North Shore of Long Island,
Asharoken, New York
Coastal Storm Risk Management
Feasibility Study

Appendix B

Environmental Assessment

November 2015

DRAFT
ENVIRONMENTAL ASSESSMENT

North Shore of Long Island, Asharoken, Suffolk County, New York Coastal Storm Risk Management Feasibility Study.

U.S. ARMY CORPS OF ENGINEERS

New York District

November 2015

EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers (USACE) New York District (NYD) proposes to provide long-term coastal storm risk management for Asharoken Avenue by depositing beachfill, installing three new rock groins, and providing periodic sand nourishment to reduce erosion affecting Asharoken Beach (Study Area) in the Village of Asharoken, Town of Huntington, Suffolk County, New York. The Village of Asharoken is located along the north shore of Long Island from Eaton's Neck Point to the northwest and Long Island Lighting Company (LILCO) Northport Power Station to the southeast. Long-term and storm-induced erosion threatens to continue to degrade remaining protective line of beach, dune, private bulkhead, and the previously constructed USACE Section 103 Project along the north (Long Island Sound) side of Asharoken Avenue.

The study area consists of a narrow section of land (tombolo) and developed shorefront with Long Island Sound to the north and Northport Bay to the south extending approximately 2.4 miles along Asharoken Avenue from the boarder of the Village of Eatons Neck to the west to the edge of Northport Basin – the cooling water intake lagoon at the Northport Power Station to the east. Asharoken Avenue, which runs parallel to the south shore of Long Island Sound provides the only access to the Village of Eaton's Neck, and thus represents the sole evacuation route to a community of approximately 1,500 residents west of the project site.

The purpose of the proposed action is to stabilize the beach and prevent erosion and flooding and the resultant damages to Asharoken Avenue, associated infrastructure and residences. Storm induced over washing of sand across the western section of Asharoken Ave. has caused environmental damage to areas of Northport Bay salt marsh that lie immediately south of the project site. The Proposed Action is needed because the study area has continually experienced, moderate to severe episodes of storm-induced waves and wave run-up resulting in beach erosion, damage to, and closure of, Asharoken Ave, as well as damage to associated infrastructure and adjacent residences. The frequency of the weather events that cause these erosive conditions is expected to increase as a consequence of climate change.

Closure of Asharoken Avenue becomes a serious impediment to the residents of Asharoken and Eaton's Neck. The loss of access creates a multitude safety hazards including loss of fire, police, and ambulance, emergency services. Although there is a firehouse on Eaton's Neck, no additional resources are available to fight a large fire when the road is impassable. While Asharoken Avenue was blocked during the December 1992 storm, two residents of Eaton's Neck had to be evacuated by helicopter for medical treatment. In the March 1993 northeaster, fire fighters were unable to reach a burning residence due to flooding on Asharoken Avenue (USACE-NYD, 2013). In 2012, during Hurricane Sandy, waves overtopped the bulkheads, causing storm damage, surface erosion and flooding, as well as direct damage to several structures in this area (USACE-NYD, 2013). Flooding from Sandy carried with it high volumes of sand and debris which smothered wetlands and maritime forest understory plants when the tides and floodwaters receded.

The proposed plan for Asharoken Beach includes the dredging and placement of approximately 600,000 cy of fill material to rebuild the beach and berm and the construction of three rock groins on the Western end of the project to retain sand and decrease erosion at a "hotspot" there. The sand used for the initial 600,000 placement will be dredged from a nearby offshore borrow area (delineated as borrow area "A") located about ½ mile offshore of the western section of the project beach. Dredging is to be conducted on the side of a ridge of sand, removing areas of higher relief minimizing the potential of leaving a significant depression that can exacerbate the development of hypoxia in bottom waters. Dredging will be conducted during the fall (October-December) to minimize potential impacts to stationary or slow moving early life stages of various marine fish and invertebrate species. Dredging during this period will also help to minimize the potential for low dissolved oxygen. Periodic re-nourishment is anticipated at a frequency of 80,000 cy every 5 years. Sand for each re-nourishment will be trucked in from a fully permitted upland site. Presently about 10,000 cy of sand is annually dredged from the LILCO power station inlet and is "by passed" on to the eastern most section of the project beach, adjacent to the LILCO property. This practice is expected to continue for the life time of the project.

Based on the past storm events and existing and expected without-project shoreline conditions, it is clear that wave attack and over topping of dunes and bulkheads will continue to cause shoreline recession, damage to existing protection structures, infrastructure and residences, accelerating with time in a without project future. The TSP would reduce the risk of damages from wave energy and overtopping forces. The implementation of the proposed Project will have significant overall beneficial impacts to the adjacent communities, including shoreline stabilization, reduced risk of damage and expanded recreational opportunities. The TSP will also offer protection of marsh habitats, and increase in the availability of suitable habitat for Federal and state-listed species of shorebirds.

Impacts to marine and terrestrial resources in the proposed Project Area are expected to be minor and temporary. There will be some short-term adverse impacts to terrestrial and aquatic habitats and the species that utilize the habitats. These impacts would be largely limited to the dredging, sand placement and groin footprints and areas in their immediate vicinity. Impacts are expected to be local temporary in nature coinciding with the initial construction period and nourishment activities. There will be project life duration impacts in terms of changes to habitat once the project is completed. Such impacts include the habitat created by the installation of groins, changes to profile of the beach, berm and nearshore and the new topography created at the borrow area. Direct adverse impacts during construction are expected to be minor because many affected species will utilize other suitable habitat nearby if disturbed. Many sessile species will be lost, but are expected to rapidly re-colonize once the disturbance has ended. The construction of the groins will permanently cover the substrate beneath the footprint and non-mobile benthic species will be lost. The benthic infauna community will be replaced by that of a "reef" community. This change will increase local diversity and may be viewed as beneficial. Colonization of the groins will increase the forage base for many fish species as well as create habitat for structure oriented fish and invertebrates. Groins will also offer roosting and foraging habitat for various shorebirds. Mobile species displaced by construction activities will utilize other suitable habitat for foraging activities etc. Much of the existing upper beach and dune areas within the Project Area are currently of relatively low value to most wildlife species.

The project related direct and indirect adverse impacts to environmental resources including potential loss of benthic invertebrate species, finfish, submerged aquatic vegetation and/or disturbance affects will be minimal and will not be significant to local resident or migratory populations. The use of Best Management Practices (BMP) during construction will be implemented through all phases of construction and include measures to be implemented prior to, during and after completion of the project. To minimize depth related impacts to water quality such as the potential for low oxygen excavation will be conducted along the side of a ridge which is expected to all but eliminate typical impacts related to creating a deep pit with steep side slopes. To minimize impacts to sensitive early life stages of important aquatic organisms dredging will be conducted during specific seasonal window (October to mid-January) as regulated by the NYSDEC. Use of a cutterhead pipeline dredge is the expected method of dredging to be used for this project. Other than the direct impact to sediment born organisms and a temporary localized increase in turbidity, no other significant impacts to water quality or biota are anticipated. If used hopper dredges would be equipped with state of the art turtle and sturgeon deflectors to decrease the probability of impacting or taking either species. Qualified individuals will be placed on board all dredges to monitor for the presence of any ESA species in the vicinity of the dredge as well as monitor for ESA takes due to entrainment. A pre and post construction benthic characterization program as requested by the NYSDEC will be implemented to assess the any impacts to offshore habitats. All concerned species management and protection will be guided by USFWS and NMFS recommendations including any measures recommended in regard to potential impacts from the project's public access sites.

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APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

The List of Abbreviations and Acronyms section will define the abbreviations and acronyms referenced throughout the Environmental Assessment.

°F	degrees Fahrenheit
APE	Area of Potential Effect
BMP	Best Management Practice
CAP	Continuing Authority Program
CERCLIS	Comprehensive, Environmental Response, Compensation and Liability Information System
CO	carbon monoxide
COC	contaminant of concern
cy	cubic yard(s)
DO	Dissolved Oxygen
DPS	Distinct Population Segments
DWT	displaced weight tons
EA	Environmental Assessment
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
ft	foot/feet
fps	feet per second
FWOP	Future Without Project
in	inch(es)
IPCC	Intergovernmental Panel on Climate Change
L	liter(s)
LILCO	Long Island Lighting Company
LIS	Long Island Sound
LPIL	lowest possible identification level
mg	milligram(s)
MHW	mean high water
MHHW	mean higher high water
MLLW	mean lower low water
MLW	mean low water
mm	millimeter(s)
MSFCMA	Magnuson Stevens Fisheries Conservation and Management Act
MSGC	Metropolitan Sand and Gravel Company
NAAQS	National Ambient Air Quality Standards
NAVD	North American Vertical Datum
NED	National Economic Development
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxides
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation

NYSDOS	New York Department of State
O_3	Ozone
PAH	Polycyclic aromatic hydrocarbon
Pb	Lead
PM-2.5	particulate matter less than 2.5 microns in width
ppt	parts per thousand
RCRIS	Resource Conservation and Recovery Information System
SHPO	State Historic Preservation Office
SLR	Sea Level Rise
SO_x	sulfur oxides
TRIS	Toxic Release Inventory System
USACE-NYD	United States Army Corps of Engineers New York District
USEPA	United States Environmental Protection Agency
yr	year(s)

1.0 INTRODUCTION AND SITE DESCRIPTION

Asharoken Beach Project is located in Village of Asharoken, Town of Huntington, Suffolk County, New York. The project beach and study area is located along the north shore of Long Island from Eaton's Neck Point to the northwest and Long Island Power Authority (LIPA) Northport Power Station to the southeast. The U.S. Army Corps of Engineers (USACE) New York District (NYD) proposes to provide long-term coastal erosion and storm protection for the Village of Asharoken including Asharoken Avenue by rebuilding the beach and dune, installing three new rock groins, and providing periodic sand nourishment to maintain the project design template.

The study area consists of a narrow section of land and developed shorefront along Long Island Sound Northport Bay to the south, extending approximately 2.4 miles between along Asharoken Avenue between Bevin Road intersection and the eastern edge of Northport Basin – the cooling water intake lagoon at the Northport Power Station (Figure 1). The width of the beach at mean low water (MLW) varies along this section of beach from 50 feet at the northwestern section near Bevin Road to approximately 100 feet (ft) at the southeastern limit near the power plant. Asharoken Avenue, provides the only access to the villages of Asharoken and Eaton's Neck, a community of approximately 1,500 residents based on a 2010 census.

Figure 1. Map of Study Area

In the late 18th century, a shoal began to form between Long Island and Eaton's Neck Island as a result of longshore sediment transport, gradually becoming only navigable by ship at high tide.

Continued accretion of the shoal, supplied predominantly with sediment from shores to the east, eventually joined Eaton's Neck with Long Island (USACE-NYD, 2013).

In the 1930s, the Metropolitan Sand and Gravel Company (MSGC) built two jetties into Long Island Sound to connect to a basin being enlarged for excavation of sand, currently known as Northport Basin. A permit for this construction was issued in March 1930 with the condition that the jetties would be temporary and removed in five years. MSGC excavated sand from Northport Basin, periodically requesting and receiving time extensions for the jetty permit until March 1968, when LILCO bought the property and started construction of the power plant. In 1977, LILCO requested and subsequently received a change of permit for permanent maintenance of the jetties. Erosion to the west of the jetties and accretion to the east of the jetties began to occur after the jetties were constructed. Tugs and other vessels use the basin and the channel between the jetties to service a fuel platform located 2 miles offshore where 50,000 Displaced Weight Tons (DTW) tankers dock to unload oil for the power plant. Recreational boaters and some commercial fisherman also use the Basin to launch their vessels. Since the construction of the power plant, LILCO has dredged material from the channel serving the cooling water intake lagoon and deposited the material (15k cy annually) on the beach west of the jetties.

To counter the erosion at Asharoken Beach, timber bulkheads were constructed by homeowners and five interlocking concrete groins were placed by the New York State Department of Public Works in 1956. Old photos of the eroded shoreline after the Thanksgiving 1950 northeaster show evidence of old sheet pile or timber groins, apparently as an earlier effort to stem erosion at Asharoken. A concrete and stone groin was also constructed in Reach 1 (Figure 2) approximately 1,000 feet southeast of Bevins Road in 1952 (USACE-NYD, 2013).

