

# 2008 FIRE ISLAND, NY BEACH NOURISHMENT PROJECT DESCRIPTION

## 10-29-07

### A. Introduction and Location

Eight Fire Island communities are planning to restore their beaches in 2008. The communities of Saltaire, Fair Harbor, Dunewood, Lonelyville and Fire Island Pines, located on Fire Island, New York, are due for periodic renourishment in 2008. Davis Park has been wracked by severe erosion within hot spots extending along one-third of the community shoreline. Seaview, Ocean Beach and Ocean Bay Park suffered from the recent nor'easter which has aggravated their long term erosion trend. Other communities such as Corneille Estates and Summer Club may decide to join this project at a later date. Timely renourishment is needed to avoid a state of critical erosion that has occurred in the past. The communities, reaches and sand sources are identified in Figure 1 below. The total project area encompasses 4 reaches, along 29,000 liner feet of shoreline with a nourishment volume of 1.9 million cubic yards in 2008-9. Each year in project delay can increase the project volume by approximately 150,000 cy/yr.

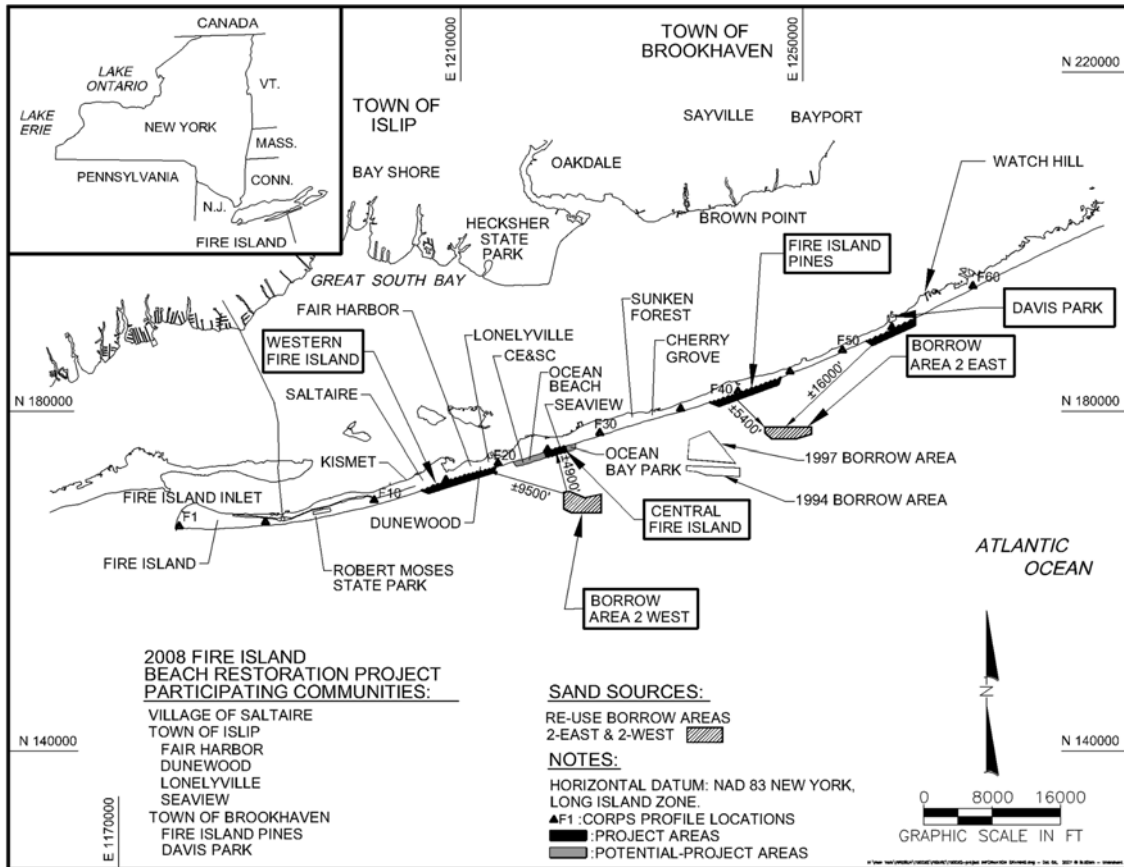


Figure 1: Fire Island Location Map

Fire Island is a 31-mile long barrier island located on the south shore of Long Island, in Suffolk County, New York (Figure 1). The island is bounded by the Atlantic Ocean to the south, Fire Island Inlet to the west, Moriches Inlet to the east, and the Great South Bay to the north. Fire Island consists of a mixture of National, State, and County Parks, municipal recreation areas, and

a number of residential communities. The communities, located between Robert Moses State Park and the Otis G. Pike Wilderness Area (Watch Hill), are predominately comprised of summer cottages & houses and a smaller number of full-time residences.

