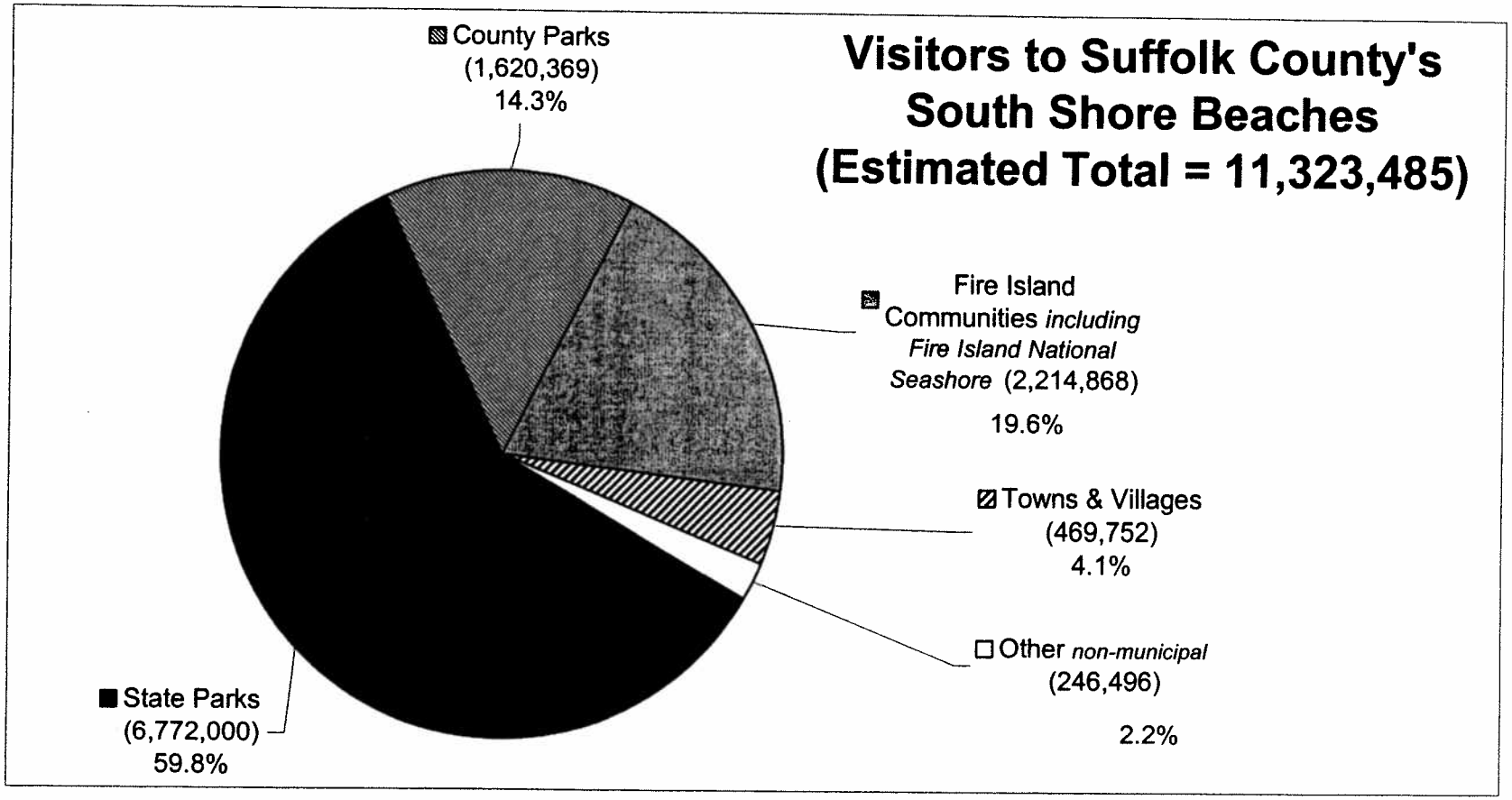
Visitors to Suffolk County's South Shore Beaches (Estimated Total = 11,323,485)
County Parks (1,620,369) 14.3%
Fire Island Communities *including Fire Island National Seashore* (2,214,868) 19.6%
Towns & Villages (469,752) 4.1%
Other *non-municipal* (246,496) 2.2%
State Parks (6,772,000) 59.8%

Table 4.7: Tourist Beach Visits
Tourist Visits to Suffolk County's South Shore Beaches

| | All Tourists [1] | | | Suffolk County Beach Tourists as a % of All Tourists [2 (b)] | Suffolk County Tourists *plus* Residents Visiting South Shore Beaches [2] | |
|---|---|---|---|---|---|---|
| | Long Island | Nassau County [2 (a)] | Suffolk County [2 (a)] | | | |
| | 100.0% | 39.3% | 60.7% | | | |
| Percent Suffolk County Beach Visits on the South Shore [2 (c)] | | | | 75.00% | | |
| Domestic Overnight Leisure Tourists | 3,757,895 | 1,476,853 | 2,281,042 | 21.22% | 363,028 | |
| Domestic Day-Trip Tourists (leisure & business) | 4,220,000 | 1,658,460 | 2,561,540 | 6.92% | 132,944 | |
| Domestic Overnight Business Tourists | 740,864 | 291,160 | 449,704 | | | |
| International Leisure Tourist | 279,728 | 109,933 | 169,795 | 21.22% | 27,023 | |
| International Business Tourists | 137,800 | 54,155 | 83,645 | | | |
| Total Number of Tourists [1] | **9,136,287** | **3,590,561** | **5,545,726** | | **522,995** | 4.6% |
| South Shore Beach Visits by Local Residents | | | | | **10,800,490** | 95.4% |
| Total Number of South Shore Beach Visits [3] | | | | | **11,323,485** | 100.0% |

1. See Table 4.3 for calculations made to derive "All Tourists".

2. To calculate the number of tourist visits to Suffolk County's south shore beaches, the total number of tourists on Long Island are multiplied by three factors: (a) an estimate for Suffolk County tourists as a percent of all tourists coming to Long Island (b) an estimate for the percent of tourists whose primary attraction to Long Island is the beach and (c) an estimate for the percent beach visits within Suffolk County that are to south shore beaches. For instance, Domestic Overnight Leisure Visitors to South Shore Beaches (132,944) equals All Tourists in Suffolk County (2,281,042) times % Suffolk County Beach Visits on the South Shore (75%) times Beach Tourists as a % of All Tourists (21.22%).

2 (a) The percent of tourists in Suffolk County was calculated by taking the portion of hotel/motel room nights on Long Island that were occupied in Suffolk County. As seen in the table above, the split was 60.7% Suffolk and 39.3% Nassau. The data used to make this calculation was prepared by the Suffolk County Planning Dept. based on information for the year 2000 from Island-Metro Publications.

2 (b) The percent beach tourists was derived from D.K. Shifflet survey data on activities in which tourists took part. The problem with these data is that tourists often list more than one primary activity. In fact, the sum of percent tourists participating in the six major activity groups added up to 142.4%. For overnight leisure tourists, in order to approximate a distribution of activities that adds up to 100%, it is assumed that all tourists list general activities (dining, entertainment and shopping). This has the effect of reducing the total for all primary activities to 103.9%. To further reduce the total to 100%, the relative shares of each of the remaining five major activity groups are identified. The revised percentages from the major activity groups are apportioned to the specific activities listed under each group (i.e. apportion the major activity nature among the specific nature activities of beach/waterfront, camping, hike/bike, and parks) by taking their relative shares of the revised percentages.
For day-trip tourists, data was made available for percent beach/waterfront as a primary activity, but data were not available for other specific activities. These data were obtained from D.K. Shifflet on 01/30/03. In order to calculate revised percent beach/waterfront for day-trip tourists, we take the ratio of revised (21.2%) to unrevised (31.6%) percent from overnight leisure tourists is multiplied by the unrevised percent for day-trip tourists.

2 (c) The percent of Suffolk County's beach visits that are on the south shore was derived by taking the percent of hotel/motel rooms in Suffolk County that were at or near the south shore, as opposed to the north shore. The calculated value of 75% was net of hotel/motel rooms located in the interior of Suffolk County, since guests of these establishments were for the most part not visiting for the purpose of going to the beach.

3. See Table 4.6 for calculations made to derive the "Total Number of South Shore Beach Visits".

Table 4.8: Breakdown of Local Resident Beach Visits into Vacationers Associated with a Higher Tourism Spending Profile and Lower Non Tourism Spending Profile Associated with Beach Visits from Home or While Vacationing Primarily for Non Beach Reasons

| | | Number of Beach Visits |
|---|---|---|
| | South Shore Suffolk County Beaches Associated with Tourism [1] | |
| | Montauk Point | 918,800 |
| | Shinnecock East | 46,869 |
| | Fire Island Communities | 2,214,868 |
| | Southampton Town | 287,116 |
| | East Hampton Town | 50,000 |
| | Village of Westhampton Beach Dunes | 33,210 |
| | Other | 246,496 |
| (1) | Total South Shore Suffolk County Beach Visits Associated with Tourism | 3,797,359 |
| (2) | ***less*** Non Resident Tourists Visiting South Shore Suffolk County Beaches [2] | **522,995** |
| (3)=(1)-(2) | ***equals*** Net Number of Local Resident Visits to Tourist Designated Beaches | 3,274,364 |
| (4) | ***times*** Beach Tourists as a % of All Leisure Tourists [3] | 21.22% |
| (5)=(3)x(4) | ***equals*** Local Resident Beach Visits Associated with the Higher Tourism Spending Profile | **694,820** |
| (6) | Total South Shore Beach Visits by Local Residents [4] | 10,800,490 |
| (5) | ***less*** Local Resident Beach Visits Associated with the Higher Tourism Spending Profile | 694,820 |
| (7)=(6)-(5) | ***equals*** Local Resident Beach Visits Associated with the Lower Non Tourism Spending Profile | **10,105,670** |

| Suumary Breakdown of Beach Visits: | |
|---|---|
| Non Resident Tourists Visiting South Shore Suffolk County Beaches | 522,995 |
| Local Resident Beach Visits Associated with the Higher Tourism Spending Profile | 694,820 |
| Local Resident Beach Visits Associated with the Lower Non Tourism Spending Profile | 10,105,670 |
| Total Number of South Shore Beach Visits | 11,323,485 |

1 Beaches designated as being associated with tourism are a subset of those found in Table 4.6.

2. Non resident tourists visiting Suffolk County's south shore beaches was derived in Table 4.7.

3. Beach tourists as a % of all leisure tourists can be found in Table 4.7, where it was used to derive the number of domestic overnight leisure visitors that are considered as beach tourists. This estimate was based on D.K. Shifflet survey data for domestic overnight leisure visitors whose primary reason for visiting Long Island is to take part in beach related activities.