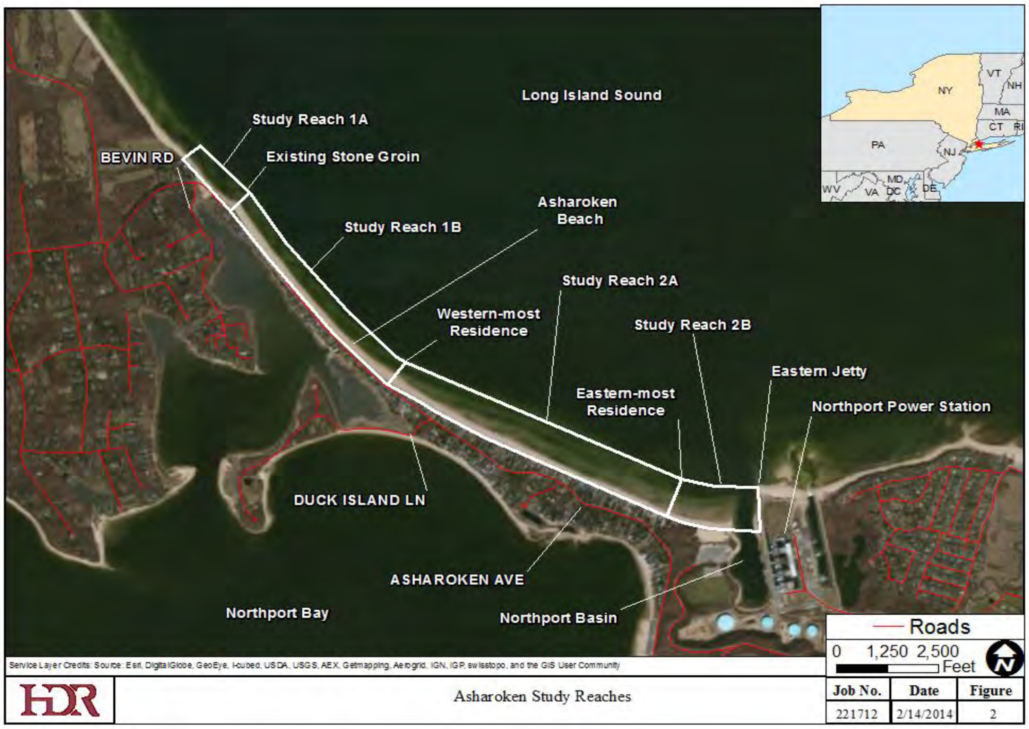


Figure 2 Asharoken Study Reaches

During past storm events, municipal and residential structures have suffered minor damage. However, flooding of Asharoken Avenue has occurred at the northwestern portion of the study area. Additionally, during past storms the northwestern portion of the study area has experienced wave attacks which have caused overtopping of the dune system. This overtopping has deposited sand and debris and has created ponding of water on Asharoken Avenue causing the road to be impassible for more than 24 hours. Since the shoreline continues eroding, the roadway and properties will be subject to increasing storm damage without additional shore protection measures.

Asharoken Beach suffered severe erosion losses in the 1962 Ash Wednesday storm. To repair this damage, about 840,000 cy of sand (640,000 by New York State and 200,000 by the Village of Asharoken) were taken from nearby offshore borrow area and placed on the beach in the Village of Asharoken. This borrow areas can still be identified by current bathymetry and the that remains has been shown to be responsible for an erosional hot spot (nodal point) on the adjacent beach front (USACE-NYD, 2013).

Following the December 1992 northeaster, Congress authorized a study of storm damage problems on the North Shore of Long Island. To expedite protection for the critical area along the northwestern 900 linear feet of Asharoken Avenue near Bevin Road, (see Figure 2), an emergency shoreline protection project was implemented in 1997 by the USACE. This was done in partnership with the New York State Department of Environmental Conservation (NYSDEC), under the authority of Section 103 of the Rivers and Harbors Act of 1962, part of the USACE's

Continuing Authority Program (CAP). The project design included a 10-ft-tall steel sheet pile wall with riprap toe protection on the seaward side and sand backfill on the landward side. The steel sheet pile has a top elevation of 12.5 ft National Geodetic Vertical Datum (NGVD) and is supported by steel strut beams and whalers connected to deadmen 15 ft landward of the sheet pile. The 800-pound riprap with a side slope of 1 ft vertical on 3.5 ft horizontal was covered by sand fill with the same side slope (Figure 3). A 20-ft-wide artificial dune behind the wall was stabilized with geotextile matting and planted with American beach grass (*Ammophila breviligulata*). The roadway protection was designed for up to a 22-year storm event to temporarily protect the most vulnerable portion of Asharoken Avenue near Bevin Road.

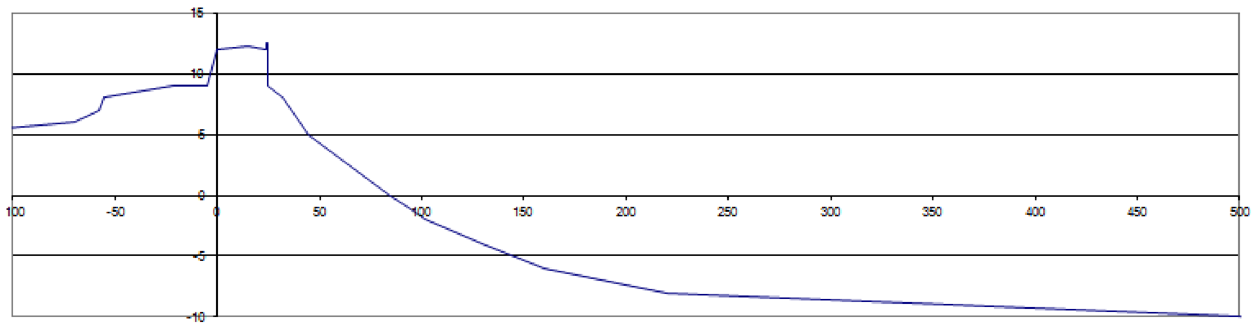
Figure 3 Repaired/Modified 103 Project (Reach 1a)

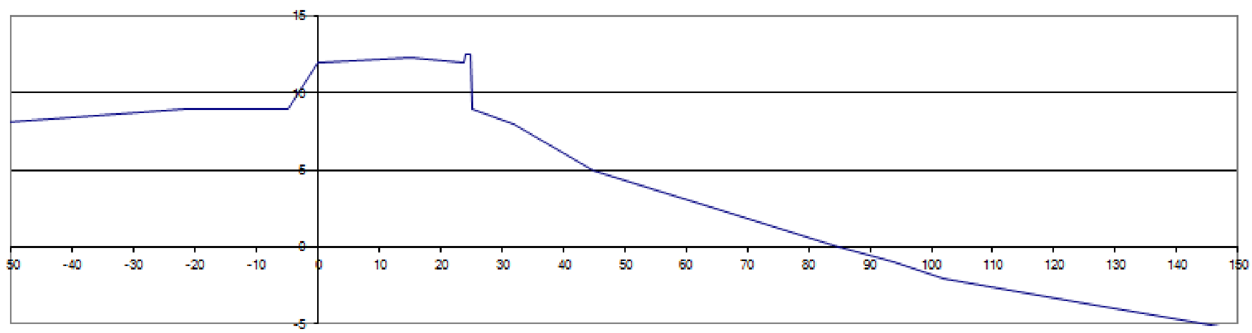
Since its construction several powerful storms damaged the bulkhead and dune project, necessitating repairs. Damage from Tropical Depression Ernesto in September 2006 required emergency repairs in two phases in 2007. The Nor'Ida coastal storm in November 2009 and a northeaster in March 2010 damaged the project and a short length of the roadbed of Asharoken Avenue, again requiring emergency repairs. The project was damaged during Hurricane Irene in August 2011 and Hurricane Sandy in October 2012, and was again repaired. The temporary protection project continues to provide a low level of protection to Asharoken Avenue in Reach 1, up to a 10 percent (10-year, if communicating risk in the manner prior to E.R. 1105-2-101 guidance) storm event, and has a remaining life of seven years.

For engineering and economic analyses, the present project's study area has been subdivided into two primary reaches along the Long Island Sound Shorefront – based on the presence or absence of shorefront residences – with each primary reach sub-divided into two sub-reaches. The definition/delineation of each reach is presented below:

> ***Reach 1a***. This reach starts from the western border of project shoreline near the intersection of Bevin Road and Asharoken Avenue, extending east approximately 900 ft along the waterfront shoreline. A stone groin is located to the eastern limit of this reach. This shoreline was washed over during the 1992 northeaster and was since rebuilt to a 15

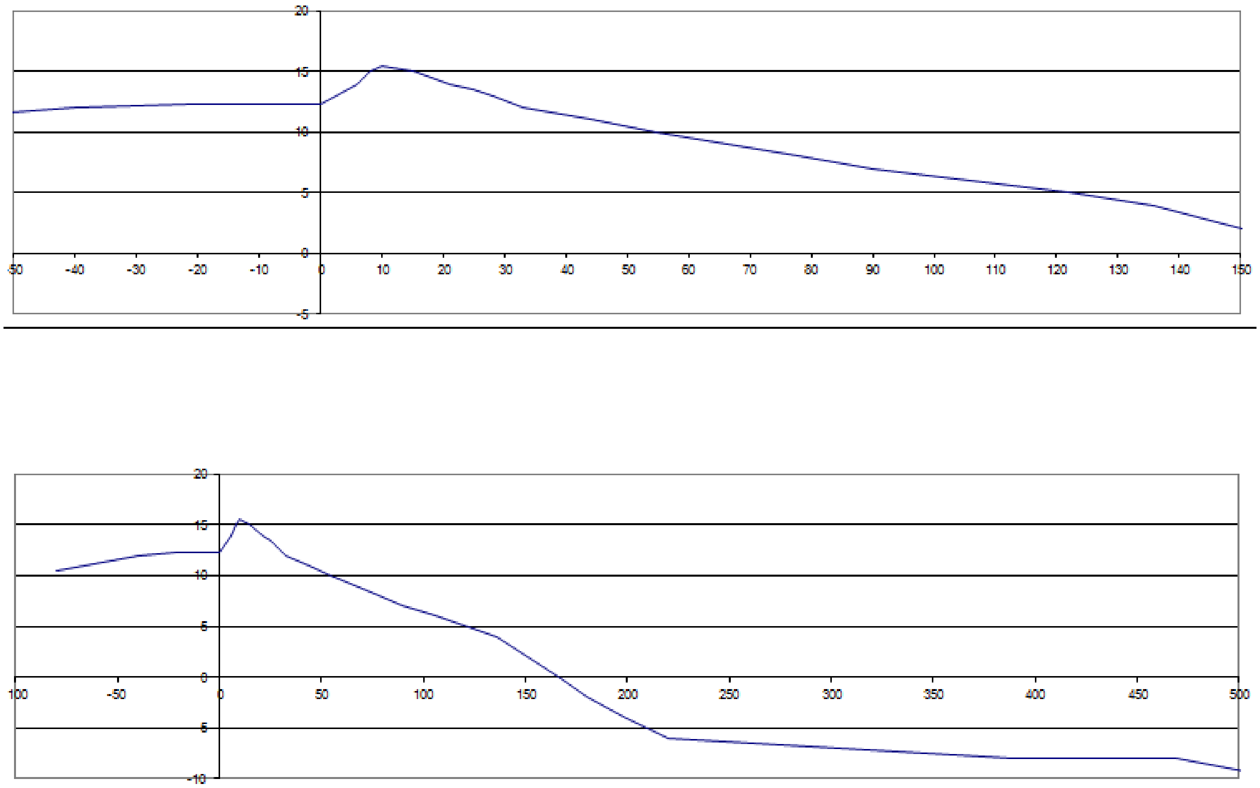
year design life erosion control structure under the authority of Section 103 Small Shore Protection Projects. The Section 103 design includes a steel sheet pile at +12.5 ft NGVD crest elevation, a riprap toe protection and an approximately 20 ft wide backfill. The road elevation behind this reach is approximately 9 ft above NGVD. Beach profile of this stretch of shoreline is characterized by a relatively steep foreshore slope and a narrow berm averaging +6 ft NGVD elevation in front of the steel bulkhead. The foreshore slope is approximately 1 vertical on 8 horizontal down to elevation –6 ft NGVD. Asharoken Avenue is located landward of the backfill. Beach widths in this reach range from 0 ft to 20 ft measured from the MHHW (+3.9 ft. NGVD) shoreline to bulkhead toe line with riprap protection. The offshore slope is approximately 1 vertical on 100 horizontal.