Historic Projects: The Fire Island developed communities have nourished their beaches periodically since the early 1990s. In the aftermath of severe storms in the early 1990's, a number of communities were renourished using the 1994 borrow area (Figure 1). Western Fire Island was nourished with 465,000 cy and Fire Island Pines received approximately 200,000 cy. Ocean Beach among other communities also was nourished. In 1997, Fire Island Pines completed their project by placing 650,000 cubic yards from the 1997 borrow area.

Five communities on Fire Island, NY were renourished with sand from two new offshore sources between November 2003 and January 2004. The communities were grouped into three contractual entities comprised of the Incorporated Village of Saltaire, Town of Islip (Fair Harbor, Dunewood, Lonelyville), and Town of Brookhaven (Fire Island Pines). The projects were constructed by Great Lakes Dredge and Dock Company (GLDD) using their hydraulic cutterhead dredge *Alaska* and trailing-suction hopper dredge *Liberty Island*. The construction volume for Western Fire Island and Fire Island Pines was 637,800 and 516,400 cubic yards measured within the project limits in February 2004.

## **B. Purpose and Need**

Since 2004 accelerated shoreline recession along with the April 2007 nor'easter has hastened the need to secure permits before the communities become critically eroded. Some sections of the community are critically eroded today such as western Davis Park, and select reaches within Fire Island Pines, Western Fire Island and the Central Fire Island project reaches.

As a result of erosion, the communities are proposing a beach nourishment project to re-establish the shoreline protection developed in previous beach renourishment projects or where none exist, to project dimensions similar to that built in 2003. The western project area will encompass 7,300 feet within the developed communities of Saltaire, Fair Harbor, Dunewood and Lonelyville. In addition, taper sections extending 500 feet to the west (property of Fire Island National Seashore) and 500 feet to the east (property of the Town of Islip) will increase the sand retention in the project area, and add protection to those sections of beach as well.

The community of Fire Island Pines will renourish approximately 6,400 feet of beach, with tapers of 500 feet to the west and east into the property of Fire Island National Seashore.

Davis Park and the Central Reach (Seaview, Ocean Bay Park and others) plan to nourish their beaches to average dimensions similar to the 2003-04 projects. Tapers 500 feet in length are needed at the west and east end of each reach to minimize end losses and increase the projects durability. The proposed project sizes are summarized in Table 1 below:

**Table 1**  
**2008 Fire Island Nourishment Project Size Summary**

<b>Reaches</b>	<b>Developed Shoreline Length (ft)</b>	<b>Sand Volume (cy)</b>	<b>Proposed Taper Lengths (ft)</b>	<b>Modification from 2003 Permit</b>
Western Fire Island	7,280	500,000	1,000	Taper
Central Fire Island	7,580	570,000	1,000	New
Fire Island Pines	6,380	500,000	1,000	Tapers & Fill Dune Gap
Davis Park	4,140	305,000	1,000	New
Total	25,380	1,875,000	4,000	

Alternatives for the project include the no-action alternative, retreat/relocation of structures, construction of coastal shoreline hardening structures, beach renourishment from an upland source, and beach renourishment from a dredge source. The alternative of beach renourishment from a dredge source is preferred, due to feasibility, cost effectiveness, and low impact to the environment.

The preferred alternative entails renourishment of the existing beach and dune areas from two borrow sites in the Atlantic Ocean. For the western and central communities, the proposed borrow area (2-West) is located 0.9 to 1.8 miles south of the project area. The total length of fill for the renourishment project in the western and central communities will be about 8,280 and 8,580 feet, respectively. The proposed borrow area (2-East) for Fire Island Pines and Davis Park is located 1.0 to 3.0 miles south of the community. The total length of fill for the section is 12,520 feet.

The proposed 2008 project beach will be built to dimensions similar to the 2003-04 project using the same two sand sources and will require approximately 1.9 million cy. Some modification to the 2003 permit conditions is desirable to improve the efficiency of construction, the durability of the project, standardize the level of protection and avoid or minimize the dangers of winter construction.

**C. Design Cross-Section**

The design cross-section proposed for the 2008 project will be smaller than the proposed Corps of Engineers project size. The Corps current proposal is not publically available, but it is near the size illustrated in Figure 2 below. The Western and Fire Island Pines project areas will be renourished using the FINS template to the maximum extent feasible without jeopardizing the project's viability. The FINS and Corps templates are compared in Figure 2.