4. Total south shore beach visits by local residents was derived in Table 4.7.

5. Interpretation of Results: Two different spending profiles are used for local residents that attend beaches. The first corresponds to visitors that make day trips from home to the beach or beach visitors vacationing near home whose primary reason for vacationing is not related to beach activities. The second higher spending profile is associated with local residents that vacation near home for the express purpose of partaking in beach activities. To arrive at the number of local beach visitors that fall into this category, it is assumed that local residents have the same pattern as tourists in terms of their primary reasons for vacationing. In particular, based on the D.K. Shifflet survey data for domestic overnight leisure visitors, it is estimated that 21.22% come to Long Island primarily to take part in beach related activities. This percentage is then applied to the number of beach visits, net of non-resident tourists, at only those beaches associated with tourism. From the above table, these beach are Montauk Point, Shinnecock East, all Fire Island communities, the town beaches in Southampton and East Hampton, the Village of Westhampton Beach Dunes and "other." The total number of beach visits at these facilities is 3,074,361. Subtracting the estimated 522,995 tourists yields a net number of 2,551,366 local resident visits to tourist designated beaches. Multiplying by the 21.22% factor for percent tourists whose primary activity is beach related results in 541,400 out of 9,163,295 local resident beach visits being attributed to the higher beach spending profile.

Table 4.9: The Long Island Economy and the Impact of Suffolk County's South Shore Beaches [11.]

| | Suffolk County Totals (in millions of 1999 dollars) | % of All Industries | Suffolk County Totals (in millions of 2003 dollars) |
|---|---|---|---|
| **All Industries** | | | |
| Value Added (GRP) [1.] | $47,761.9 | | |
| Labor Income [2.] | $29,476.3 | | |
| Employee Compensation [3.] | $26,100.4 | | |
| Proprietors Income [4.] | $3,375.9 | | |
| Other Property Type Income [5.] | $14,381.0 | | |
| Indirect Business Taxes [6.] | $3,904.6 | | |
| Employment [7.] | 724,714 | | |
| Total Output [8.] | $75,540.1 | | |
| **Visits to Suffolk County's South Shore Beaches** | | | |
| Value Added (GRP) [1.] | $158.6 | 0.33% | $173.4 |
| Labor Income [2.] | $99.0 | 0.34% | $108.2 |
| Employee Compensation [3.] | $88.4 | 0.34% | $96.6 |
| Proprietors Income [4.] | $10.6 | 0.32% | $11.7 |
| Other Property Type Income [5.] | $38.8 | 0.27% | $42.6 |
| Indirect Business Taxes [6.] | $20.8 | 0.53% | $22.6 |
| Employment [7.] | 3,855 | 0.53% | 3,855 |
| Total Output [8.] | $341.0 | 0.45% | $364.4 |
| Direct Output (Total Spending from South Shore Beach Visits) [9.] | $255.7 | | $270.3 |
| Number of South Shore Beach Visits [10.] | 11,323,485 | | |

1. Value Added or Gross Regional Product (GRP) equals Labor Income plus Other Property Type Income plus Indirect Business Taxes.
2. Labor Income = Employee Compensation + Proprietors Income.
3. Employee Compensation is wages & salaries. Income taxes are not netted out.
4. Proprietors Income is the income of sole proprietorships, partnerships, and tax-exempt cooperatives.
5. Other property-type Income includes rental income, corporate profits, net interest, business transfer payments, subsidies, and capital consumption allowance (CCA).
6. Indirect Business Taxes, such as property taxes, sales taxes and excise taxes, are taxes on goods and services used by business.
7. Employment is the total number employed directly as a result of economic activity at south shore beaches, as well as indirectly related to support industries and activity generated by the multiplier effect.
8. Total Output is the total cost of goods and services produced. Output can be calculated by adding intermediate commodity demand to value added (GRP).
9. Total spending from south shore beach visits is estimated at $255.7 million in 1999 dollars. This figure was derived by taking the number of south shore beach visits for the various categories in Table 4.7 and Table 4.8 and multiplying by the appropriate spending profiles listed in Table 4.5. Spending of $255.7 million is equal to the number of south shore beach visits (11,323,485) times spending per visitor ($22.58). The value used for spending per visitor ($22.58) represents a weighted average of the spending profiles in Table 4.5, where the weights are the appropriate number of beach visits from Tables 4.7 and 4.8.
10. The "number of south shore beach visits" was derived in Table 4.6.
11. Interpretation of Results: Visitors to Suffolk County's south shore beaches are estimated to spend $255.7 million in 1999 dollars. This results in a total of $341 million in economic activity being generated (referred to as "Total Output" in the above table). The number of jobs supported by this activity is estimated at 3,855. These jobs account for $99 million in labor income. The gross regional product (GRP) contributed by this economic activity was $158.6 million. GRP is the value added to the cost of goods and services, or wealth created, by the south shore beaches in Suffolk County. South shore beaches account for one-third of one-percent (0.33%) of Suffolk County's GRP.

# Appendix 4.1

## Converting local tourism spending data into Implan sectors

To convert our local tourism spending data into Implan sectors, we make use of the Micro-Implan Recreation Economic Impact System (MI-REC)[48]. The MI-REC system was developed for the U.S. Army Corps of Engineers at Michigan State University, Department of Park, Recreation and Tourism Resources. Two major spending surveys sponsored by the Army Corps provide recreation-spending profiles for a variety of recreation and tourism market segments. MI-REC has been developed with more general recreation and tourism applications in mind, allowing us to apply these spending breakdowns for analysis of tourism on Long Island. In addition to the tourist spending surveys of Army Corps projects, the MI-REC system also incorporates consumer-spending profiles developed from the 1993 Personal Consumption Expenditure (PCE) survey conducted by the Bureau of Economic Analysis.

The MI-REC system contains eleven tourism-spending profiles, each of which is broken down into several Implan sectors. The eleven profiles are: *(1)* Lodging; *(2)* Restaurant; *(3)* Groceries; *(4)* Gas & Oil; *(5)* Other Auto Expense; *(6)* Local Transportation; *(7)* Recreation and Amusements; *(8)* Other Recreation/Services; *(9)* Sporting Goods; *(10)* Apparel; and *(11)* Miscellaneous Expenses/Souvenirs. Two additional industrial sectors, Water Transportation and Building and Repairing, were added to account for boating-related tourism spending.

Before Implan can be used to estimate the impact of tourism on the Long Island economy, it is necessary to convert the six local tourism spending categories into the thirteen Implan spending profiles (eleven MI-REC profiles plus the two boating-related sectors). The six local tourism spending categories are split into thirteen based on the tourism survey data provided in the MI-REC system and similar data available from the Recreation Economic Assessment System (REAS) Model.[49] REAS was also developed for the Army Corps of Engineers at Michigan State University's Department of Park, Recreation and Tourism Resources. The REAS model is based on tourism spending surveys at all Army Corps projects. The REAS spending profile we utilized is based on *(1)* a generic spending profile that is set at high spending (30% higher than average) and *(2)* spending corresponding to the Army Corps' North Atlantic Division (NAD)[50].

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[48] A detailed description of the Micro-Implan Recreation Economic Impact System (MI-REC) can be found at http://www.msu.edu/~changwe4/ipro/index.htm

[49] A detailed description of the Recreation Economic Assessment System (REAS) Model can be found at http://corpslakes.usace.army.mil/employees/economic/reas.html

[50] The REAS and MI-REC tourist survey data do not correspond precisely with the 13 spending profiles that are mapped to the Implan model. To accomplish this correspondence, based on more detailed data from the REAS and MI-REC survey data and on conversations with one of the developers of these models, the following four assumptions were made: *(1)* For business overnight visitors, to account for a larger car rental component included in "other auto expenses",

Our analysis results in the following correlation between the six local tourism-spending categories and the thirteen spending profiles that in turn map to numerous economic sectors in the Implan I-O model[51]: *(1)* room spending remains as its own spending profile, *(i)* lodging (100% of room spending); *(2)* food is broken down into two profiles, *(ii)* restaurants and *(iii)* groceries[52]; *(3)* transportation is separated into five spending profiles, *(iv)* gas & oil, *(v)* other auto expense, *(vi)* local transportation, *(vii)* water transportation, and *(viii)* boat building & repairing[53]; *(4)* entertainment is separated into two spending profiles, *(ix)* recreation & amusement and *(x)* other recreation services[54]; *(5)-(6)* shopping and miscellaneous are combined and break down into three spending profiles, *(xi)* sporting goods, *(xii)* apparel, and *(xiii)* miscellaneous expenses/souvenirs[55].

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we reduce "gas & oil", which relates to taking one's own car, and transfer this spending to "other auto expenses", up to an amount that equalizes these two spending components. *(2)* 25% of "Other Auto Expense" is separated out into "Local Transportation" for overnight leisure and day-trip visitors, and 50% for overnight business. The 25% figure is consistent with Army Corps tourist survey data. The 50% figure for overnight business adjusts for a larger car rental component, which shows up under "Local Transportation". *(3)* "Other boat expenses" is broken down into 85% "Water Transportation" and 15% "Boat Building & Repairing". *(4)* "Entertainment and recreation fees" is broken down into 75% "Recreation & Amusements" and 25% "Other Recreation/Services". *(5)* "Souvenirs and other expenses" is broken down into 40% "Apparel" and 60% "Misc. Expenses/Souvenirs".

[51] Modifications to the spending profiles for business visitors were made on a judgmental basis to adjust for differences from the leisure tourist survey data.

[52] Restaurants (groceries) were allocated 68% (32%) of spending on food for domestic overnight leisure visitors, 43% (57%) of food for day-trip visitors and 70% (30%) for domestic overnight business visitors.

[53] For domestic overnight leisure visitors, the distribution of transportation spending is 89.79% gas & oil, 2.77% other auto expense, 0.92% local transportation, 5.54% water transportation and 0.98% boat building & repairing.
For domestic day-trip visitors, the distribution of transportation spending is 89.17% gas & oil, 6.67% other auto expense, 2.22% local transportation, 1.65% water transportation and 0.29% boat building & repairing.
For domestic overnight business visitors, the distribution of transportation spending is 48.75% gas & oil, 24.375% other auto expense, 24.375% local transportation, 2.125% water transportation, and 0.375% boat building & repairing.

[54] For domestic overnight leisure visitors, the distribution of entertainment spending is 75% recreation & amusement and *25%* other recreation services for all tourist categories.