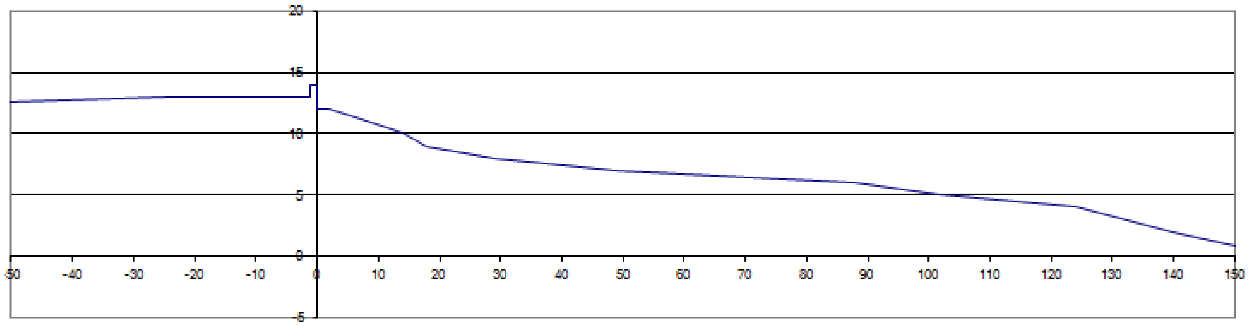
Typical Profiles for Reach 1a Shoreline

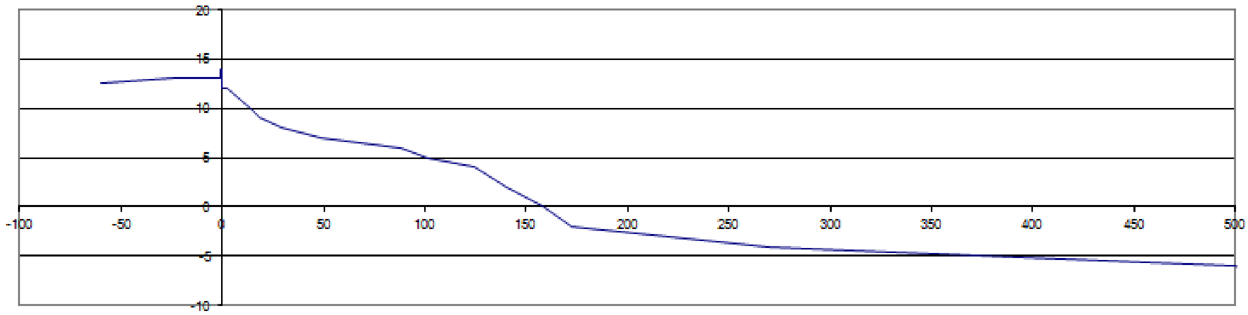
Reach 1b. This reach extends approximately 5,300 ft along the shoreline from the stone groin east to Duck Island Lane. The waterfront along this stretch of shoreline is a typical dune and beach formation with approximately +15.5 ft NGVD dune crest, sloping berm, steep foreshore slope, and mild offshore slope. Asharoken Avenue is located landward of the dune with private properties located further landward of the road. The average ground elevation (of Asharoken Ave.) behind the dune is approximately 12 ft above NGVD. The 50 ft wide sloping berm changes from +10 ft NGVD at the toe of dune down to +4 ft NGVD. Foreshore slope along this reach is approximately 1 vertical on 8 horizontal. The average beach width from base of dune to 0 ft. NGVD shoreline is approximately 100 ft. Offshore slope is approximately 1 vertical on 100 horizontal.



Typical Profiles for Reach 1b Shoreline

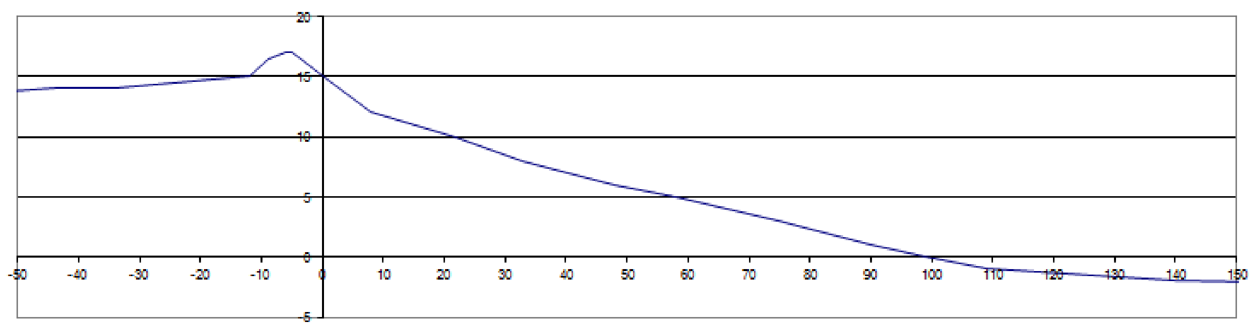
Reach 2a. This 5,000 ft reach, extending from Duck Island Lane (located at approximately the first house on the waterfront) east to the last house on waterfront (approximately 1,200 ft west of west jetty) is characterized by waterfront properties protected with timber bulkheads at an average of approximately +14 ft NGVD crest elevation. The average ground elevation behind the bulkhead is approximately +13 ft NGVD. There is a stretch of approximately 800 ft shoreline without bulkhead but protected with dune crest at an average of +15 ft NGVD. Typical beach profile in this reach is comprised of a relatively low berm and a steep forshore slope at 1 vertical on 8 horizontal. The average seaward berm elevation stands at +4 ft NGVD and gently slopes up to +12 ft NGVD. Riprap toe protection fronting the bulkhead is scattered along the entire length of the reach. The average beach width from bulkhead to MHHW (+3.9 ft. NGVD) shoreline ranges between approximately 0 to 120 ft. Offshore slope is approximately 1 vertical on 100 horizontal.

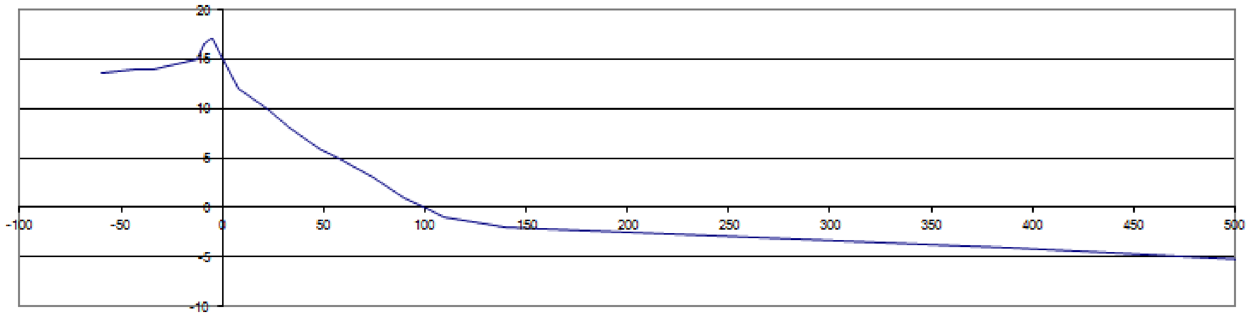




Typical Profiles for Reach 2a Shoreline

Reach 2b. This reach extends approximately 1,200 ft along the shoreline from eastern limit of private houses (approximately 1,200 ft west of the west jetty) to the west jetty of the intake lagoon. This stretch of shoreline is a typical dune and beach formation with approximately +17 ft NGVD dune crest, sloping berm continuous with a steep foreshore slope to elevation –2 ft NGVD and a mild offshore slope. The average ground elevation behind the dune is approximately 14 ft above NGVD. The foreshore beach slope is approximately 1 vertical on 8 horizontal. Offshore slope is approximately 1 vertical on 100 horizontal. Seaward dune slope is approximately 1 vertical on 3 horizontal. The average beach width from base of dune to MHHW (+3.9ft. NGVD) shoreline is approximately 40 to 60 ft.

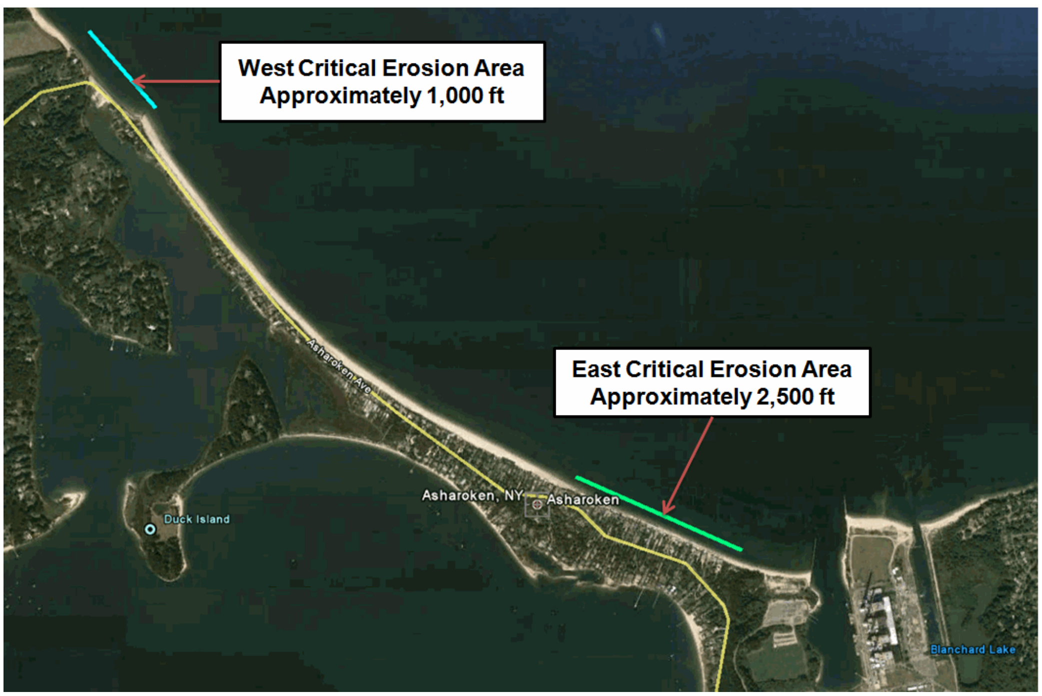




Typical Profiles for Reach 2b Shoreline

In addition to the general shoreline recession in the four Reaches described above, there are two critical erosion areas located near the western and eastern boundaries of the project shoreline as shown in Figure 4.

Figure 4. Asharoken Beach Critical Erosion Areas



The Asharoken shoreline faces northeast and is thus exposed to erosion from surges and waves on Long Island Sound generated from northerly to easterly winds. These coastal effects dominate the erosive processes along Asharoken Beach. The effects of these erosive forces are exacerbated by the lack of accretion on the beach due to existing sediment transport conditions.

Shoreline sediment transport analyses indicate that the Northport Power Plant inlet and jetties form a littoral block. This littoral block effectively limits the westward movement of sediment – the predominant direction of littoral transport along the northern shore of Long Island – and contributes to the long-term erosion of the study area. Aspects of power plant operation are shown in Figure 5. To the east, the warm water discharged by the power plant flows over a weir. Since the original construction of the jetties, the shoreline just east of the jetties has accreted, while the shores to the west and northwest have eroded. The only sand that is bypassing around the jetties is the inlet dredged material placed on the beach (Reach 2B) just west of the west jetty as part of the power plant operation (USACE-NYD, 2013).

Figure 5. Northport Power Station

1.1 Objectives

Planning objectives were identified based on the problems, needs, and opportunities, as well as the existing physical and environmental constraints present in the study area. The primary Federal objective is to contribute to the National Economic Development (NED) account consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders and other Federal planning requirements. Accordingly, the following objectives were identified:

- Reduce the probability of storm-induced damages in the Village of Asharoken.
- Reduce emergency costs in responding to overwash and repair work associated with maintaining Asharoken Avenue.
- Contribute to the national economy by reducing repair, rehabilitation, and flood-fighting costs associated with flood damage to structures and supporting infrastructure.
- Maximize NED benefits in all plan components, in accordance with the limits of institutional participation.