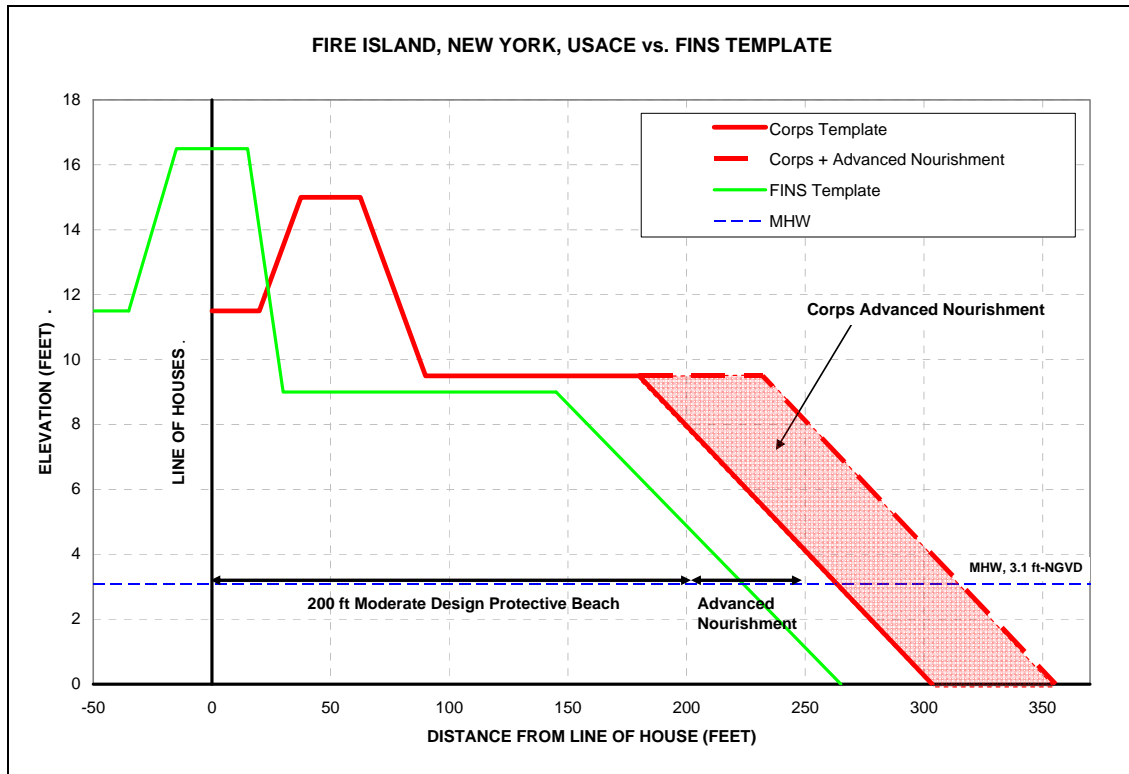


Figure 2: Design Template Comparison

FINS Template: Dune template to be constructed at 30 feet wide crest at 16.5 ft NGVD. This 30 feet will extend 15' seaward and landward of the central dune crestline ~ OR - where no dune is present the dune crestline will be located by following the trend of the adjacent (east and west) dune crestlines. The inland slope of 1:4 will extend to the position of the natural grade. The beach is always measured from the seaward toe of the dune. From that seaward of an existing dune that is already 30 feet wide at the crest at 16.5 feet NGVD, and sloping seaward to the beach at 9.0 ft NGVD, the allowable beach width will be 100 feet at 9.0 ft NGVD plus a 1:15 slope down to 0 ft NGVD which will equal 135 feet for a total of 235 feet from the seaward dune toe down to 0 feet NGVD. The beach is always measured from the seaward toe of the dune.

Corps of Engineers Design Cross-section: It has a similar shape to the above, but differs in its implementation. The Corps cross-section has a dune width of 25 ft. at elevation 15 ft NGVD, and dunes slopes of 1:5. The landward toe of dune has a buffer area from existing development required by the State of New York for access to the back of the dune. The beach berm is 90 feet long to the seaward berm crest, from which the dune slope descends at 1V:13H slope to 0' NGVD. The Corps is considering other alternative with different landward start points, requiring the acquisition and removal of selected houses. It appears that the removal of a few houses may be economically justified.

The most striking difference between the FINS template and the Corps Template is advanced nourishment. Based on interpretations in 2003 provided by FINS staff & consultants, the FINS template has no provisions for advanced nourishment, while the

Corps' Template places the advanced nourishment seaward of the berm face. Advanced nourishment is a quantity of sand expected to erode during the project life. The FINS temple cannot be considered an engineered design without a consideration for local erosion rates alongshore.