[55] For domestic overnight leisure visitors, the distribution of shopping and miscellaneous spending is 55.3% sporting goods, 17.9% apparel, and 26.8% miscellaneous expenses/souvenirs.
For domestic day-trip visitors, the distribution of shopping and miscellaneous spending is 41% sporting goods, 23.6% apparel, and 35.4% miscellaneous expenses/souvenirs.
For domestic overnight business visitors, the distribution of shopping and miscellaneous spending is 56.58% sporting goods, 17.37% apparel, and 26.05% miscellaneous expenses/souvenirs.

# Appendix 4.2

## Beaches on Suffolk County's South Shore

## by Level of Government

In Suffolk County, the majority of the utilized recreational parklands on the barrier islands are on the Atlantic Ocean side.

**1. Suffolk County Government**
Suffolk County owns and maintains four ocean parks within the proposed project area: Shinnecock East, within Reach 3; Shinnecock West, which is known as Charles F. Altenkirch Park within Reach 3; Cupsogue, within Reach 4; and Smith's Point, within Reach 4. In addition, the county owns various lots within the reformulation study area, several of which are situated on the Atlantic Ocean side of the barrier islands. Due to coastal erosion, these lots are currently under water.

**2. New York State**
The State of New York owns and maintains four primary State Parks on the Atlantic Ocean, in Suffolk County, and within the proposed project area: Montauk Point and Hither Hills, within Reach 1; and Robert Moses and Captree, within Reach 5. Gilgo State Park is also in Suffolk County on the Atlantic Ocean, but is not within the project area. Additionally, a portion of Heckscher State Park is within the project area in Reach 5, but is not on the Atlantic Ocean.

**3. Federal Government**
Fire Island National Seashore is within Reach 5 of the project area, and accounts for 22 miles of the Barrier Island beaches in Suffolk County[56]. In addition, the federal government has various active Cost Guard Stations (Ponquogue Point, Moriches, Fire Island Inlet), as well naval and military sites within the 83-mile project area.

**4. Shinnecock Government**
The Shinnecock Indian Reservation (portions within Reach 3), while not on the barrier islands, benefits from its buffering action. The reservation has three main shorelines (Old Fort Pond, Shinnecock Bay and Heady Creek). It is projected that these shorelines would be more sensitive to coastal flooding and storm surges if the barrier islands to the south, in the Township of Southampton and the Village of Westhampton Beach Dunes, were not maintained.

**5. Town Governments**

[56] http://www.dec.state.ny.us/website/education/fireisl.html

The Towns of East Hampton, Southampton, Brookhaven, Islip, and Babylon each have a portion of their towns within the proposed project area, and numerous world-class ocean beaches and parks benefiting their residents. Town beaches include:

- East Hampton: Maidstone Park Beach, Fresh Pond Beach, Alberts Landing Beach, Indian Wells Beach and Atlantic Avenue Beach.
- Southampton: Tiana, Ponquogue, Flying Point, Mecox, Sagg Main, Scott Cameron, and Foster Memorial.
- Brookhaven: Great Gun and Davis Park, which are located on the Fire Island National Seashore (FINS).
- Islip: beaches located on the Fire Island National Seashore (FINS).
- Babylon: Cedar Beach & Marina, Gilgo Beach, and Overlook Beach.

**6. Villages**

The Villages of Westhampton Beach Dunes, Ocean Beach and Saltaire are each inside the proposed project area. These villages are located entirely on the Atlantic Ocean barrier island.

# *Chapter 5*

# Benefits of Beach Restoration

Economic benefits from beach restoration projects can be measured in terms of either gains, or avoidance of losses. Typically, there are two types of benefits that accrue from beach projects: *(1)* regional economic development (RED) benefits and *(2)* national economic development (NED) benefits. An explanation of these two terms is found on the next page in the accompanying "*Description of RED and NED Benefits*".

Economic impact is important to the regional economy and represents RED benefits. Economic impact relates to the sales, employment, wages and taxes generated by people using beaches for recreation. It considers how many people participate in beach activities and how much they spend. The impact of this spending is then translated, through the multiplier effect, into job creation, income/wages, and tax revenues generated. Beach related spending by both residents and tourists is considered.

Economic valuation measures the benefit received by beach users, and is used as a measure of the recreation portion of NED benefits.[57] It is estimated by the value, or willingness-to-pay, that beach users place on a day at the beach. Economic valuation is used to calculate benefits when conducting a cost-benefit analysis of beach projects.

## A. Regional economic development (RED) benefits of beaches

Regional economic development (RED) benefits of a beach project are changes in regional economic activity associated with the project. The resulting economic impact can be measured by the value added or gross regional product (GRP) that is added to the regional economy.

### 1. RED benefits for all south shore beach visits in Suffolk County

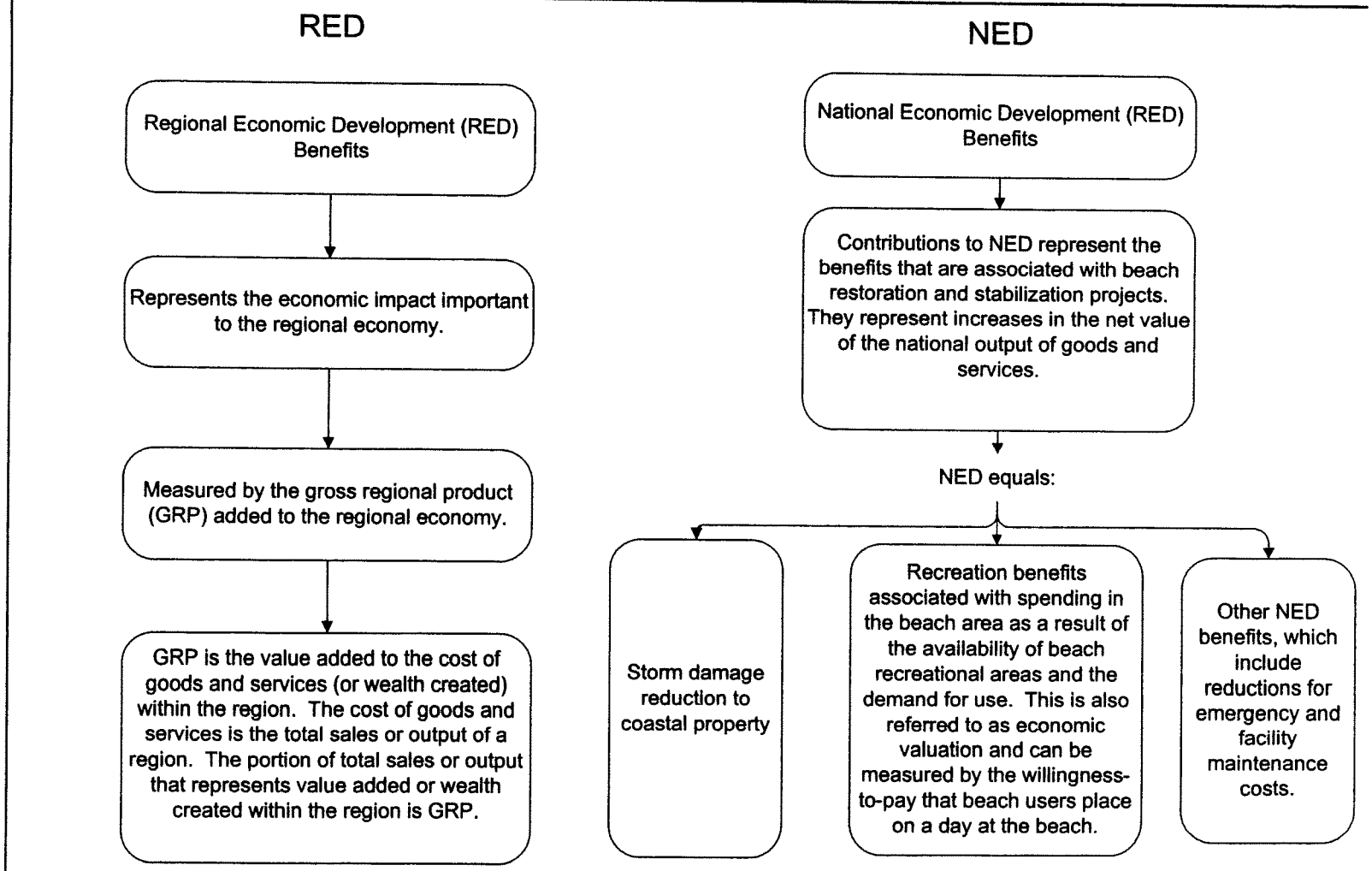
In *Chapter 4, "The Local Economy, Tourism and Suffolk County's South Shore Beaches"*, economic impacts or RED benefits are estimated for the overall tourism economy and for Suffolk County's south shore beach economy. In Table 4.9, RED benefits associated with all of Suffolk's south shore beaches are estimated at $158.6 million in 1999 dollars, the year on which this analysis is based. This accounts for one-third of one-percent (0.33%) of Suffolk County's $47.8 billion GRP in 1999 dollars. In current year 2003 dollars, the RED benefits of the south beaches are estimated at $173.4 million. One interpretation given to this result is that, should the south shore beaches in Suffolk County not be

[57] Storm damage reduction is the other major component of NED benefits. For a further discussion on NED benefits, see Section B in this chapter.

useable by tourists, the County would stand to lose $173.4 million annually in GRP. This interpretation would underestimate the impact of south shore beaches on the economy.

Economics in general, and the economic impact associated with beaches in particular, is a marginal analysis. A marginal analysis represents the impact of a small change, such as the economic impact of a specific beach project. In comparison, the above estimates are not a marginal analysis, but an unlikely "all or nothing" scenario in which the number of beach visits would drop from the annual total of 11.3 million to zero. Certainly, in the event that south shore beaches are lost, other sectors of the local economy would suffer far greater losses than the amount captured in our analysis, and the overall impact would be much larger than the estimated $173.4 million.

# Description of RED & NED Benefits



## 2. Government revenues

Another factor that can impact RED benefits is the government revenue that results from beach-related economic activity. One such source of revenue is property taxes. As seen in Table 5.1, the area covered by Suffolk County's south shore beaches can be classified as lying within SLOSH (Surge Level of Storm Height) zones. Slosh zones represent areas that would be flooded should a storm occur. Based on the 2001 tax year, property within Suffolk County's south shore SLOSH zones represents 19.4% of the full-equalized value (FEV) of all property and 13.5% of property taxes, in Suffolk County. Total property taxes collected within the study area are $395.3 million.