1.2 Purpose and Need for Action

The purpose of the proposed action is to stabilize the beach and prevent erosion and flooding along Asharoken Avenue. The Proposed Action is needed because the study area has experienced moderate to severe beach erosion from storm-induced waves and wave run-up. The coastal hazards of long-term and storm-induced erosion and wave attack pose the greatest threat to residential structures, Asharoken Avenue, and, in particular, the remaining protective beach along the Long Island Sound. As Asharoken Avenue is the only vehicular access to Eaton's Neck, one of the most critical problems for the study area is wave attack and severe beach erosion fronting Asharoken Avenue in Reach 1A at the northwestern end of Asharoken Beach near the intersection with Bevin Road. In addition, some residences in the study area are susceptible to inundation by high storm surge levels and have previously experienced first-floor flooding, resulting in damages to the contents and, to a minor extent, structures of buildings (USACE-NYD, 2013).

Asharoken Avenue has been damaged numerous times as a result of wave action and storm-induced erosion. In the Thanksgiving storm of 1950, Asharoken Avenue was partially destroyed when erosion undermined the road, causing the concrete to buckle. Evacuation delays were incurred in addition to high utility repair and road restoration costs. During more recent storms, the northwestern portion of the study area (Reaches 1A and 1B) has continued to experience storm surge and wave attack that have caused overtopping of the dune system and erosion of the beach. This overtopping has deposited sand and debris on Asharoken Avenue, obstructing the road for hours and causing damage to utilities and the road bed. Damage during the December 1992 northeaster occurred primarily along a 900-ft section of the road (Reach 1A) near the vicinity of Bevin Road. During the March 2010 northeaster, which sustained Level I Hurricane gusts, a length of Asharoken Avenue's roadbed was damaged and fiber optic cables were exposed (USACE-NYD, 2013).

Closure of Asharoken Avenue disrupts access for the residents of Eaton's Neck. The loss of access creates a safety hazard as Eaton's Neck is cut off from emergency services including fire, police, and ambulance. Although there is a firehouse on Eaton's Neck, no additional resources are available to fight a large fire when the road is impassable. While Asharoken Avenue was blocked during the December 1992 storm, two residents of Eaton's Neck had to be evacuated by helicopter for medical treatment. In the March 1993 northeaster, fire fighters were unable to reach a burning residence due to flooding on Asharoken Avenue (USACE-NYD, 2013).

During the 1992 Northeaster, several homes on the Northport Bay and Eaton's Neck reported flooding problems caused by high surge. Flood levels have ranged from 1 to 2 ft above the first floor in some structures. Local officials agreed that Long Island Sound storm forces are the main problem, and the bayside flooding problems are relatively minor. None of the structural measures considered for Asharoken in this report are designed to reduce the risk of flooding from Northport Bay. As is discussed later in this report, non-structural measures were considered for threatened residences along the Northport Bay side of Asharoken Avenue (USACE-NYD, 2013).

The southeastern portion of Asharoken Beach (Reach 2A) is also susceptible to storm-induced erosion. Residents have constructed a nearly continuous line of private bulkheads to protect approximately 70 year-round residences located between Long Island Sound and Asharoken Avenue. These bulkheads vary in height, construction material, and condition, providing inconsistent levels of protection. During the December 1992 northeaster, several residential structures in this area were damaged by erosion, and privately constructed bulkheads were damaged due to erosion and wave attack.

In 2012, during Hurricane Sandy, waves overtopped the bulkheads, resulting in surface erosion and flooding, as well as direct damage to several structures in this area (USACE-NYD, 2013). Heavy flooding, carrying with it high volumes of sand and associated debris remained covering wetlands and understory plants when the tides and floodwaters receded.

1.3 Proposed Action

The proposed plan for Asharoken Beach includes the dredging and placement of approximately 600,000 cy of fill material to rebuild the beach and 50' wide berm. and the construction of three rock groins on the Western end of the project. The source of the initial sand for the beachfill will be an offshore borrow area (Figure 6). Periodic re-nourishment is anticipated at a frequency of 80,000 cy every 5 years with the re-nourishment sand trucked in from a certified source. Another re-nourishment source will be sand dredged from the National Grid power station inlet to the east and "by passed" to the project site (@15,000 cy annually).

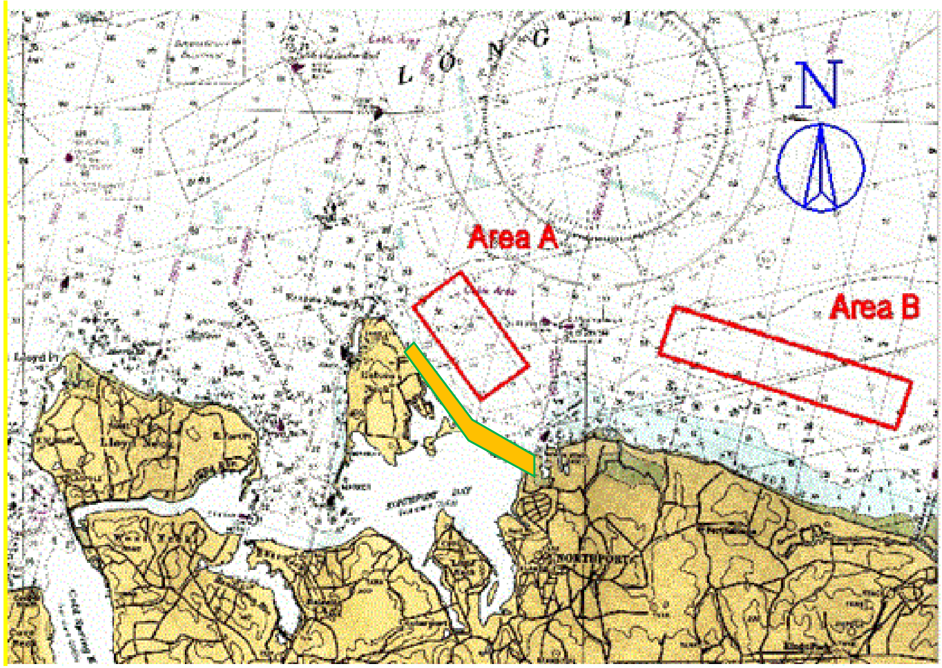


Figure 6. Borrow Source (Area A) General Location Map

1.4 Project Authorization

The North Shore of Long Island, New York, study was authorized by the Committee of Public Works and Transportation, United States House of Representatives, adopted 13 May 1993. To wit:

> Resolved by the Committee on Public Works and Transportation of the United States House of Representatives, That, the Secretary of the Army, acting through the Chief of Engineers, is requested to review the report of the Chief of Engineers on the North Shore of Long Island, Suffolk, County, New York, published as House Document 198, Ninety-second Congress, Second Session, and other pertinent reports to determine whether modifications of the recommendations contained therein are advisable at the present time, in the interest of beach erosion control, coastal storm risk management and related purposes, on the North Shore of Long Island, New York, particularly in and adjacent to the communities.

2.0 SELECTED PLANNING ALTERNATIVES

The USACE-NYD developed multiple coastal storm risk management alternatives consistent with both Federal objectives and the desires of the community. The alternatives that best met the economic, environmental, health and safety, and technical criteria for this study area consisted of Alternatives 1, 4, and 5, of 5. Alternative 4 was chosen as the Tentatively Selected Plan, TSP. The following paragraph and associated table give a brief overview/comparison of the 3 short listed Alternatives and each one's environmental effects.

Table 1

	Alternative 1	Alternative 4	Alternative 5
	Beachfill Only	Beachfill+3 West Groins	Beachfill+11 Groins
Initial Fill Volume (CY)	600,000	600,000	600,000
Coastal Structures	n/a	3 rock groins	11 rock groins
Nourisment (cy/period)	60,000 cy/3 yrs	80,000 cy/5 yrs	100,000 cy/10 yrs
Total Nourishment in 50yrs	1,000,000 cy	800,000 cy	500,000 cy
Advantages	Low Initial Cost	Reduced Erosion Rate	Reduced Erosion Rate
		Reduced Nourishment	Reduced Nourishment
		Volume and Frequency	Volume and Frequency
		Stabilized West	Stabilized both East and
		Shoreline	West Shoreline
		Reduced Seawall Damage	Reduced both Seawall and
			Timber Bulkhead Damages
Disadvantages	Frequent Nourishment	Need Downdrift Mitigation	Need Downdrift Mitigation
	Frequent Seawall and		
	Bulkhead Damage Repair		

Area of Groin Footprints : Alternative 4 = 0.58 acre /Alternative 5 2.54 acres

As one can see from the above table, the initial beach fill operation is identical among all the alternatives as would be the environmental affects of this construction phase. Thus any differences in environmental impacts would arise from the variations in re-nourishment cycles and volumes and the number of groins constructed. In regard to re-nourishment cycles and volumes placed the there might be a significant difference in benthic recovery and benthic diversity between Alternative 1 and Alternative 4 and 5 because of the higher frequency of placement of Alternative 1. The difference in impacts related to the frequency of re-nourishment between 4 and 5 is probably not significant because benthic recovery is anticipated to be complete after 2-3 years. Alternative 4, however might require two re-nourishments for every one required for Alternative 5. The most significant environmental difference between Alternatives 4 and 5 would be 3 groins constructed versus 11. Although the biological impacts of such hard structures have both beneficial and adverse aspects, in general excessive hardening of the shoreline is considered to have negative environmental implications by the NYSDEC as well as the NYSDOS.

2.1 Tentatively Selected Plan

The Tentatively Selected Plan (TSP) consists of approximately 2.4 miles of initial beachfill, three new rock groins and periodic nourishment of sand. A preliminary design baseline has been set up along the existing permanent features, which include the existing steel bulkhead seawall at the western border of the study area, Asharoken Avenue, and the timber bulkhead along the eastern half of the project shoreline.

Details of the selected protection plan are described below by section reach. The beach nourishment template can be seen as Figure 7a while Figure 7b displays the plan for the 3 western groins. Planned Project Beach Profiles are located in Table 2.

Station 0+ 00 to 9+00 – Initial 100 ft Width Composite Beachfill with Three Rock Groins and 500 ft Beachfill Tapers
This 900-ft shoreline fronts the existing steel bulkhead seawall and would receive beachfill with a high berm elevation of +12 ft North American vertical Datum (NAVD) and low berm at +8 ft. The crest width of the +12 ft berm is 50 ft, with 1 vertical on 5 horizontal seaward slope. The +8 ft berm is 30 ft wide with a 1 vertical on 15 horizontal foreshore slope. The composite beachfill will provide storm wave protection to the existing bulkhead seawall.

The 100 ft wide composite berm width will be retained with three new rock groins located at stations -5+00, 0+00 and 5+00. The groin lengths are 120 ft, 100 ft, and 80 ft in length respectively tapering from southeast to northwest, with crest elevation at +9 NAVD. Note that the terminal groin at station -5+00 may require longer trunk section in order to tie into the existing toe of bluff to avoid structural flanking.

Station 11+ 00 to 61+00 – 100 ft Width Composite Dune and Beachfill (no advance fill) A composite 100 ft wide dune and beachfill will be provided in this stretch of shoreline. The dune feature is a +15 ft crest width with 1 vertical on 3 horizontal side slopes on both landward and seaward sides. The berm is 50 ft wide with 1 vertical on 15 horizontal foreshore slopes. The proposed dune and beachfill will provide a total of 200 ft wide beach and a higher dune elevation.

Station 63+ 00 to 124+00 – 100 ft Width Beachfill Including 50 ft Advanced Nourishment
The stretch of shoreline with existing timber bulkheads would receive berm and beachfill totaling 100 ft. The proposed beachfill will include a 50 ft wide berm at +8 ft NAVD and 1 vertical on 15 foreshore slopes, plus an additional 50 ft berm width equivalent to 5 years of advance nourishment volume, including contingency due to outdated offshore bathymetry.