In previous Fire Island designs by CPE, a protective two hundred foot beach width from the line of houses to the MHW line was found to offer moderate level of protection (CPE 2002). Dune elevations in the 15-17 foot elevations were placed where they could fit seaward or tangent with existing line of houses.

Figure 2 shows a comparison between the three methods, illustrating that the FINS Template and the 200 foot standard has a seaward projection smaller than the Corps plan. The communities can live with the FINS average volume density, but need flexibility to vary the width alongshore in proportion to the local advanced nourishment requirements.

#### **D. Sand Sources**

The sand sources for the 2008 project will be the same ones previously permitted in 2003-04. There is approximately 2.8 million cubic yards of sand remaining in both borrow areas, especially if the previously permitted cut depth is increased by a few feet in Borrow Area 2-East (Figure 1). The borrow areas are located seaward of the -37' NGVD contour line, a recent planning depth for borrow areas established by the Corps.

The borrow areas for the projects are located in the US Army Corps of Engineers (USACE) Borrow Area 2 complex, which has been subdivided into Borrow Area 2-West and Borrow Area 2-East for this project since the 2003.

Borrow Area 2-East has a surface area of 156 acres and lies in water depth of 38-43 feet NGVD. Dredged sand from this depth is coarser than existing beach sand, with a mean grain size approximately 0.42mm. Approximately 700,000 cy of sand was removed from this borrow area in 2003-04.

Borrow Area 2-West has a surface area of 209 acres and lies in water depth of 44-53 feet NGVD. Sand characteristics are comparable in size to the existing beach sand, with a mean grain size of 0.40mm. No change is proposed for its' borrow area dimension from those previous permitted.

These borrow areas were permitted in 2003 based on specific cultural resources and biological investigations, and conditions have not changed other than the removal of the yardage for the previous project. The small depth increase was considered during previous investigations. The proposed project will exhaust the sand available within the 2003 permitted project limits. A geological report will be prepared to analyze possible impairments caused by the borrow areas. The sand sources are summarized in the table below:

**Table 2  
Sand Source Summary**

<b>Borrow Area</b>	<b>Sand Volume Remaining (cy)</b>	<b>Composite Grain Size (mm)</b>	<b>Initial Volume (cy)</b>
2-West	1,840,000	0.40	3,500,000
2-East	950,000	0.44	1,500,000
Total	2,790,000		5,000,000

**E. Construction Method and Timing**

For each reach, beach construction will be accomplished utilizing a hydraulic cutterhead dredge connected by submerged pipeline to the shoreline of the communities; or a hopper dredge which collects sand at one location and transports it to another location pumping ashore via submerged pipelines. Both types of dredges were used successfully in the 2003-04 project. Once ashore the pipeline will be extended along the beach as the construction progresses. In addition to dredge equipment, construction will require the use of bulldozers, front-end loaders, and other heavy construction equipment, supply and crew trucks. Permission to access the project area through swales at Kismet Fire Station and just west of Lonelyville is needed for the western communities. Beach access to the Central Reach, Fire Island Pines and Davis Park will be along the beach from previous project areas. Barges may be used in selected cases.

The communities need to begin construction by mid-September, due to the inhospitable nature of winter dredging in the north Atlantic. Active construction will take approximately 2-4 months, with an additional month required for mobilization and demobilization of equipment. The ideal construction timeline would be to construct beach and dune areas during the fall months. Construction during this time will have the lowest environmental impact due to a short construction time, and will occur at a time when few visitors are on the island.

In addition to renourishment, the communities plan to stabilize the restored dune system with vegetation, sand fencing, and dune walk-overs. This will not only stabilize the new dune area, but also facilitate colonization by native flora and fauna.

**F. Changes from the 2008 Project**

The communities plan to stick to the project size and conditions permitted in 2003-04 project to the greatest extent practical. The project performance since 2004 indicates that some change would be beneficial to the project durability, construction efficiency & safety, level of protection, and could allow for an economic price. The proposed changes are summarized below:

Timing: Start construction on or near September 15 for both types of dredges. The hydraulic dredge was permitted to start October 1 in 2003, and the hopper not until November 15. The hopper restrictions are more severe than in the Gulf of Mexico, where year round hopper dredging is allowed with appropriate restrictions and conditions in a relatively rich turtle environment. A late construction start will double the project time and greatly increase the cost

of construction. The later the start date the slower the construction time, and the longer the equipment is working in the ocean.