Table 5.1: Property Values and Property Taxes for Parcels in Slosh Zones on the South Shore Of Suffolk County

| | 2001 Total Full-Equalized Value of Property (FEV) for Parcels in SLOSH Zones on the South Shore Of Suffolk County | | | | | 2001 Townwide Total FEV |
|---|---|---|---|---|---|---|
| | SLOSH Zone 1 | SLOSH Zone 2 | SLOSH Zone 3 | SLOSH Zone 4 | All SLOSH Zones | |
| Babylon | $363,962,295 | $1,274,728,074 | $1,511,426,148 | $979,541,639 | $4,129,658,156 | $11,210,052,418 |
| Brookhaven | $683,217,696 | $507,420,052 | $567,496,649 | $697,674,136 | $2,455,808,534 | $24,887,577,173 |
| East Hampton | $357,450,281 | $472,351,461 | $737,635,281 | $892,323,258 | $2,459,760,281 | $9,607,008,764 |
| Islip | $1,226,818,064 | $1,535,088,182 | $1,839,053,644 | $1,439,091,346 | $6,040,051,236 | $17,763,125,899 |
| Southampton | $2,286,030,234 | $1,764,097,391 | $1,627,177,826 | $1,822,288,562 | $7,499,594,013 | $15,898,754,649 |
| Total | $4,917,478,570 | $5,553,685,160 | $6,282,789,548 | $5,830,918,942 | $22,584,872,220 | $79,366,518,903 |
| Countywide (all towns & all parcels) | 4.2% | 4.8% | 5.4% | 5.0% | **19.4%** | $116,188,629,961 |

| | 2001 Property Taxes for Parcels in SLOSH Zones on the South Shore Of Suffolk County | | | | | 2001 Townwide Total Tax Warrant |
|---|---|---|---|---|---|---|
| | SLOSH Zone 1 | SLOSH Zone 2 | SLOSH Zone 3 | SLOSH Zone 4 | All SLOSH Zones | |
| Babylon | $8,705,861 | $38,644,954 | $46,642,293 | $30,735,051 | $124,728,160 | $403,575,108 |
| Brookhaven | $12,847,741 | $13,051,615 | $14,629,056 | $16,521,570 | $57,049,981 | $744,728,823 |
| East Hampton | $2,563,662 | $3,779,383 | $5,792,517 | $7,207,181 | $19,342,743 | $84,423,834 |
| Islip | $10,162,563 | $35,635,449 | $43,961,841 | $41,200,951 | $130,960,804 | $575,751,852 |
| Southampton | $18,996,109 | $15,351,592 | $14,066,649 | $14,840,306 | $63,254,656 | $163,992,696 |
| Total | $53,275,936 | $106,462,993 | $125,092,356 | $110,505,059 | **$395,336,344** | $1,972,472,313 |
| Countywide (all towns & all parcels) | 1.8% | 3.6% | 4.3% | 3.8% | **13.5%** | $2,920,949,182 |

SLOSH stands for Sea-Lake Overland Surge from Hurricanes. SLOSH zones are based on the National Oceanic and Atmospheric Administration's (NOAA's) National Weather Service SLOSH model. In general, Zones 1 through 4 correspond to hurricane categories 1 through 4. Based on the Saffir-Simpson scale, category 1 includes 74 to 95 mph wind speeds and 4 to 5 foot storm surges, category 2 includes 96 to 110 mph wind speeds and 6 to 8 foot storm surges, category 3 includes 111 to 130 mph wind speeds and 9 to 12 foot storm surges, and category 4 includes 131 to 155 mph wind speeds and 13 to 18 foot storm surges.

Data on property values and property taxes in the the SLOSH zones on the south shore of Suffolk County were obtained from the Suffolk County Tax History System (THS). The THS was cross referenced against the geographic coordinates of the south shore SLOSH zones. The THS data represent values prior to exemptions and also exclude the small amount of taxes collected by villages. The property tax data were adjusted to obtain a value for exemptions in each town by taking the ratio of total to taxable property values for all properties townwide.

In Table 5.2, the property tax data from Table 5.1 is distributed between the various levels of local municipalities – towns, county, school districts, fire districts and villages. Table 5.2 also includes most other types of tax revenue collected by the various levels of government. It should be noted that data is not available for the Suffolk County portion of most state and federal taxes and fees. State and federal revenues coming from Suffolk are therefore estimated, based on the assumptions made in the footnotes accompanying the table. This data should be viewed as illustrative only, and is not intended to provide an accurate representation of the distribution of government revenues.

Table 5.2: 2001 Government Revenue Related to Beach Activities

| | | All of Suffolk County | | Estimate of Entire Economy in Suffolk County South Shore SLOSH Zones [1] | | Estimate of Portion Directly Related to Suffolk County South Shore Beach Economy [6] | |
|---|---|---|---|---|---|---|---|
| | | Tax Revenue | Percent of Total | Tax Revenue | Percent of Total | Tax Revenue | Percent of Total |
| 1. | **All Local Sources** [2, 3] | **$4,717,980,273** | **28.1%** | **$575,296,300** | **33.5%** | **$25,137,689** | **35.8%** |
| | ***Town Taxes*** | ***$811,160,794*** | ***4.8%*** | ***$110,695,534*** | ***6.4%*** | ***$4,321,915*** | ***6.2%*** |
| | Property Taxes | $512,361,559 | 3.1% | $69,919,721 | 4.1% | $2,729,894 | 3.9% |
| | Other Revenue | $298,799,235 | 1.8% | $40,775,813 | 2.4% | $1,592,021 | 2.3% |
| | ***County Taxes*** | ***$1,496,812,615*** | ***8.9%*** | ***$170,156,387*** | ***9.9%*** | ***$7,975,110*** | ***11.4%*** |
| | Sales Tax [5] | $791,463,153 | 4.7% | $82,435,648 | 4.8% | $4,216,964 | 6.0% |
| | Property Taxes | $435,013,108 | 2.6% | $54,100,376 | 3.2% | $2,317,777 | 3.3% |
| | Other Revenue | $270,336,354 | 1.6% | $33,620,363 | 2.0% | $1,440,369 | 2.1% |
| | ***School Districts*** | ***$2,193,721,483*** | ***13.1%*** | ***$256,220,479*** | ***14.9%*** | ***$11,688,283*** | ***16.7%*** |
| | Property Taxes | $2,064,013,124 | 12.3% | $241,070,909 | 14.0% | $10,997,189 | 15.7% |
| | Other Revenue | $129,708,359 | 0.8% | $15,149,570 | 0.9% | $691,094 | 1.0% |
| | ***Fire Districts*** | ***$119,914,452*** | ***0.7%*** | ***$18,481,141*** | ***1.1%*** | ***$638,912*** | ***0.9%*** |
| | Property Taxes | $110,057,907 | 0.7% | $16,962,056 | 1.0% | $586,395 | 0.8% |
| | Other Revenue | $9,856,545 | 0.1% | $1,519,085 | 0.1% | $52,516 | 0.1% |
| | ***Villages*** | ***$96,370,929*** | ***0.6%*** | ***$19,742,759*** | ***1.2%*** | ***$513,470*** | ***0.7%*** |
| | Property Taxes | $64,861,815 | 0.4% | $13,287,733 | 0.8% | $345,588 | 0.5% |
| | Other Revenue | $31,509,114 | 0.2% | $6,455,026 | 0.4% | $167,882 | 0.2% |
| 2. | **NYS State Taxes** [4] | **$3,636,834,987** | **21.7%** | **$378,798,241** | **22.1%** | **$15,186,332** | **21.6%** |
| | Individual Income Tax | $2,159,061,182 | 12.9% | $224,879,210 | 13.1% | $7,312,662 | 10.4% |
| | Sales Tax | $791,463,153 | 4.7% | $82,435,648 | 4.8% | $4,216,964 | 6.0% |
| | Excise and Use Taxes and Fees | $179,938,399 | 1.1% | $18,741,667 | 1.1% | $958,723 | 1.4% |
| | Business Taxes | $421,018,029 | 2.5% | $43,851,560 | 2.6% | $2,243,210 | 3.2% |
| | Other Revenues | $85,354,224 | 0.5% | $8,890,156 | 0.5% | $454,773 | 0.6% |
| 3. | **Federal Taxes** [5] | **$8,442,130,096** | **50.3%** | **$762,430,904** | **44.4%** | **$29,845,306** | **42.5%** |
| | Individual Income Taxes | $6,574,015,489 | 39.1% | $593,716,576 | 34.6% | $22,265,952 | 31.7% |
| | Corporation Income Taxes | $1,223,058,354 | 7.3% | $110,457,607 | 6.4% | $4,142,454 | 5.9% |
| | Excise Taxes | $339,997,107 | 2.0% | $30,706,030 | 1.8% | $1,811,526 | 2.6% |
| | Other Revenues | $305,059,146 | 1.8% | $27,550,691 | 1.6% | $1,625,374 | 2.3% |
| **Total** | **All Municipalities** | **$16,796,945,356** | **100.0%** | **$1,716,525,445** | **100.0%** | **$70,169,327** | **100.0%** |

Notes accompanying Table 5.2:

1. SLOSH stands for Sea-Lake Overland Surge from Hurricanes. SLOSH zones are based on the National Oceanic and Atmospheric Administration's (NOAA's) National Weather Service SLOSH model. In general, Zones 1 through 4 correspond to hurricane categories 1 through 4. Based on the Saffir-Simpson scale, Category 1 includes 74 to 95 mph wind speeds and 4 to 5 foot storm surges with coastal damage up to 10 feet of the high tide sea level, Category 2 includes 96 to 110 mph wind speeds and 6 to 8 foot storm surges, Category 3 includes 111 to 130 mph wind speeds and 9 to 12 foot storm surges, and Category 4 includes 131 to 155 mph wind speeds and 13 to 18 foot storm surges.

2. Data for all local revenue sources was obtained from the "NYS Comptroller's 2001 Special Report on Municipal Affairs", http://www.osc.state.ny.us/localgov/muni/publist1.htm#annual. "Other Revenue" for local sources is net of intergovernmental aid (state and federal aid and revenues from other governments).

3. The portion of local property taxes that corresponds to the south shore SLOSH zones (Surge Level of Storm Height) was made available from the Suffolk County Tax History System (THS). The THS was cross-referenced against the geographic coordinates of the south shore SLOSH zones. To arrive at property taxes by municipal unit (towns, county, schools, fire districts, and villages), it was assumed that the same proportions apply to property in the south shore SLOSH zones as for the total warrant.
   The portion of "Other Revenue", for each of the local municipal units that corresponds to the south shore SLOSH zones is assumed to be the same proportions used for property taxes.

4. State tax collections for 2001 were based on data from the NYS Department of Taxation and Finance, http://www.tax.state.ny.us/Statistics/Stat_FY_Collections.htm. Individual income tax data for 1999, by school district in Suffolk County, was also obtained from the NYS Dept. of Taxation and Finance.
   To calculate state taxes within the south shore SLOSH zones (Surge Level of Storm Height), use was made of data available on 1999 individual income taxes by school district. The apportionment used is based on the fraction of land area within school districts that fall in the SLOSH zones. For 1999 state individual income taxes, it was determined that 10.42% ($172,784,622.77/$1,658,902,004.64) of taxes were attributable to the south shore SLOSH zones. The same apportionment is used for all state tax receipts.