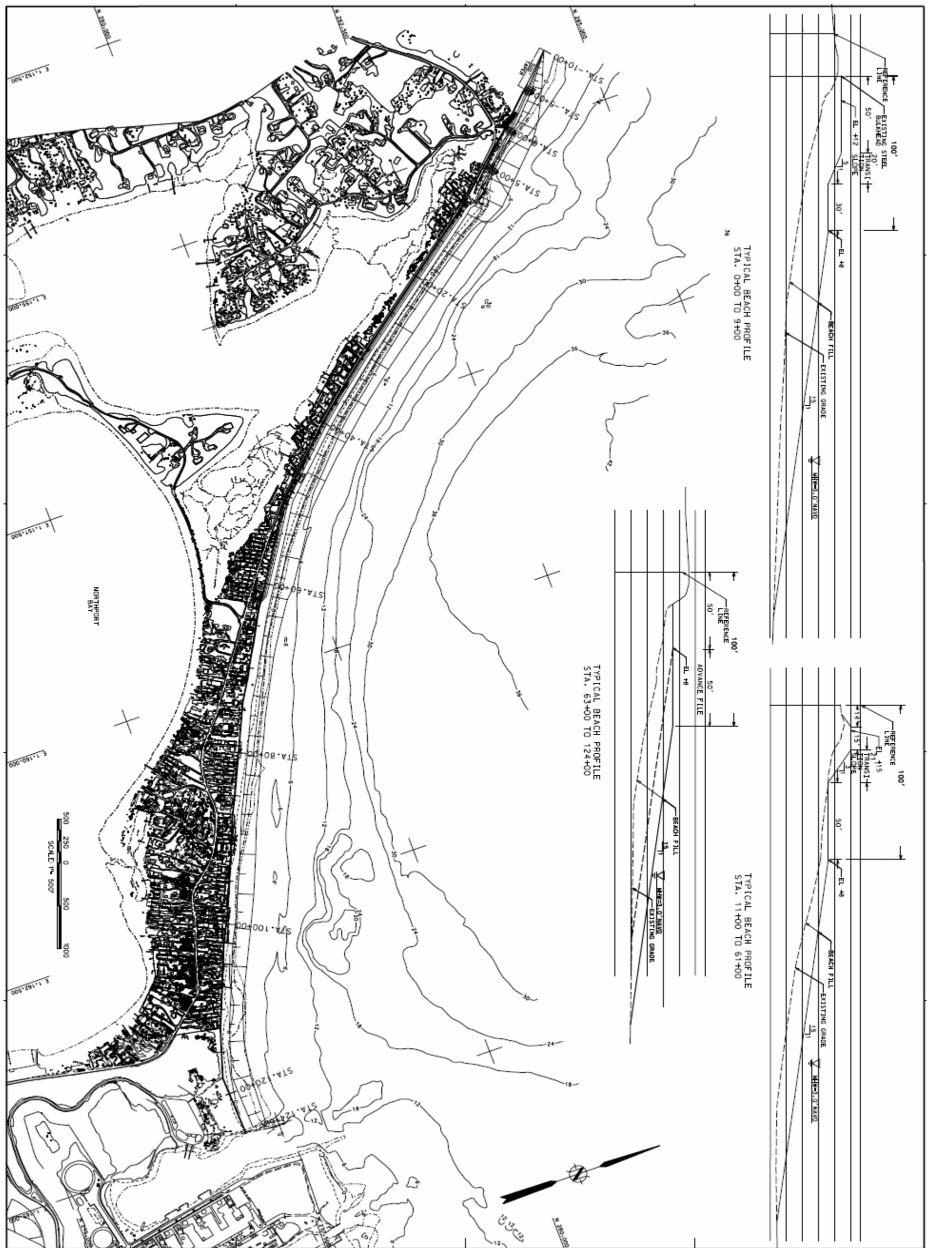
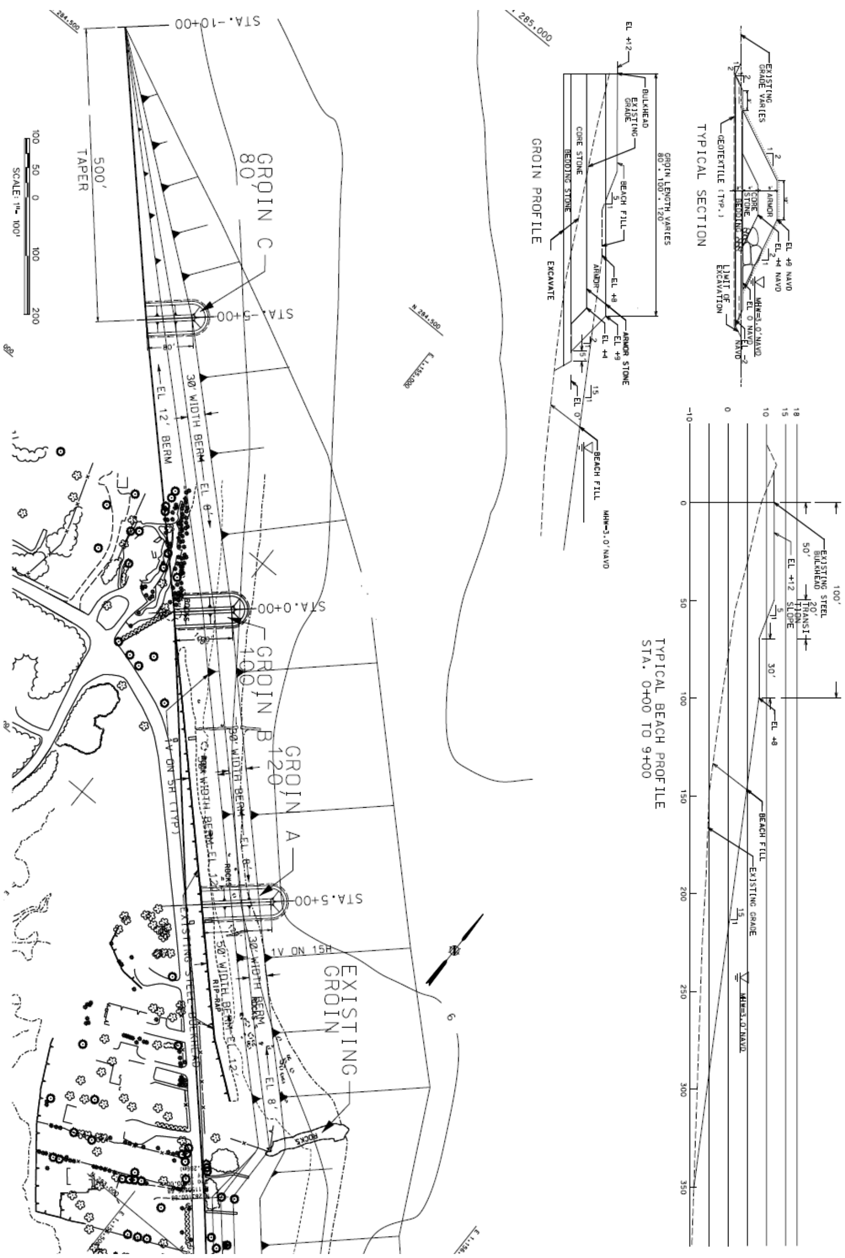


Figure 7a Beach Nourishment Template



7b Western Groin Layout

Tapering and Transition Beachfill

A 500 ft beachfill taper will be provided from Station -5+00 to -10+00. This transition will provide a continuous beachfill shoreline and stability west of the proposed taper groin at station -5+00. Two 200 ft beachfill transitions will be provided at station ranges from 9+00 to 11+00 and from 61+00 to 63+00 to maintain a continuous shoreline.

Periodic Nourishments

Beach re-nourishment is required over the life of the project to counteract long-term and storm-induced erosion and additional erosion from sea level rise. In addition to the advance nourishment during initial fill, an estimated 80,000-cy nourishment would be provided every 5 years to maintain the design beachfill profile. The nourishment would be placed between stations 62+00 to 124+00 as both beachfill and feeder beach. However, this nourishment would be adjusted based on the actual shoreline response, particularly the response of the 900 ft steel bulkhead seawall site with two new rock groins.

Following nourishment, the dune elevation would be approximately 15 ft. NGVD, with a 15-ft dune crest width, 1V:5H dune slopes, and a 50-ft berm width having a berm crest at elevation +7 to 8 ft NGVD (historically the most stable berm crest elevation to prevent scarping) with a historically stable 1V:15H foreshore slope, and sand fence and beach grass for added dune stability. A typical beach nourishment profile with berm and dune fill is shown in Figure 9.

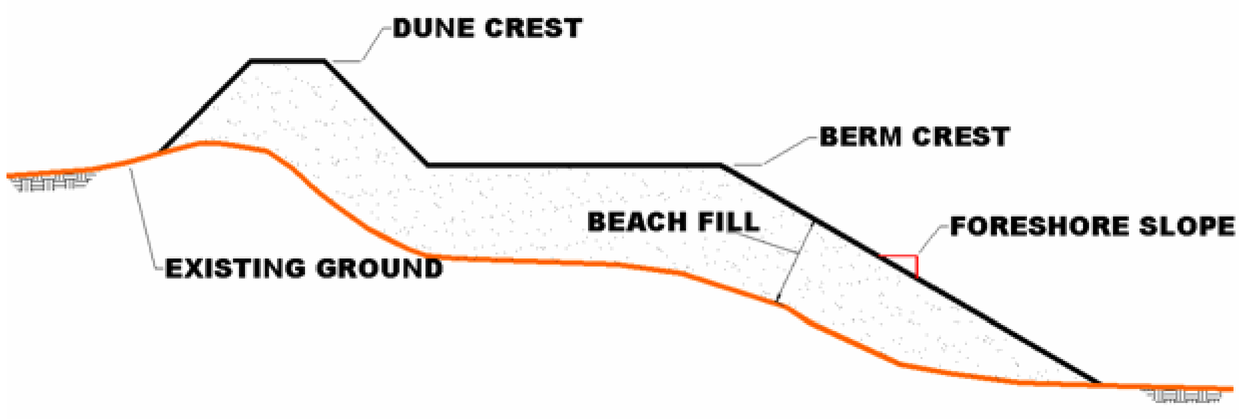


Figure 8

Borrow Source

The initial fill and advance fill source would be from Borrow Area A, just northeast of Asharoken Beach as shown in Figures 9 and 10. The boundaries of borrow area (north and south respectively) range from about 0.43 to about 0.85 miles offshore, perpendicular to the shore line. The water depth at the borrow site ranges from about 20 to 40 feet. Sand will be removed from an existing ridge minimizing any depression left by the dredge foot print within the surrounding bottom surface. Figure 11 displays the post dredge bathymetry profiles of transects lines 5 through 8 as seen in Figure 10