Sand Source: Beach compatible sand lies a few feet deeper than the 2003 borrow area cut limits for borrow area 2-East. Extra dredge depth can provide beach compatible sand for Fire Island Pines and Davis Park. A wave refraction analyses will be conducted to measure the potential impact of this change.

Project-Design Cross-Section: The 2003 project was limited by a cross-section develop by FINS geomorphology consultant. As described above and illustrated in Figure 2, this cross section is too small to be universally applied. The proposed project does not envision a larger average volume density from 2003, but there is a need to distribute sand alongshore according to engineering principals. Larger volume densities should be placed in hot-spots, while colds spots (stable to low erosion areas) need less density. If tapers are not allowed, the cross-section near the community borders should be increased to mitigate of the lack of tapers.

Dunes should be continuous and full, but the rigid placement requirements of the FINS template in Figure 2 do not allow sufficient flexibility to construct with height and width allowed by the template. The cross-shore placement needs to be flexible so that gaps and low points can be avoided. Recently damaged dunes should be repair of their historic dimensions.

Taper Section: The lack of tapers section at the three FINS borders in the 2003 project caused increased sand losses from the project area, even on the updrift project segments. Tapers entirely within the communities will leave some shoreline areas vulnerable to storm impacts at less than the design life. Tapers increase the durability and life of the project. Beach sand has been placed in other national parks with similar environmental considerations. A geological analysis of historic reports and recent Lidar data will be conducted to examine environment impacts and potential impairment caused by tapers.

New Communities: Two new reaches are proposed for this project; Davis Park and the Central Reach (Ocean Bay Park, Seaview, Ocean Beach and others). Their long term erosion was aggravated by the April 2007 nor'easter, and it would be economical to address their beach erosion now. The latest news from the Corps of Engineers is that their studies are still many years from completion, and the communities need a nourishment project to protect their communities until the comprehensive Corps project can be implemented.

## **G. Project Studies**

An environmental assessment of the project area was conducted for the 2003-04 project and it will be updated for the 2008 project. Results show that although construction will have a short-term impact on beach and dune communities through displacement of flora and fauna, recolonization is expected within a short period of time following completion of construction, resulting in negligible impacts. The essential fish habitat offshore of the project site is also expected to suffer minimal, if any, impact from the dredging and renourishment project. The most significant impact will be to the benthic communities of the borrow area and beach/inshore area where sand fill is placed. It is expected that invertebrates and benthic fishes may be lost due

to dredging and fill placement. However, recolonization of beach/inshore area is expected within 2-7 months (Hackney et al., 1996; Nelson, 1985), and that of the borrow area within 12-18 months (Naqvi & Pullen, 1982). There is a concern about hopper dredge impacts to sea turtles before November 15, which can be addressed by procedures described in the NMFS Gulf of Mexico Biological Opinion.

Special status species, including the piping plover, least tern, seabeach amaranth, and seabeach knotweed are expected to undergo negligible negative impacts as a short-term effect. Piping plover and least terns have been observed in the Fire Island Pines project area; however, there has been no nesting of either species observed since the single (unsuccessful) piping plover nest in 2004. Piping plovers and least terns are more commonly observed outside of the developed communities throughout Fire Island. In the event a piping plover or least tern nest is found, mitigation efforts, including fencing off nesting areas to avoid construction until hatchlings are fledged, will be implemented. Discussions of specific environmental protection and monitoring requirements have been undertaken with the US Fish and Wildlife Service (USFWS). Discussions will result in special permit conditions requested by USFWS and agreed to by the applicants.

Seabeach amaranth and seabeach knotweed are known to inhabit the project area. If a specimen of either plant is found, that specimen and sufficient root system will be transplanted to an area adjacent to construction, to prevent loss of the specimen.

A geological analysis of previous reports will be conducted to evaluate potential impairments within the Fire Island National Seashore as expressed by FINS staff members. A wave refraction analysis of proposed depth changes to Borrow Area 2-East will be conducted to evaluate potential impacts.

The following permits and approvals are required for this beach renourishment project:

1. US Army Corps of Engineers
2. National Parks Service/Fire Island National Seashore—Special Use Permit and Vehicle Access Permits
3. NYS Department of Environmental Conservation—Article 15, 25 and 34 Permits
4. NYS Department of State—Coastal Consistency Certification
5. Town of Islip—Town Board Authorization for placement of fill on town lands
6. Town of Brookhaven—Coastal Erosion Hazard Permit
7. NYS OGS Dredging Permit

Post-construction environmental monitoring will be conducted in a manner similar to the 2003-04 project, but some modification is expected where the previous monitoring showed no or little environmental impacts occurred. No significant impacts have been identified from the previous beach projects and borrow areas along the Fire Island developed communities.