5. To arrive at federal tax receipts from Suffolk County, with the exception of the individual income tax, for each revenue category NYS tax receipts were first taken as a percent of all states; Suffolk County receipts were then taken as a percent of NYS tax receipts. Federal tax receipts were obtained from the Congressional Budget Office web site and state tax receipts were obtained from the U.S. Census Bureau web site. Suffolk County as a percent of NYS tax receipts was derived from the New York State Department of Taxation and Finance web site. For federal "individual income taxes" collected from Suffolk County, actual data was obtained from the federal government for 1998. To arrive at the figure for 2001 the growth rate in total federal individual income taxes was applied across all states. "Other revenues" for federal collections include estate and gift taxes, customs duties, and miscellaneous receipts."

   To calculate federal taxes within the south shore SLOSH zones (Surge Level of Storm Height), use was made of data available on 1998 individual income taxes by zip code. The apportionment used is based on the fraction of land area within zip codes that fall in the SLOSH zones. For 1998 federal individual income taxes, it was determined that 9.03% ($494,746,000/$5,478,149,000) of taxes were attributed to the south shore SLOSH zones. The same apportionment is used for all federal tax receipts.

6. Estimate of Portion Directly Related to Suffolk County South Shore Beach Economy: For federal and state income taxes, to derive the portion that is attributed to the south shore beach economy, the estimate of the percent employee compensation (wages & salaries) in Suffolk that is attributed to the south shore beaches was used. This estimate, which comes from Table 4.9, is 0.34% ($88,401,170/$26,100,418,312). For all other taxes, the estimate of beach taxes is the percent indirect business taxes in Suffolk that is attributed to the south shore beaches, also from Table 4.9. Indirect business taxes include property, sales and excise taxes. The estimated percent from Table 4.9 is 0.53% ($20,803,791/$3,904,570,285).

Government revenues can be used as one of several criteria for financing government spending, such as spending on beach projects. Accordingly, Table 5.2 estimates that a total of $16.8 billion in taxes and fees are paid annually in all of Suffolk County. The federal government collects 50.3% of these revenues, the state 21.7% and local municipalities the remaining 28.1%. Secondly, it is estimated that $1.7 billion of the $16.8 billion countywide total is collected in the area restricted to the south shore slosh zones of Suffolk County. The federal government collects 44.4% of these taxes and fees, the state 22.1%, and local municipalities 33.5%. The final category in Table 5.2 represents the portion of tax and fee revenues directly related to Suffolk County's south shore beach economy. As can be seen, the entire economy in the Slosh zones includes considerably more economic activity than just beaches. The south shore beach economy contributes an estimated $70.2 million in taxes, with the federal government collecting 42.5%, the state collecting 21.6% and local municipalities collecting 35.8%.

3. RED benefits related to specific beach projects

In order to understand how RED benefits relate to specific beach projects, consider a hypothetical beach renourishment project that either increases the available beach area or prevents the deterioration of a beach. If this project results in an increase of 100,000 beach visits per year, or prevents a reduction of 100,000 beach visits per year, the RED benefit would be $1,531,484 annually[58]. This represents a 0.88 % increase in the number of beach visits over the estimated total of 11,323,485 annual visits to Suffolk County's south shore beaches. The $1,531,484 estimate represents 0.97% of total beach GRP presented in Table 4.9.

This estimate can be scaled to any increase in project related beach visits: for example, an increase of just one beach visit would contribute $15.31 in RED benefits to the economy $I5.31= (1/11,323,485) x$173.4 million[59]. The "per beach visit benefit " can be explained as follows:

- Based on the beach spending profiles and number of beach visits in *Chapter 4* of this report, average spending per beach visit (weighted by the number of visits in each spending category) is $22.58 in 1999 dollars.
- In current year 2003 dollars, spending per beach visit is $23.87. This represents the direct increase in output associated with one beach visit.
- Through the multiplier effect, total output (or spending) per beach visit in Suffolk County is estimated to increase by $32.18. This result yields an output multiplier for beach activities equal to 1.348 (=$32.18/$23.87).
- The $32.18 increase in total output represents the total cost of goods and services. The portion of this total output that represents value added or wealth created within the region is estimated to be $15.31.

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[58] This figure was derived by multiplying total estimated GRP attributed to Suffolk County's south shore beaches ($173.4 million in 2003 dollars) by the fraction of beach visits affected by the project (100,000/11,323,485).

[59] $15.31 = (1/11,323,485) x $173.4 million

It is important to note that RED benefits are not part of a cost-benefit analysis to determine the worth of a beach project; national economic development (NED) benefits are used for that purpose. NED benefits discussed in the next section in this report are likely to be substantially greater. For instance, a 1999 Army Corps of Engineers study found NED benefits associated with a 6-year interim plan to restore and stabilize beaches along the Fire Island Inlet to Moriches Inlet reach were $21.8 million annually. This large benefit can be attributed, in part, to NED benefits from storm damage cost savings. In particular, the loss of property, other assets, and property tax base that are implicit in NED benefits are not part of RED benefits.

## B. National economic development (NED) benefits of beaches

Monetary contributions to national economic development (NED) are the federal objective in water project planning. Contributions to NED are increases in the net value of the national output of goods and services. NED benefits of beach projects are made up of *(1)* storm damage reduction to coastal property; *(2)* recreation benefits associated with spending in the beach area as a result of the availability of beach recreational areas and the demand for use (i.e. willingness-to-pay); and *(3)* other NED benefits, which include reductions for emergency and facility maintenance costs.

Once the NED benefits are calculated, the merits of a beach project can be evaluated on the basis of whether project benefits exceed project costs. Costs and cost-benefit analysis are covered in C*hapters 6* and *7.*

1. Storm damage reduction

Storm damages can be broken down into *(1)* inundation damages; *(2)* erosion and wave damages; and *(3)* beach closure damages. Based on preliminary analysis provided by the Army Corps of Engineers, the cost of storm damages in the Fire Island to Montauk Point study area is estimated at $54.3 million annually. This breaks down to *(1)* $45.7 million in inundation damages (with sea level rise); *(2)* $6.0 million in erosion and wave damages; and *(3)* $2.6 million in beach closure costs. Calculation of the annual cost of inundation damages is based on a 50-year project life and a 6.625% discount rate (the interest rate used to annualize benefits). Most of the inundation damages occur in the western portion of the Fire Island to Montauk Point study area. In particular:

| Project Reach | Inundation Damages |
|---|---|
| Great South Bay | $30,000,000 |
| Moriches | $11,000,000 |
| Shinnecock | $4,400,000 |
| Ponds | $140,000 |
| Montauk | $160,000 |
| Total | $45,700,000 |

A break down by project reach was not available for erosion and wave damages or for beach closure damages.

National economic development (NED) benefits of a specific beach project are based on the extent to which the project reduces these storm damage costs. For example, based on a 1999 analysis of the Fire Island Inlet to Moriches Inlet reach, the Army Corps of Engineers estimated annual project benefits to be $13,834,000. The breakdown was $12,750,000 in reduced costs from inundation, erosion and wave damages plus $1,084,000 in breach closure cost savings.[60] Calculated benefits in this study were based on an interim plan with a 6-year project life, protection from a 44-year storm, and a 6.875% discount rate for the cost of capital. Benefits, as well as costs, would be greater for projects that protect against larger storms and cover more years. In the final analysis, the appropriate project life and level of storm protection should be based on a cost-benefit analysis. A detailed cost-benefit analysis should be available in 2005, when the Army Corps of Engineers completes its Fire Island to Montauk Point Reformulation Study.

2. Recreation benefits

Benefits can also be increased by the recreational value associated with beach projects. As noted above, recreational value is typically estimated by the willingness-to-pay that beach users place on a day at the beach. The Army Corps of Engineers' 1999 analysis of the Fire Island inlet to Moriches inlet reach estimated annual recreational benefits associated with the 6-year project life to be $936,000. This figure is based on 2.4 million beach visits and an increase in willingness-to-pay of $0.39 per visit. The methodology used by the Army Corps estimated willingness-to-pay at $5.57 without the project and at $5.96 with the project.[61] The difference of $0.39 represents the increase in willingness-to-pay.

One of the objectives of this report is to estimate the dollar value of the recreational benefit received by Suffolk County's Atlantic Ocean beach users. Based on a willingness-to-pay of $5.57 per beach user and our annual estimate of 11,323,485 beach visits for the study area, the total value to beach users of the recreational benefit of Suffolk County's Atlantic Ocean is $63,071,811 (= 11,323,485 x $5.57).

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[60] See Appendix D: Benefit Appendix, in the Nov. 1999 Vol. II Technical Appendices document from the "Fire Island Inlet To Montauk Point, Long Island, New York: Reach 1: Fire Island Inlet To Moriches Inlet", US Army Corps of Engineers, New York District. Reduced costs are equal to the difference between "without project" costs and "with project" costs. For inundation, erosion and wave damages, without project costs are $41,083,000 in Table D8, p. D34, and with project costs are $28,333,000 in Table D9, p. D39. For beach closure, without project costs are $1,728,000 in Table D10, p. D44, and with project costs are $644,000 in Table D11, p. D44. Locations considered in this breach closure analysis are Old Inlet, Water Island, Atlantique, and Robert Moses. The analysis also requires that estimates be made of the probability of a breach occurring both with and without the interim plan project.

[61] Ibid, pages D44-D50.

3. Other NED benefits and total NED benefits

Based on the same 1999 analysis of the Fire Island inlet to Moriches inlet reach, other benefits listed are $6,122,000 for mainland post renourishment benefits and $793,000 for barrier Island post renourishment benefits. Total NED benefits for the 6-year interim plan were[62]:

| | |
|---|---|
| 1. Reduced damages from inundation, erosion and waves | $12,750,000 |
| 2. Reduced breach closure costs | $1,084,000 |
| 3. Increased recreational value | $936,000 |
| 4. Mainland post renourishment benefits | $6,122,000 |
| 5. Barrier Island post renourishment benefits | $793,000 |
| Total Benefits | $21,685,000 |

4. NED benefits and the Moriches Inlet to Shinnecock Inlet reach

In 1999, the Army Corps also published an analysis of benefits for the Moriches Inlet to Shinnecock Inlet reach, an area just east of the Fire Island Inlet to Moriches Inlet reach. Annual benefits in this portion of the study area were estimated at $4,407,000 for an interim plan with a 6-year project life and protection against a 44-year storm.[63]

[62] Ibid, Table D16, p. D53.