Figure 9 Detail of Borrow area A footprint from within the larger Area A box

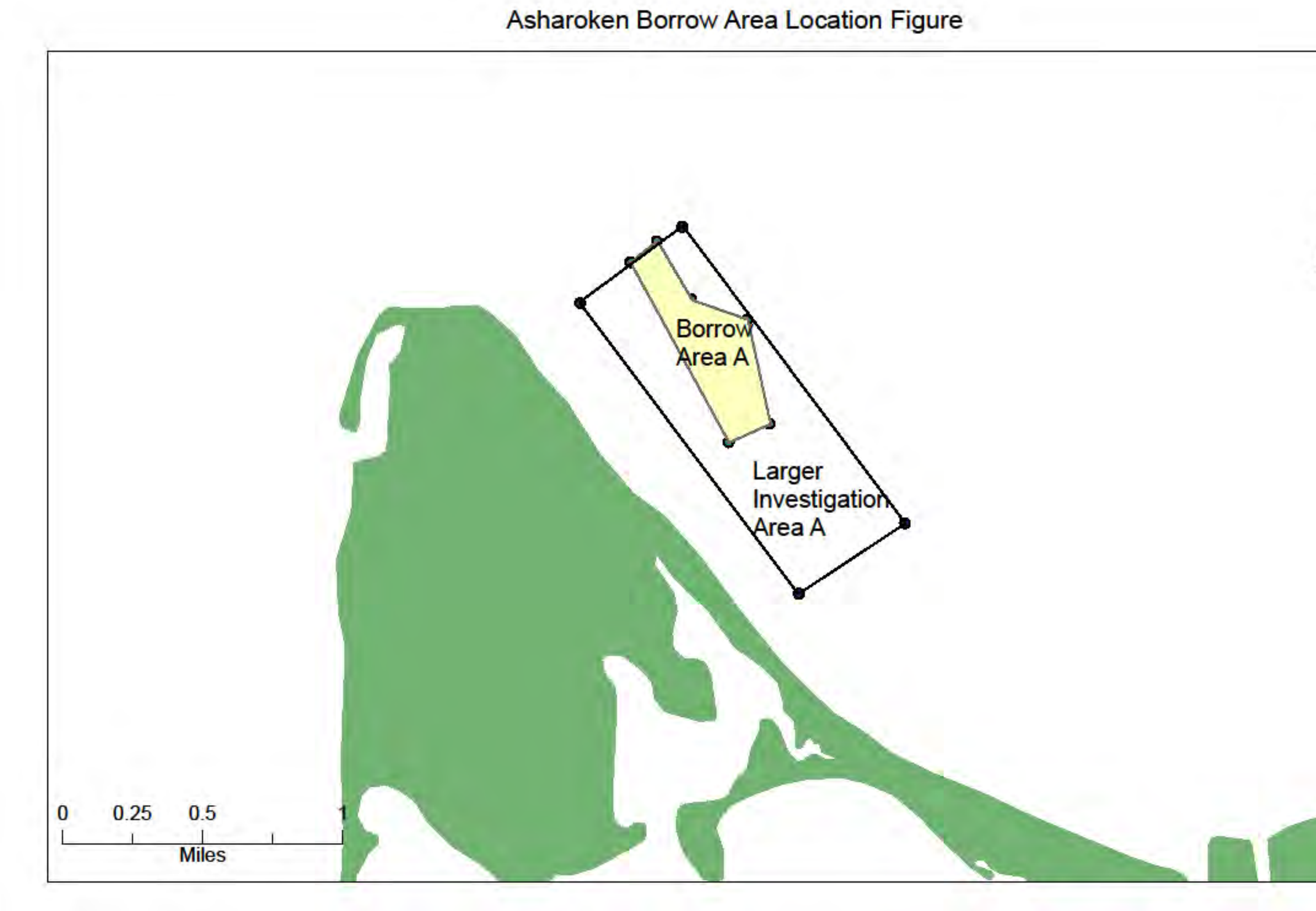


Figure 10 Dredge footprint detail note transect lines

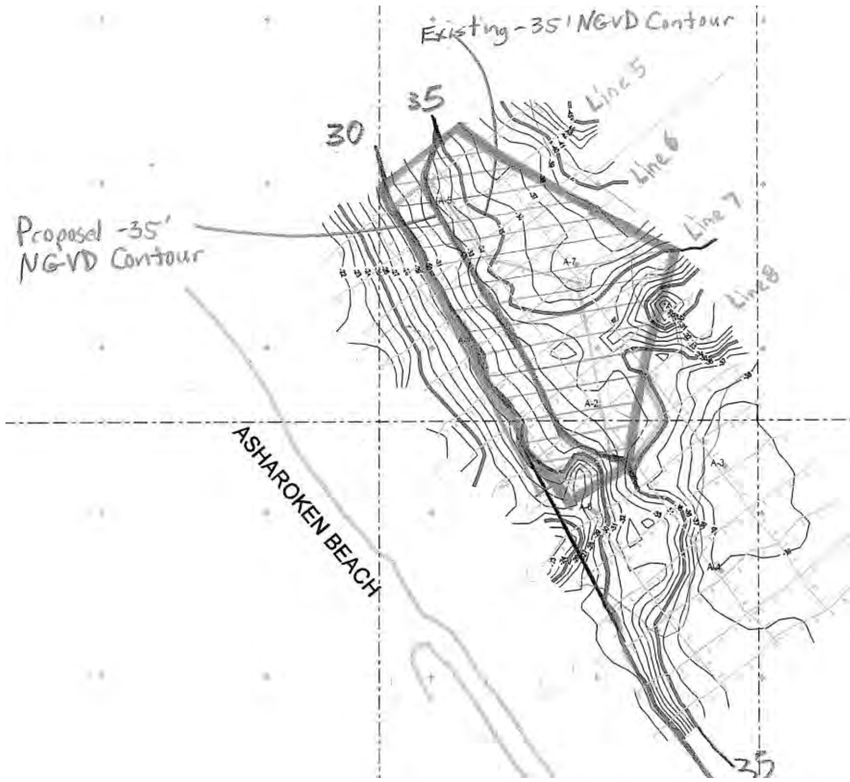
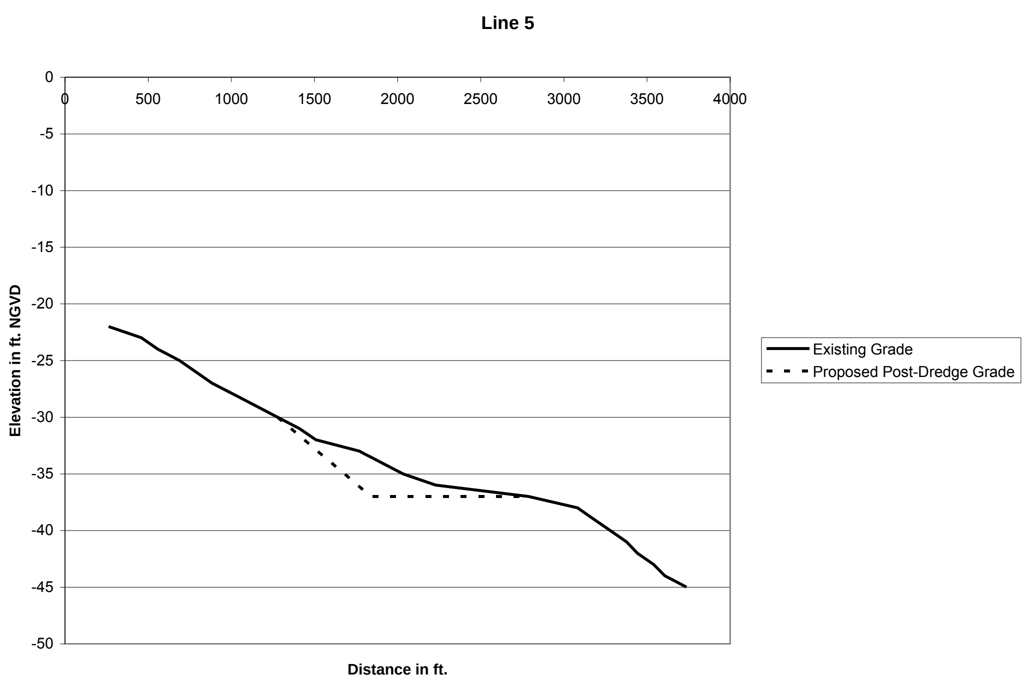
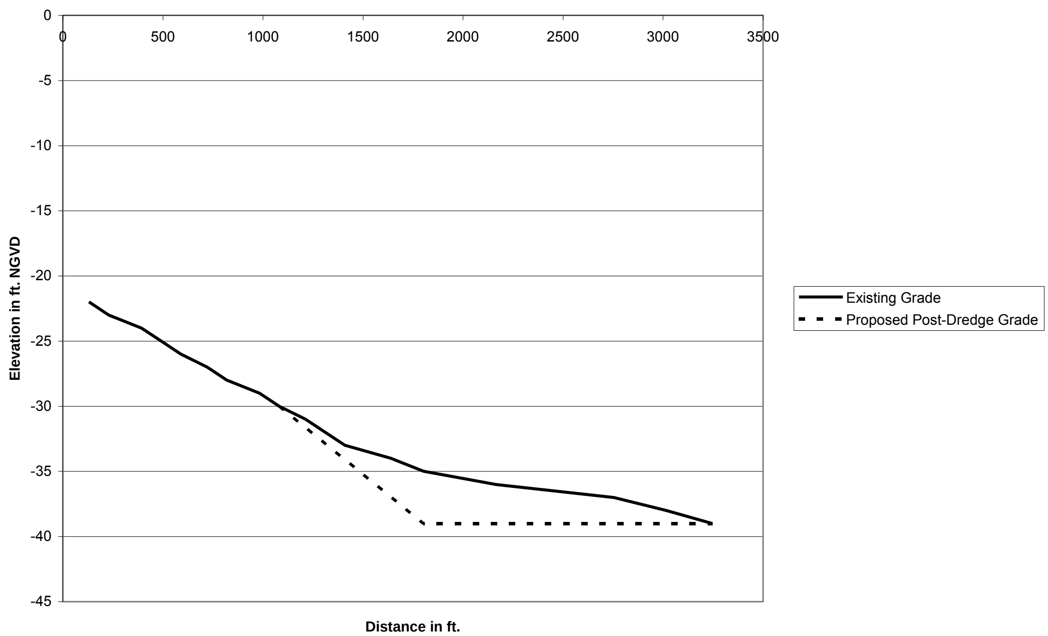


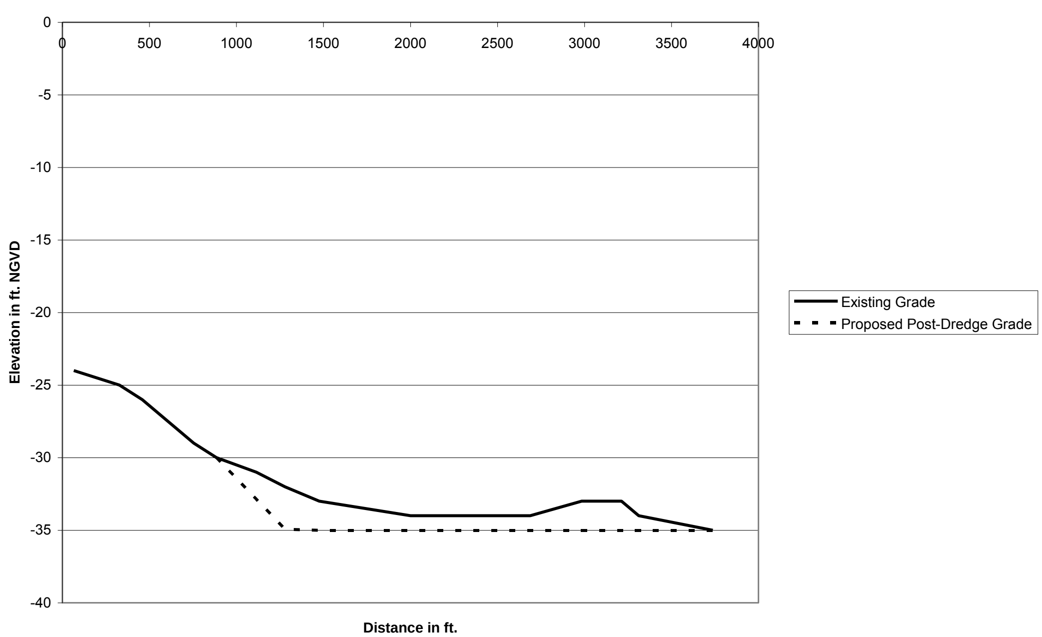
Figure 11 Borrow Area dredge transect bathymetry profiles



Line 6


0
500
1000
1500
2000
2500
3000
3500
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
Elevation in ft. NGVD
Distance in ft.
Existing Grade
Proposed Post-Dredge Grade

Line 7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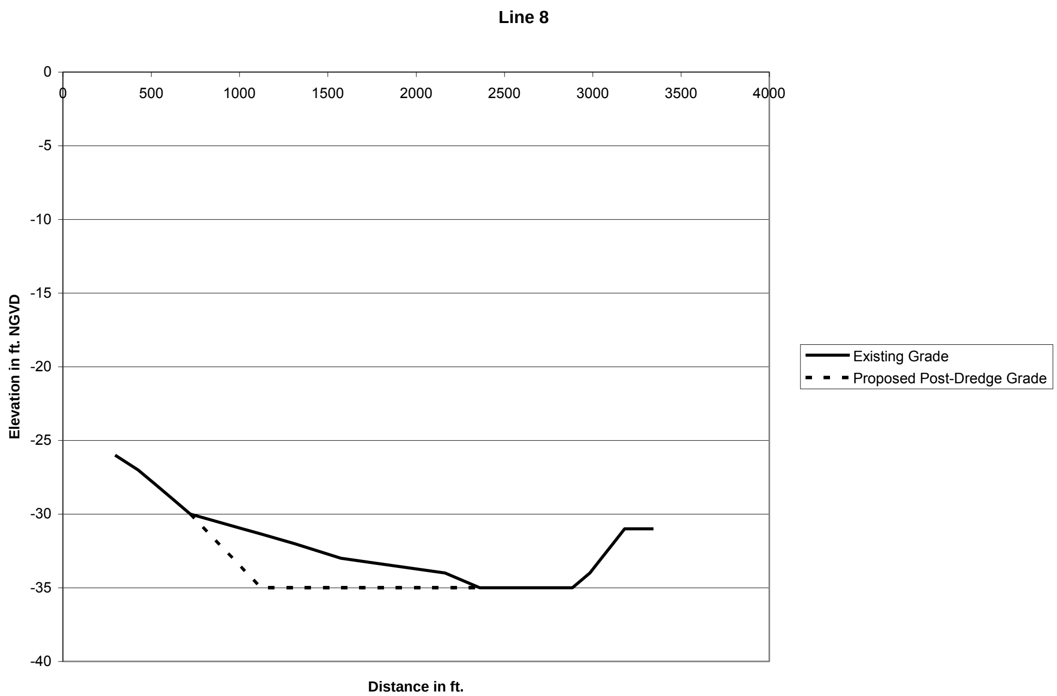
-40
Elevation in ft. NGVD
Distance in ft.
Existing Grade
Proposed Post-Dredge Grade



Cutterhead dredge would be the preferred method of dredging in Area A since it combines the qualities of high productivity in difficult soils with the ability to transport via pipeline to shore over distances of up to 15,000 feet and 30,000 feet with a booster pump. However, the Cutter Suction is unsuitable for large production in cobbles. Bars may be installed at the input end of the suction tube to reject large cobbles at their source. Where the cutterhead dredge cannot efficiently work, the backhoe or clamshell dredge would be utilized. A certified upland borrow source would be used for periodic re- nourishment cycles (80,000 cy every 5 years if needed).