[63] See "Fire Island Inlet to Montauk Point, Long Island, New York: Reach 2 – West of Shinnecock Inlet, Draft Decision Document, An Evaluation of an Interim Plan for Strom Damage Protection, Volume I, U.S. Army Corps of Engineers, New York District, December 1999" for in-depth discussion. See Table 9, p. 78, for benefits.

# *Chapter 6*
# The Cost of Beach Projects

## A. Cost of Beach Restoration

1. The Reformulation Study and costs associated with a 50-year project

As previously noted, the U.S. Army Corps of Engineers' Fire Island to Montauk Point Reformulation Study will be the comprehensive document to establish the long range plan for beach restoration along the south shore of Suffolk County. The Army Corps has provided a work-in-progress draft report from 1999 on the cost of various methods of erosion control and protection, including flood proofing, beach restoration, groins, floodwalls, and other hard construction methods. An explanation of these and other methods of beach restoration can be found in *Chapter 2.*

Table 6.1: Annual Cost Summary for Various Methods of Erosion Control and Protection (in 1999 dollars)
Case of a 50-year Project for Protection Against a 100-year Storm, with Costs Annualized Using a 7.125% Discount Rate

| Project Reach | Physical Reach | Non-Structural (Floodproofing) | Beach Restoration | Beach Restoration and Breakwaters | Beach Restoration and Headlands | Beach Restoration and Seawalls | Beach Restoration and Groins | Groin Removal | Levees and Floodwalls | Closure Gates |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Montauk | 1A | | $9,791,311 | $23,628,893 | $21,461,928 | $33,530,667 | $12,938,955 | $28,071 | | |
| | 1B | | $2,357,347 | $11,633,667 | $10,351,178 | $16,466,416 | $6,252,474 | $123,283 | | |
| | 1C | | $1,997,878 | $9,674,304 | $8,612,934 | $13,674,065 | $5,221,053 | $0 | | |
| | Total | $182,000 | $14,146,536 | $44,936,864 | $40,426,040 | $63,771,168 | $24,412,482 | $151,354 | $475,000 | N/A |
| 2. Ponds | 2A | | $1,613,303 | $7,211,063 | $6,437,146 | $10,127,161 | $3,259,789 | $659,978 | | |
| | 2B | | $2,431,052 | $8,038,351 | $7,242,323 | $11,188,098 | $4,664,501 | -$85,875 | | |
| | 2C | | $2,746,382 | $10,419,259 | $9,357,888 | $14,423,019 | $5,970,642 | -$1,225 | | |
| | Total | $226,000 | $6,790,737 | $25,668,673 | $23,037,357 | $35,738,278 | $13,894,932 | $572,878 | $3,745,000 | N/A |
| 3. Shinnecock | 3A | | $1,214,638 | $6,655,179 | $5,903,375 | $9,485,311 | $3,500,606 | $42,107 | | |
| | 3B | | $3,299,673 | $9,587,193 | $8,636,382 | $13,759,718 | $5,505,781 | $0 | | |
| | 3C | | $5,294,146 | $16,112,954 | $14,498,786 | $23,052,067 | $8,612,493 | $0 | | |
| | Total | $5,926,000 | $9,808,457 | $32,355,326 | $29,038,543 | $46,297,096 | $17,618,880 | $42,107 | $19,165,000 | $24,316,000 |
| 4. Moriches | 4A | | $963,581 | $6,883,752 | $6,065,612 | $9,963,939 | $961,168 | $1,938,349 | | |
| | 4B | | $1,569,842 | $4,253,043 | $3,855,029 | $5,948,584 | $2,406,601 | -$109,754 | | |
| | 4C | | $2,671,962 | $8,298,322 | $7,458,070 | $13,832,484 | $4,370,761 | -$247,360 | | |
| | 4D | | $1,974,649 | $8,722,325 | $7,705,178 | $15,484,742 | $4,359,463 | -$2,070 | | |
| | Total | $18,510,000 | $7,180,054 | $28,157,442 | $25,083,889 | $45,229,749 | $12,097,993 | $1,579,145 | $35,969,000 | $25,866,000 |
| 5. Fire Island | 5A | | $2,142,963 | $13,404,716 | $11,834,772 | $22,955,599 | $6,880,225 | $0 | | |
| | 5B | | $3,625,780 | $18,814,116 | $16,691,375 | $31,820,829 | $10,049,623 | $0 | | |
| | 5C | | $2,405,970 | $7,711,797 | $6,915,769 | $12,978,977 | $3,718,797 | $112,284 | | |
| | 5D | | $529,716 | $5,523,285 | $4,815,704 | $9,928,318 | $2,526,386 | $0 | | |
| | 5E | | $1,145,450 | $4,697,855 | $4,145,057 | $8,488,177 | $2,340,016 | $0 | | |
| | Total | $53,239,000 | $9,849,879 | $50,151,769 | $44,402,677 | $86,171,900 | $25,515,047 | $112,284 | $30,138,000 | $122,223,000 |
| **Total For All Reaches** | | **$78,083,000** | **$47,775,663** | **$181,270,074** | **$161,988,506** | **$277,208,191** | **$93,539,334** | **$2,457,768** | **$89,492,000** | **$172,405,000** |

Source: Table 5.14 Annual Feature Cost Summary in "Work Order 1 – Interim Submission No. 6 – Draft: Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York – Storm Damage Reduction Reformulation Study – Alternative Screening", July 1999, A Joint Venture, URS Consultants/Moffatt & Nichol Engineers.

Table 6.1 details the potential cost of each of a variety of possible approaches, for each "Reach" along the study area. The chart illustrates the annualized costs that would be incurred for a 50-year project life designed to protect the beaches from a 100-year storm. A cost-benefit analysis may conclude that, on a reach-by-reach basis, smaller scale plans are more feasible. Such analysis awaits completion of the Reformulation Study.

The costs shown in Table 6.1 are annualized, broken down by reach and method, and are expressed in present value terms.[64] Cost estimates for beach restoration are shown alone, as well as in combination with the construction of breakwaters, headlands, and groins. The two least expensive alternatives are beach restoration, with an annual cost of $47.8 million, and non-structural flood proofing, which is estimated to cost $78.1 million per year. The most expensive alternatives are $277.2 million for beach restoration in combination with seawalls, $181.3 million for beach restoration and breakwaters, and $172.4 million for closure gates.

It is important to note that, in recent years, it has become increasingly difficult to gain approval for beach projects. At present, approval is very difficult to gain for any but interim projects that focus on the beach restoration method. Table 6.2 shows the derivation of annualized costs for the beach restoration method. A breakdown of beach lengths, initial costs, annualized first costs, and annualized nourishment costs, is listed for each reach. These costs therefore include the initial project costs, as well as the maintenance costs incurred over the life of the project. As shown in both Table 6.1 and Table 6.2, the most expensive area is Montauk (Reach 1) with an annual cost of $14.1 million, while the least expensive area is Ponds (Reach 2) that has an annual cost of $6.8 million.

Table 6.2: Cost Breakdown for Beach Restoration (in 1999 dollars)
Case of a 50-year Project for Protection Against a 100-year Storm, with Costs Annualized Using a 7.125% Discount Rate

| Project Reach | Physical Reach | Name | Length (feet) | Total First Cost | Annualized First Cost | Annualized Nourishment Cost | Total Annualized Cost |
|---|---|---|---|---|---|---|---|
| 1. Montauk | 1A | Montauk Point | 49,000 | $88,434,989 | $6,509,443 | $3,281,868 | $9,791,311 |
| | 1B | Napeague | 29,000 | $30,385,695 | $2,236,603 | $120,745 | $2,357,348 |
| | 1C | Amagansett | 24,000 | $25,769,693 | $1,896,832 | $101,045 | $1,997,877 |
| | | Total | 102,000 | $144,590,377 | $10,642,878 | $3,503,658 | **$14,146,536** |
| 2. Ponds | 2A | Georgica | 17,500 | $20,892,919 | $1,537,867 | $75,436 | $1,613,303 |
| | 2B | Sagaponack | 18,000 | $28,340,095 | $2,086,032 | $345,019 | $2,431,051 |
| | 2C | Mecox | 24,000 | $35,938,611 | $2,645,337 | $101,045 | $2,746,382 |
| | | Total | 59,500 | $85,171,625 | $6,269,236 | $521,500 | **$6,790,736** |
| 3. Shinnecock | 3A | Southampton | 17,000 | $15,503,552 | $1,141,172 | $73,466 | $1,214,638 |
| | 3B | Shinnecock Inlet | 21,500 | $27,612,333 | $2,032,464 | $1,267,209 | $3,299,673 |
| | 3C | Tiana | 36,500 | $48,662,086 | $3,581,875 | $1,712,271 | $5,294,146 |
| | | Total | 75,000 | $91,777,971 | $6,755,511 | $3,052,946 | **$9,808,457** |
| 4. Moriches | 4A | Westhampton | 18,500 | $12,012,494 | $884,205 | $79,376 | $963,581 |
| | 4B | Pikes | 9,000 | $12,744,465 | $938,083 | $631,759 | $1,569,842 |
| | 4C | Moriches Inlet | 19,000 | $21,989,492 | $1,618,583 | $1,053,399 | $2,671,982 |
| | 4D | Smith Point | 23,000 | $9,171,397 | $675,080 | $1,299,569 | $1,974,649 |
| | | Total | 69,500 | $55,917,848 | $4,115,951 | $3,064,103 | **$7,180,054** |
| 5. Fire Island | 5A | Wilderness Area | 35,500 | $24,648,719 | $1,814,321 | $328,643 | $2,142,964 |
| | 5B | Cherry Grove | 48,000 | $43,241,413 | $3,182,875 | $442,905 | $3,625,780 |
| | 5C | Atlantique | 18,000 | $17,991,108 | $1,324,273 | $1,081,697 | $2,405,970 |
| | 5D | USCGS | 16,000 | $3,007,769 | $221,393 | $308,323 | $529,716 |
| | 5E | Robert Moses | 12,500 | $6,672,165 | $491,119 | $654,331 | $1,145,450 |
| | | Total | 130,000 | $95,561,174 | $7,033,981 | $2,815,899 | **$9,849,880** |
| Total For All Reaches | | | 436,000 | $473,018,995 | $34,817,557 | $12,958,106 | **$47,775,663** |

Source: Table 5.4 Conceptual Beachfill Costs in "Work Order 1 – Interim Submission No. 6 – Draft: Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York – Storm Damage Reduction Reformulation Study – Alternative Screening", July 1999, A Joint Venture, URS Consultants/Moffatt & Nichol Engineers.

[64] A 7⅛% discount rate was used to calculate the present value and to annualize costs.