Because public funding is being used to build this (beach) project, under (CFR citation) public access must be provided as part of the final project construction. As per USACE regulation access points must be available every ½ mile providing ingress or egress from the site within a quarter mile of any place on the project beach. Five access points are planned with the 2.5 miles of the project reach, with extra parking locations planned at the east and west ends.

2.2 Future Without Project, No Action Alternative

Under the Future Without Project (FWOP) condition, no action would be taken to stabilize the shoreline. Long term shoreline erosion and recession would continue along Asharoken Beach, particularly near the intersection of Asharoken Avenue and Bevin Road, and would increase the risk of damage to the Asharoken Avenue roadbed. Storm events would have the potential to obstruct Asharoken Avenue due to roadbed damage, flooding, or the deposition of sand and debris, disrupting emergency services for residents of Eaton's Neck. As Asharoken Avenue is the only vehicular access to Eaton's Neck, first responders during an emergency situation, such as fire, police, and ambulance services, would be impeded if Asharoken Avenue is obstructed. The protective beach along the southeastern portion of Asharoken Beach, adjacent to approximately 70 residences, would continue to erode, flood and increase the risk of damage to residential structures and bulkheads. Wave run-up and over topping would continue and lead to additional property damage.

In the absence of a shore protection project, it is assumed that the current coastal features (jetties, groins, Section 103 project, bulkheads, etc.) would remain in place and be repaired as necessary. It is also assumed that the power plant would continue to operate in a similar manner, periodically placing dredged material from the intake channel on the immediate down drift (western) shore. For evaluation purposes, the average yearly quantity of dredged material is estimated to remain at 15,000 cy/yr, as noted in recent historic records and the most recent dredging permit. It is also assumed that no additional littoral material would be transported to Asharoken Beach from the eastern shoreline. The expected future without project conditions for each of the four reaches are discussed below (USACE-NYD, 2013).

In addition, the two critical erosion areas would continue to be impacted. For the Western area, the continued destabilization of existing riprap, frequent seawall damage, overtopping and roadway damage as well as worsened down drift bluff erosion. For the Eastern Area, sediment deficits, un-natural shoreline alignment of timber bulkeads, deep water hole offshore which would worsen erosion and storm wave overtopping.

2.2.1 Reach 1A

Reach 1A from the vicinity of Bevin Road to the stone groin is the site of the temporary Section 103 project bulkhead and dune, constructed by the USACE in 1996 to 1997 and repaired in 2007, 2010, and 2013. This project was designed to reduce the threat of compromising Asharoken Avenue until a more comprehensive solution could be developed. The road elevation in this reach is approximately +7 to 9 ft NGVD. The beach profile in this reach is characterized by a steep foreshore slope and a narrow berm at +8 ft NGVD in front of the steel bulkhead. The foreshore slope is approximately 1 ft vertical on 8 ft horizontal down to elevation -6 ft NGVD. Beach widths in this reach range from 80 to 100 ft from the bulkhead to the 0 ft NGVD shoreline. The offshore slope ranges from 1 vertical ft to 15–100 ft horizontal.

The 1996-97 bulkhead and dune project has prevented the erosion of Asharoken Avenue for over 15 years. However, without a regular supply of littoral material, which is partially impeded by the groin structure, the beach to the north of this project has almost disappeared and moderately high tides and waves have attacked the bulkhead and the toe stone. In the Future Without Plan scenario, the small remaining beach would continue to recede, eventually causing bulkhead failure. In addition, storm-induced overtopping waves would cause the bulkhead to fail with rapid dune erosion, leading to frequent over-washes of Asharoken Avenue and damage to the road itself, interrupting access to Eaton's Neck. The existing beach protection provides for the equivalent of a surge from an approximately 10 percent storm event, which, due to erosion, is reduced to an approximately 20 percent storm event in the Future Without Plan scenario (USACE-NYD, 2013).

For evaluation purposes, it is assumed that the project would not completely fail until 2020, depending on the intensity of storms. Once failure occurs, it is assumed that, to save the road, the Village of Asharoken would undertake remedial measures or repairs consisting of driving steel sheet pile with rock armor toe protection and placing sand beachfill. This local work would provide protection against a storm with a surge elevation equivalent to a 20 percent storm event. Repairs would be repeated as necessary to maintain useable and safe road conditions

2.2.2 Reach 1B

This 5,300-ft-long reach extends from the extant stone groin southeast to the westernmost residential structure near Duck Island Lane. This reach is a dune and beach area with a dune crest of +15 ft NGVD, a sloping berm, a steep foreshore slope, and a mild offshore slope. Asharoken Avenue lies just landward of the narrow dunes with residential structures located further landward. Some of the dunes in this reach are no more than steeply sloped fill material placed just seaward of the road. Moving from northwest to southeast, the dunes become wider and more vegetated. The average ground elevation behind the dune is approximately +12 ft NGVD. The 100-ft-wide sloping berm changes from +12 ft NGVD at the toe of the dune down to +5 ft NGVD. The foreshore slope is about 1 ft vertical to 8 ft horizontal. The average beach width ranges between 100 and 150 ft. The offshore slope is approximately 1 ft vertical on 100 ft horizontal.

The long-term horizontal erosion rate in Reach 1B is about 1 ft/yr. Wave attack during moderate to severe storms would cause dune failure, particularly from wave overtopping and overwash. Initially, dune lowering would deposit sand on the road and nearby landward properties but wave attack during surge elevations of 5 to 15-year storm events would eventually damage the road and the structures behind the road.

As a recent example, the waves and high surge from Hurricane Sandy in October 2012 essentially destroyed the dunes in Reach 1B. Sand from the road area and approximately 5,000 cy of trucked-in sand were used to build a narrow triangular-shaped dune immediately seaward of Asharoken Avenue. This is considered a typical response to storm events in the FWOP scenario, and would be repeated as necessary after storm events (USACE-NYD, 2013).

2.2.3 Reach 2A

This 5,000-ft reach, extending from the westernmost residential structure near Duck Island Lane southeast to the easternmost residential structure on Asharoken Beach, is characterized by waterfront properties protected by timber bulkheads, some with riprap toe stone protection, at an average crest elevation of +14 ft NGVD. The average ground elevation behind the bulkhead is +13 ft NGVD. There is a stretch of shoreline without bulkheads within the reach that is 800 to 1,000 ft long and includes dunes with a crest elevation averaging +15.5 NGVD. The beach berm has a maximum elevation of +12 ft NGVD, which gentle slopes down to an average berm height of +4 ft NGVD. The beach width ranges between 150 and 180 ft. The offshore slope is approximately 1 ft vertical on 100 ft horizontal.

The long-term horizontal erosion rate in this reach is approximately 1 ft/yr. In the Future Without Plan condition, the existing bulkheads and dunes would eventually exhibit intermittent failure due to toe scour and wave overtopping forces. It is estimated that a storm surge elevation associated with a 5 to 15 year storm event would initiate bulkhead failures and a rapid loss of inland material, leading to damage of any residential structures located near the bulkheads.

In the future without project condition, it is expected that residents would try to prevent the undermining of their homes by performing remedial bulkhead maintenance when less than 5 ft of littoral material remains in front of the bulkheads. Such remedial maintenance would consist of a single row of timber bulkhead with limited rock armor toe protection, placement of sand fill on the nearby foreshore and landward sides of the bulkhead.

2.2.4 Reach 2B

This reach is 1,200 ft long, extending from the last shorefront resident to the east jetty at the power plant. This undeveloped shoreline has a large dune system with a +17 ft NGVD dune crest, a sloping berm down to -2 ft NGVD, and a mild offshore slope of 1 ft vertical on 100 ft horizontal. The average ground elevation behind the dunes is approximately +14 ft NGVD. The average beach width is approximately 100 feet. Horizontal erosion in this reach is estimated at 5 ft/yr. Dune overwash and overtopping from waves is considered minimal in this reach due to the high dune elevations. Erosion is partially offset by the periodic placement of material dredged from the power plant cooling water intake channel.

Based on the above assessment of the existing conditions and expected Future Without Project, the primary storm damage would continue to be long- term erosion, and overtopping of dunes and bulkheads due to wave attack. Storm surges in both Long Island Sound and Northport Bay have the potential to inundate Asharoken Avenue and damage structures, and pose a serious threat to low-lying properties along the bay side. Erosion forces along the bay side of Asharoken Avenue are considered to be negligible.

3.0 AFFECTED ENVIRONMENT / EXISTING CONDITIONS

The following sections describe the existing environment of the study area and surrounding lands and water.

3.1 Land Use/Zoning

The land use in Asharoken and Eaton's Neck is predominantly single family housing. Of the 1500 acres in the Village of Asharoken, less than 500 acres are vacant. Within the incorporated Village of Asharoken and the Unincorporated section of Eaton's Neck there are four institutional uses: The Village Hall and Police Station, the US Coast Guard station, the Eaton's Neck Firehouse and the Town of Huntington Beach House. The power plant is located within the study area, but not within the Village of Asharoken.

3.2 Geological / Topography and Soils

Long Island belongs to the inner part of the Atlantic Coastal Plain. Major topographic features include the north shore plateaus, which are glacial moraines, and the southern sloping plains. Portions of the island consist of true coastal plain deposits, whereas the greater portion of both the surficial and underlying materials were formed during the Pleistocene age and consist of moraine-derived and outwash accumulations associated with the continental glaciers (USACE-NYD, 2002).

Two terminal moraines of the Wisconsin ice sheet, the Ronkonkoma and the more northerly Harbor Hill moraine, deposited material from New England and New York forming two low, roughly parallel ridges across what would become Long Island. The ice sheet also crushed and redeposited the existing cretaceous sedimentary rocks. The surface adjacent to these moraines was then built up from gravels, sands, and muds from glacial outwash and a brief interglacial period. Sea level rise during the early Holocene then filled the lower-elevation Long Island Sound and left the elevated moraines and their outwash separated from southern New England, forming the island. The local topography was then shaped by water courses flowing from the moraine ridges south or north through the outwash sediments.

Along the north shore, bays and harbors alternate with peninsulas and necks that are backed in some areas by fresh cliffs or bluffs of shore scarp, creating a highly irregular shoreline. The north shore harbors and bays are in locations of former Cretaceous-era valleys of the north-draining streams. The Manhasset formation covered Cretaceous rocks, and the area was subsequently covered by Wisconsin drift and till. Materials eroded from the necks, headlands, and offshore islands have been deposited as spits, bay mouth bars and tombolos (bars, like Asharoken Beach, which connect offshore islands to the mainland). The extensive unconsolidated sediments underlying the study area range from fine silts and clays to sands and coarse gravel (USACE-NYD, 2002).

The Asharoken shore is oriented to the northeast on Long Island Sound, located between the Eaton's Neck Point bluffs to the northwest and the power plant to the southeast. The narrow beaches of the necks are generally backed by bluffs approximately 30 ft high, with some bluffs over 75 ft high in Eaton's Neck. Elevations decrease easterly from Eaton's Neck Point to the vicinity of Bevins Road, leveling off at approximately 10 to 15 ft NGVD until reaching the west jetty of the power plant cooling water intake lagoon.