2. Cost associated with an interim plan (6-year project life, protection from a 44-year storm)

The Army Corps has previously conducted cost-benefit analyses of portions of the south shore of Suffolk County. Annualized costs associated with these analyses are as follows:

| | Annualized Costs Interim Plan with a 6-year project life for protection against a 44-year storm |
|---|---|
| Fire Island Inlet to Moriches Inlet[65] | $17,040,000 |
| Moriches Inlet to Shinnecock Inlet[66] | $3,245,000 |

The above costs differ from the cost shown in Tables 6.1 and 6.2, but can be compared to the beach restoration method detailed in Table 6.2. A major difference between the costs is that the above costs relate to an interim plan with a 6-year project life for protection against a 44-year storm, while the cost estimates in the previous table are for a 50-year project life that provides protection against a 100-year storm. The costs in Table 6.2 are therefore greater. An important point to note is that the Army Corps' Reformulation Study will be considering a variety of scenarios in addition to the 50-year-life project listed in Tables 6.1 and 6.2. The intent will be to develop a plan that provides the greatest benefit relative to project costs.

The intent of beach restoration efforts is to provide protection up to a maximum level of storm damage, such as one that is expected to occur only once every 44 years. This is implicit in the cost-benefit analysis of beach restoration projects, where calculations are based in part on probabilities. Consider a project in which calculated benefits exceed costs. It is always possible that a severe storm could wipe out benefits much earlier than expected. In hindsight, project benefits would be less than costs. This is an unlikely event, and does not detract from the fact that the odds are in favor of benefits exceeding costs. In such a case, it would be appropriate to replicate the project. In general, beach projects are designed to provide protection against damage created by storms that are less severe than Category 3 hurricanes; beach projects will provide little to not protection against more severe hurricanes.

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[65] Fire Island Inlet To Montauk Point, Long Island, Reach 1: Fire Island Inlet To Moriches Inlet, Long Island, New York: Reach 1: Fire Island Inlet To Moriches Inlet", Vol. I: Main Report and Draft Environmental Impact Statement, US Army Corps of Engineers, New York District, Nov. 1999. Costs are presented in Table 16, p. 122.

[66] Fire Island Inlet to Montauk Point, Long Island, New York: Reach 2 – West of Shinnecock Inlet, Draft Decision Document, An Evaluation of an Interim Plan for Strom Damage Protection, Volume I, U.S. Army Corps of Engineers, New York District, December 1999. See Table 9, p. 78 for benefits, Table 14, p. 86, for costs, and Table 15, p. 87 for benefit-cost comparison.

# *Chapter 7*
# Cost-Benefit Analysis of Beach Projects

## *A. Cost-Benefit analysis*

The merits of beach projects are based on whether or not their benefits exceed their costs. Although a comprehensive cost-benefit analysis awaits the completion of the Army Corps of Engineers' Fire Island to Montauk Point Reformulation Study, certain information of value is available from previously published reports. The following chart combines benefit and cost data for the interim plan referenced in *Chapters 5 and 6* to generate a cost-benefit analysis of that plan.

| | Annualized Benefits and Costs Interim Plan with a 6-year project life for protection against a 44-year storm |
|---|---|
| Fire Island Inlet to Moriches Inlet:[67] | |
| Benefits | $21,685,000 |
| Costs | $17,040,000 |
| Net Benefits | $4,645,000 |
| Benefit-Cost Ratio | 1.3 |
| Moriches Inlet to Shinnecock Inlet:[68] | |
| Benefits | $4,407,000 |
| Costs | $3,245,000 |
| Net Benefits | $1,162,000 |
| Benefit- Cost Ratio | 1.36 |

The conclusion reached by the Army Corps of Engineers from these studies is that interim beach projects are worth undertaking; that is, their benefits exceed their costs. The credibility of this conclusion is enhanced by the fact that the Army Corps is the recognized expert in the field of beach restoration and stabilization. The more comprehensive Reformulation Study will look at each of the physical reaches within the study area, and determine what plan is most effective for each reach.

It should be also be noted that a similar conclusion was reached in the most recent non Army Corps analysis that estimates the costs and benefits of beach

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[67] See Fire Island Inlet To Montauk Point, Long Island, Reach 1: Fire Island Inlet to Moriches Inlet, Long Island, New York: Reach 1: Fire Island to Moriches Inlet, Vol. 1: Main Report and Draft Environmental Impact Statement, US Army Corps of Engineers, New York District, Nov. 1999. The cost-benefit comparison can be found in Table 20, p. 133, with detail on benefits listed in Table 14, p. 118, cost in Table 16, p. 122, and net annual benefits in Table 17, p. 123.

[68] Fire Island Inlet to Montauk Point, Long Island, New York: Reach 2 – West of Shinnecock Inlet, Draft Decision Document, An Evaluation of an Interim Plan for Strom Damage Protection, Volume I, U.S. Army Corps of Engineers, New York District, December 1999. See Table 9, p. 78 for benefits, Table 14, p. 86, for costs, and Table 15, p. 87 for benefit-cost comparison.

projects in this region. Specifically, a 1995 study by Koppelman[3] calculated the benefit-cost ratio along the Fire Island reach to be 1.4. Although there were other estimates in the Koppelman report that led to higher benefit-cost ratios, this result is the one that most closely corresponds to the Army Corps' methodology.

In spite of favorable analysis by the Army Corps, considerable opposition to beach restoration projects remains. In recent years it has become difficult to gain approval for beach projects. Officials at various levels of government have stated that it would be difficult to obtain permits, especially for the more costly hard methods of beach restoration, such as seawalls and groins. In fact, to obtain a permit for the construction of a groin or other hard method, one would have to demonstrate that no other alternative would work to remedy the erosion problem.

Proponents for restoration projects have voiced concerns over continued beach erosion and have been frustrated by long delays in the approval of beach projects and in the completion of the Reformulation Study. Erosion, if left unchecked, will be more costly to remedy and will leave the barrier islands more susceptible to breaches. In this regard, beach renourishment is like any type of home repair or maintenance: the work should be done before damage becomes more costly to fix.

In closing, several beach restoration and stabilization issues that go beyond the scope of cost benefit ratios are reviewed.

## B. Allowing increased development in vulnerable locations

Those opposed to beach renourishment projects often argue that these projects protect the property of a few at the expense of all taxpayers. Valid concerns are voiced over allowing increasingly valuable structures to built on properties in dynamic and vulnerable locations. Often, structures are even built on what was previously water. As the values of these structures increase, so do the potential losses. In addition, once it provides assistance, government often finds itself in the position of making a commitment to maintain a beach in the face of future storm damage. This can be an expensive proposition.

Often lost in the debate over beach restoration and stabilization is that protection of mainland properties from damage caused by beach erosion and breaches is the primary focus of beach restoration and stabilization. In fact, Army Corps of Engineers' studies often find that increased storm damage and rising sea levels result in larger net benefits. Although costs go up, benefits - in the form of savings from reduced storm damage - are often greater. The merits of beach restoration projects should not, therefore, focus solely on the benefit to beach property owners, but rather on the greater benefit realized by reducing storm damage costs overall. The impact of beach restoration on economic activity at the local level is also an important consideration.

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[3] Koppelman, Lee E. (1995). Economic Analysis Fire Island Reach. NY Coastal Partnership

When beach property owners pay for the benefit they receive, some of the objections to beach restoration projects are eliminated. In terms of insurance, premiums paid into the National Flood Insurance Program by local beach property owners exceed payouts. In addition, erosion control tax districts, such as those that exist in Islip and Brookhaven, help to ensure that beach property owners pay their fair share of project costs.

This does not mean that unchecked development at vulnerable beach locations should be allowed. Development presents an expensive problem for municipalities that are facing fights against beach erosion. The Town of Southampton, for example, is currently trying to address this issue.[4] A proposal would change the town's shoreline zoning code to require that a replacement house be built at least 100 feet from the crest of the sand dune and behind a setback line designed to protect environmentally fragile wetlands on the north side of Dune Road. In cases where there is not enough room left to rebuild properties would have to be condemned.

Another important consideration is that one of the goals of beach renourishment is to improve public access to the beaches. Private development can limit public access to taxpayer-funded restored beaches. This concern is addressed in State and Federal law, which prohibits expenditure of public funds to restore beaches that do not provide public access[5]. It should be noted, however, that there is a distinction between access and use: in certain cases, it remains difficult for the public to use the beach, despite having access to it. In locations where right-of-way walkthroughs over private property are added, public use of beaches may continue to be problematic due to lack of parking and bathroom facilities. Full use may require condemnation of one or two parcels to provide such facilities. It may also lead to opposition by local residents, who would prefer to limit the number of non-residents to the area. While this issue is a concern to some, in most cases it is not sufficient to offset the benefits provided by beach restoration.

## C. Environmental Effects of Beach Renourishment

In two recent reports, the Army Corps of Engineers found very little negative environmental impact resulting from beach restoration projects[6][7]. Among the reports' findings are the following:

- The adverse environmental effects of beach nourishment projects can be minimized or avoided through the use of sound management practices. The protocol used by the Army Corps takes into consideration

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[4] Drawing Line In the Sand, Mitchell Freedman, Newsday, 01/30/03, p.A22.

[5] See page 5 in "Recreation and Access Plan for the Fire Island Beach Replenishment Program", July 1996, Ivan P. Vamos.

[6] The Distribution of Shore Protection Benefits: A Preliminary Examination, prepared by the U.S. Army Corps of Engineers for the Office of Management and Budget, November 2001.

[7] The New York District's Biological Monitoring Program for the Atlantic Coast of New Jersey, Asbury Park to Manasquan Inlet Beach Erosion Control Project, U.S. Army Corps of Engineers, Final Report, 2001.

environmental concerns so that the potential for adverse affects is minimized.

- Studies monitoring the effects of beach nourishment projects have found no significant long-term impacts on the environment. Beach nourishment in New Jersey's Asbury Park to Manasquan Inlet Beach Erosion Control Project "resulted in short-term declines in abundance, biomass, and taxa richness. Recovery of inter-tidal assemblages was complete within 2-6.5 months of the conclusion of filling."
- The results of monitoring programs indicate that the effects of beach nourishment are short-lived. Plant and animal species in beach environments adapt and survive environmental changes.
- Beach nourishment projects can have beneficial environmental effects. For example, renourishment of beaches can create new nesting areas, spawning grounds and habitats that previously did not exist.

Other beach restoration issues related to the environment include the following:

1. Natural ebb and flow of beaches

One argument put forth by those opposed to beach projects is that they interfere with the natural ebb and flow of beaches. A project that affects the natural flow of sand, may result in locations down drift of the project being deprived of beach fill that would have naturally accumulated there. This criticism is valid in pointing out that projects need to anticipate and address their impact on other locations. Proponents of beach restoration projects counter that the natural processes have already been altered. As discussed in *Chapter 6*, over the years many beach projects have been implemented, permanently interrupting the natural flow of sand. The argument here is that once a project is started, it should be completed and then be maintained, as any other government infrastructure would be.

In budgetary terms, beach projects also need to be looked at on a continuous basis and maintained over time. It is not enough for government to allocate resources in the initial years of a project without an understanding that a long-term commitment is required.

2. Rising sea levels

The United States Environmental Protection Agency estimates that the Atlantic sea level of the United States is rising. One view is that global warming has contributed to the present long-term trend in rising ocean levels. The sea level rise of one foot (30 cm) is likely by 2050, but could occur as soon as 2025. "In the next century (2100), a two foot rise is most likely, with a one-percent chance of exceeding a 4-foot rise (122 cm)."[8] [9] Evidence suggests that this trend will probably continue for several centuries. It should be noted that these long-term projection models are less accurate than short-term projection models and

[8] United States Environmental Protection Agency (EPA), http//www.epa.gov/globalwarming/impacts/coastal/index.html

[9] United States Environmental Protection Agency (EPA) http//www.gcrio.org/EPA/sealevel/chap9.txt

require periodic re-evaluation, since sea level rises can vary due to unforeseen influences.

Historically, as the sea level rises, it alters the shoreline by eroding beaches; inundating wetlands and other low-lying lands; increasing the salinity of rivers, bays and groundwater tables; and intensifying flooding. Forecast models of global warming suggest intensifying differences in weather conditions, higher and lower temperatures, increased flooding and drought, and stronger storms and surges. A three-foot higher sea level would enable a 15-year storm to flood areas that today would be flooded only by a 100-year storm.[10]

Army Corp studies often find that increased storm damage and rising sea levels result in larger net benefits. Rising sea levels lead to increasing storm damage on the mainland. As a result, the benefits derived from beach projects, in the form of savings from reduced storm damage, would be higher. This increase in benefits is often greater than the increased cost of beach restoration and stabilization. The implication is that beach protection should not be considered a waste of time simply because sea levels are rising. More to the point, rising sea levels are a serious problem that needs to be addressed. If done properly, beach projects to address rising sea levels can make sense from a cost-benefit prospective.

## D. Cost of the National Flood Insurance Program

A popular misconception is that property owners on Suffolk County's south shore receive a benefit, at the expense of taxpayers, from subsidized premiums under the National Flood Insurance Program. To the contrary, experience data show that local flood insurance premiums exceed payouts. In particular,

- in 2001, the Federal Emergency Management Agency (FEMA) guaranteed 4.3 million policies for property owners around the country in the $1.5 billion National Flood Insurance Program. The estimated number of policies in 2003 is 5.1 million.
- FEMA is seeking a 100% premium increase on beachfront policies to make up for historically underpaid policies nationwide and to pay for anticipated beach erosion costs in the future.
- more than 36,000 policies existed in Nassau and Suffolk Counties in 2001. Since 1978, over $125 million has been disbursed locally. The average annual disbursement to Nassau and Suffolk Counties is $5.21 million ($125 million divided by 24 years) or $145 per policy ($5.21 million divided by 36,000). In comparison, annual premiums average $350 nationwide but routinely exceed $1,000 for beachfront homes.
- a 1993 report[11] indicated that in Suffolk County the annual premiums-to-claims ratio, from 1978 to 1993, was 9 to 5. This resulted in an average

[10] www. Taxpayer.net/corpswatch/troubledwaters/projects/longisland.htm
[11] Flood Insurance Coverage and Private Insurance Industry Trend Study, prepared by First Coastal Corporation for the Governor's Coastal Erosion Task Force, December 1993.

annual net cost or contribution (premiums less claims) of approximately $4 million during this period.

- beachfront property owners received an average claim payout of $145 from FEMA while paying premiums substantially greater than this amount, thereby subsidizing other areas of the nation. These areas primarily include policyholders who live near rivers in the Midwest and South that flood seasonally. Less than four-percent of repetitive losses are beach front; nevertheless, FEMA wants to increase premiums and build beach erosion costs into rates.
- while beach renourishment may only *directly* benefit the minority of property owners on the sensitive shoreline, these same property owners are paying more in insurance premiums than the government is paying out. In addition, beaches provide a benefit to the local economy, which in turn indirectly benefits all taxpayers.

# Glossary of Terms

Beach Renourishment: the use of sand, either dredged or excavated from off site locations, to repair damaged beach areas caused by coastal storm activity. Sand is utilized to reduce the water depth near the shoreline and to build up, shape, and align beach berms and dunes in areas vulnerable to erosion.

Berm: a mound or wall of earth, or earth and debris.

Breach: an opening or gap that develops in a barrier island, allowing the ocean water and bay water to meet.

Breakwaters: structures placed in the surf zone to protect beaches from wave action by dissipating wave energy before it reaches the beach. Structures could be rocks placed under the surface of the water or floating canisters connected to strips of rubber that are fixed to the sea bottom.

Closure Gates: part of a levee flood control system designed to prevent lowland areas from storm surges. Closure gates are built into the levee (an embankment for preventing flooding), and are located at streams and manmade waterways as gates. The gates are left open under normal conditions to permit water flow and drainage and are closed prior to an anticipated storm surge.

Cost-Benefit Analysis: a method used to determine the merits of a project, based on the costs and benefits attributed to the project. Projects that have benefits that exceed costs are considered worthwhile.

Dune: a hill or ridge of sand piled up by the wind.

Floodplain: the area affected when a body of water, such as a river, overflows its banks.

Floodwall: a wall built to protect the mainland from flooding. Also referred to as a seawall.

Groin: a structure built out from a shore to protect the shore from erosion, to trap sand, or to direct a current for scouring a channel. Both jetties and groins are similar in construction. The purpose of a jetty is to keep open an inlet from one body of water to another, while a groin is an extension from the shore to protect the shore from erosion.

"Hard" Methods of Beach Restoration: beach restoration methods that require construction of a structure, such as seawalls and groins, and are often more costly than soft methods, such as beach renourishment.

Headlands: cliffs, bluffs and open space that provide a habitat for a diversity of native plants and coastal animals.

Implan: a computerized input-output (I-O) regional economic model, with data available for counties, states, and the entire United States economy. Implan is an acronym for "IMpact analysis for PLANning".

Implan Sectors: the 528 different industries that are included in the Implan model.

Indirect Business Taxes: taxes on goods & services used by business, such as property taxes, sales taxes and excise taxes.

Intertidal: part of, or relating to, the littoral zone above the low tide mark.

Inundation Damages: storm damages to property and other assets attributed to flooding.

Jetty: a structure, such as a pier or dock, extended into the water to influence the current or tide, or to protect a harbor. Jetties and groins are similar in construction: the purpose of a jetty is to keep open an inlet from one body of water to another, while a groin is an extension from the shore to protect the shore from erosion.

Littoral: the shore zone between high and low watermarks.

Multiplier Effect: total impact or change in spending resulting from an initial change in spending. In addition to spending, multipliers can be computed for other variables, including changes in final demand, employment and income. For the Implan model used in this report, the multiplier is measured by the ratio of total effects to direct effects.

National Economic Development (NED) Benefits: increases in the net value of the national output of goods and services. In this report, contributions to NED represent the benefits that are associated with beach restoration and stabilization projects. NED is made up of *(1)* storm damage reduction to coastal property; *(2)* recreation benefits associated with spending in the beach area as a result of the availability of beach recreational areas; and *(3)* other NED benefits, which include reductions for emergency and facility maintenance costs.

Neap Tide: the low tide, occurring at the first and third quarters of the moon.

Overwash: the deposit left after a high water pulse (such as the bulge of high water that is formed by the high winds and low atmospheric pressure of a hurricane) overtops or breaches the dune line of a barrier beach. Much of the worst coastal damage from a hurricane is in areas of extensive overwash.

Project Life: the number of years the changes implemented by a project are forecast to last.

Reach: a continuous stretch or expanse; designation used by the U.S. Army Corps of Engineers to specify the area covered by an Army Corps project. For instance, the project reaches in the yet-to-be-completed Fire Island to Montauk Point Reformulation Study are: Reach 1-Montauk Point, Reach 2-Ponds, Reach 3-Shinnecock, Reach 4-Moriches, and Reach 5-Fire Island.

Reformulation Study: short for the U.S. Army Corps of Engineers' Fire Island to Montauk Point Reformulation Study; an Army Corps study scheduled for completion in 2005 that will provide a comprehensive plan for stabilization and restoration of Suffolk County's south shore beaches.

Regional Economic Development (RED) Benefits: the economic impact to the regional economy. It is measured by the increase in gross regional product (GRP) associated with an economic activity, such as a beach project. GRP is the value added to the cost of goods and services (or wealth created) within the region.

Revetment: a layering of erosion resistant material, frequently quarried rocks, placed on top of shorelines, berms and dunes, intended to protect the underlying surface from erosion.

Salinity: degree of salt content.

Salt wedge: the area where salt waters and fresh waters converge.

Sand Bypassing: a method used to mitigate beach erosion caused when an inlet channel disrupts near-shore sand movements. This can be accomplished by modifying and extending the two jetties (which maintain the opening of an inlet between ocean and bay) away from the shoreline on the ocean side. As sand moves along the shoreline, it is collected and builds up on the incoming side of the primary jetty. Sand is then transferred across the inlet opening down coast by prevailing currents and/or with the use of various types of dredging equipment.

Sandscraping: a beach restoration and stabilization method wherein the top layer (12 inches) of sand is removed from the front beach between the first dune and the coastline and deposited on the face of the first dune to increase the level of protection against wave surges.

Seawall: a wall or embankment, usually employed on the "upland" (mainland) side of a waterfront to prevent erosion and to provide an extra buffer of protection from flooding caused by storm surges.

SLOSH: an acronym for Sea-Lake Overland Surge from Hurricanes. It is based on the National Oceanic and Atmospheric Administration's (NOAA's) National Weather Service SLOSH model and is used to identify areas that are susceptible to flooding from storms.

Tidal Surge: an abnormal rise of sea level along a shore, primarily resulting from the winds of a storm.

Topography: the physical and natural features of a surface, such as the headways (cliffs, bluffs and open space) adjacent to the coastline.

Value Added: the dollar value of an industry's sales less the value of intermediate goods purchased for use in production. In this report, value added is measured by gross regional product (GRP).

Whisprwave: a system of polygon-shaped modules made of high-density polyethylene, that are placed in the surf zone for the purpose of decreasing a shoreline's erosion rate and to assist in stabilization.