Asharoken Beach is sustained by littoral sediment from the east that is transported by reflected wave energy from the northeast. Littoral materials also come from the west as the Eaton's Neck bluffs erode, supplying sediment driven southeastward by waves from the northwest. The jetties and lagoon at the east end of Asharoken Beach, significantly changed the previous pattern of littoral movement. Since the construction of the jetties the shoreline east of the basin has accreted, while the shoreline west of the jetties has retreated. Based on dredging records from the Northport Power Station, the average bypassing rate dredged from the intake channel deposited on the beach just northwest of the west jetty in the period 1962–2001 was approximately 10,000 cy/yr.

The composition of the beach has changed since the construction and subsequent rehabilitation of the jetties by LILCO. Before 1930, the mean grain size of the sand on the beach was about 0.3 millimeters (mm); the current mean grain size is about 0.9 mm. This increase in mean grain size was due to the preferential erosion of fine-grained sand without a continuous supply of fine-grained sand from the east. Consequently, the sand on the beach is coarser than the sand that is being trapped east of the jetties (USACE-NYD, 2013).

The volume of sand transported from the east has decreased over the past 70 years from an estimated 30,000 cy/yr to approximately 15,000 cy/yr. This reduction in the volume of sand was the result of increased property development, particularly the construction of bulkheads and groins along the updrift shorelines west of the Northport Power Station (USACE-NYD, 2013).

A Sediment Transport Analysis was performed for the area located between the Northport Power Station to the east and Eaton's Neck to the west in order to forecast the potential future condition of Asharoken Beach and to determine the volumes of beachfill material necessary for an alternative plan to protect the community and stabilize the shoreline (USACE 2915 Engineering Report). Ten sediment budget cells were established at coastal structure boundaries and where shoreline orientation changes are significant as shown in Figure 13. The 1976–2001 sediment budget illustrates the recent sediment transport pattern at the project shoreline and is used for transport rate estimates. This sediment budget excludes the effect of an 840,000 cy beachfill, which was a non-representative, one-time project in the mid-1960s, but includes the current and ongoing sediment bypassing by the power plant.

Useful key erosion and transport rates derived from this sediment budget (USACE-NYD, 2004) are summarized as follows:

- Based on the 1976–2001 sediment budget, the erosion rate on the eastern shoreline immediately west of the jetties (Cell 4, which includes study Reach 2A and a portion of Reach 1B) is eroding at approximately 10,000 cy/yr in addition to the 10,000 cy/yr bypassed from upstream by the power plant for a total erosion rate of 20,000 cy/yr;

- The shoreline in the middle of Asharoken Beach (Cells 2 and 3, including the majority of Reach 1B) are more stable, experiencing minor shore erosion at approximately 4,000 cy/yr;

- Beach erosion increases along the western shoreline (Cell 1, which includes Reach 1A) at approximately 18,000 cy/yr. This 900-ft shoreline experiences higher erosion due to interruption of sediment supply by the 1996-97 USACE concrete/stone groin located just east of this section;

- The sand spit outside the study area just west of Eaton's Neck Point (Cell 0) is growing at a rate of 16,000 cy/yr, representing net sediment transport into this cell, less sediment lost offshore;

- The sediment supply from the updrift shoreline to the east of the study area is approximately 15,000 cy/yr from Cell 8 to Cell 6, with 10,000 cy/yr being bypassed (via dredging) downstream to Cell 4 (Reach 2B) and approximately 5,000 cy/yr retained in Cell 6 or lost offshore.

In addition, sand has been transported across Asharoken Avenue near Bevin Road from Asharoken Beach to the bayside in Duck Island Harbor.

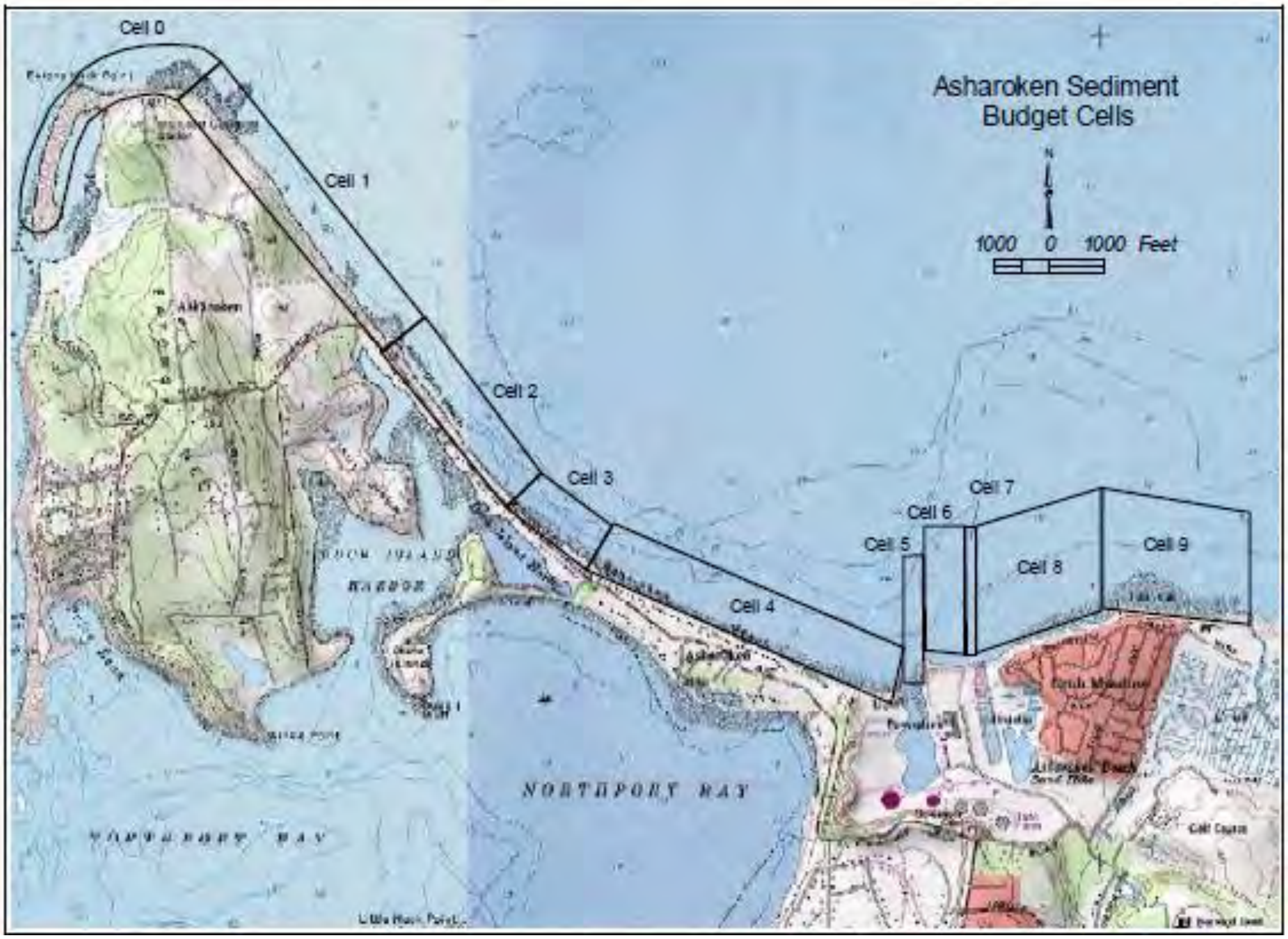


Figure 12. Asharoken Sediment Budget Cells

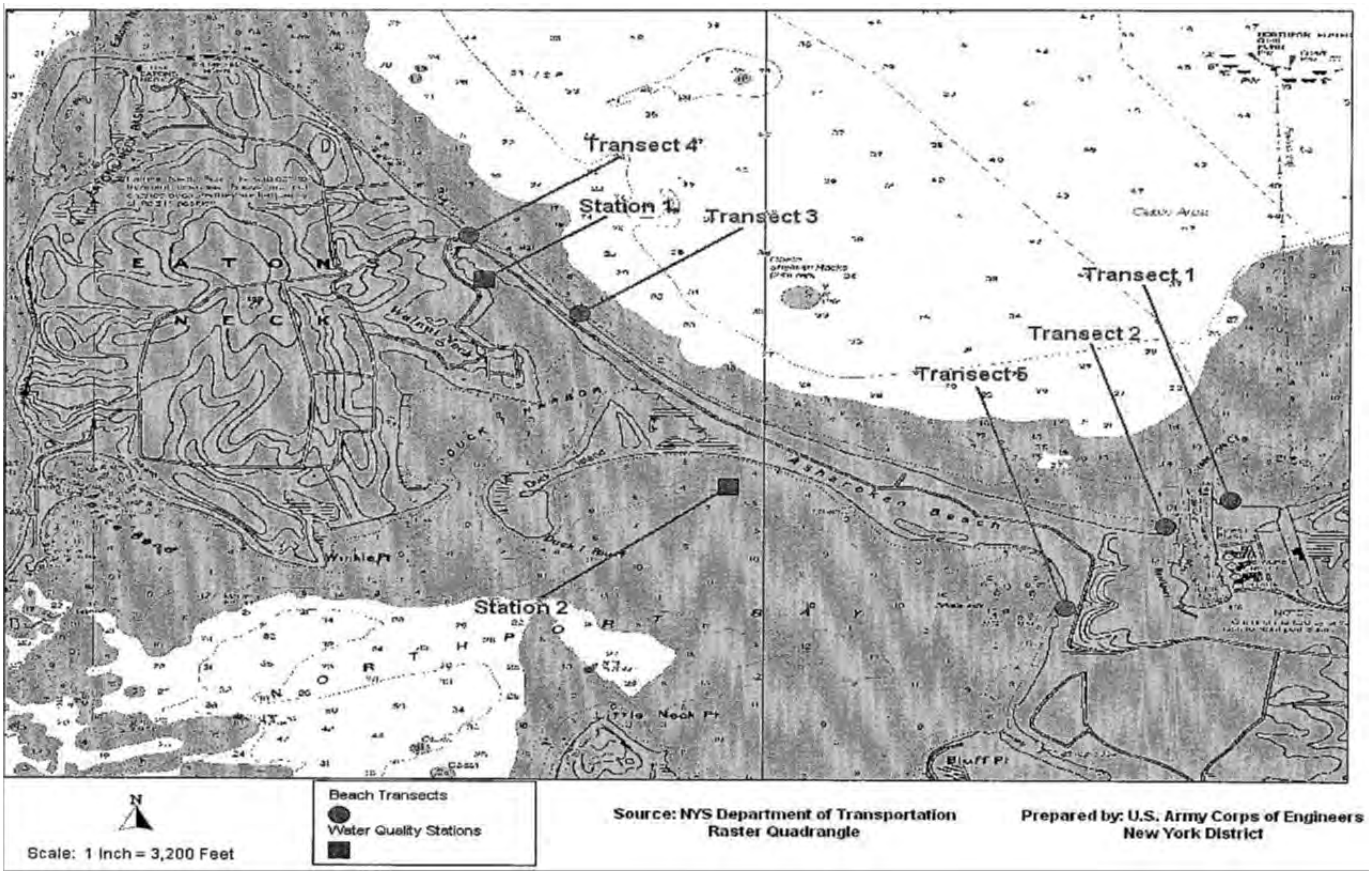


Figure 13. Asharoken beach sample transects and water quality stations.

In association with biological investigations at Borrow Areas A and B, grain size samples were collected during fall 2003 and spring 2004 (USACE-NYD 2007). Samples were taken at 34 stations from Borrow Area A, and from 15 stations in Borrow Area B. (Appendix A). Medium grain size sands were the dominant sediment fraction collected in both Areas A and B (comprising 45 percent in each). Fine sand was the second most abundant fraction, particularly in Borrow Area B. No pebble-sized (or larger) sediments were collected, and only small amounts of silt or clay fractions were present at either site (Figure 9).

In addition to the grain size sampling analysis, a total of 12 samples were collected for analysis of contaminants of concern (COCs) at Borrow Area A. The only COC detected at levels exceeding New York State Technical and Administrative Guidance Memorandum cleanup objective criteria was Chrysene, a polycyclic aromatic hydrocarbon (PAH) typically derived from cigarette smoke, coal tar pitch volatiles, coke oven emissions and diesel exhaust. Chrysene was detected in two out of the 12 Area A samples. A total of six samples were collected for analysis of chemical constituents in Area B. As with Borrow Area A, the only COC found to exceed New York State criteria was Chrysene, which occurred in four out of the six Area B samples. Chrysene is formed in small amounts during the burning or distillation of coal, crude oil, and plant material

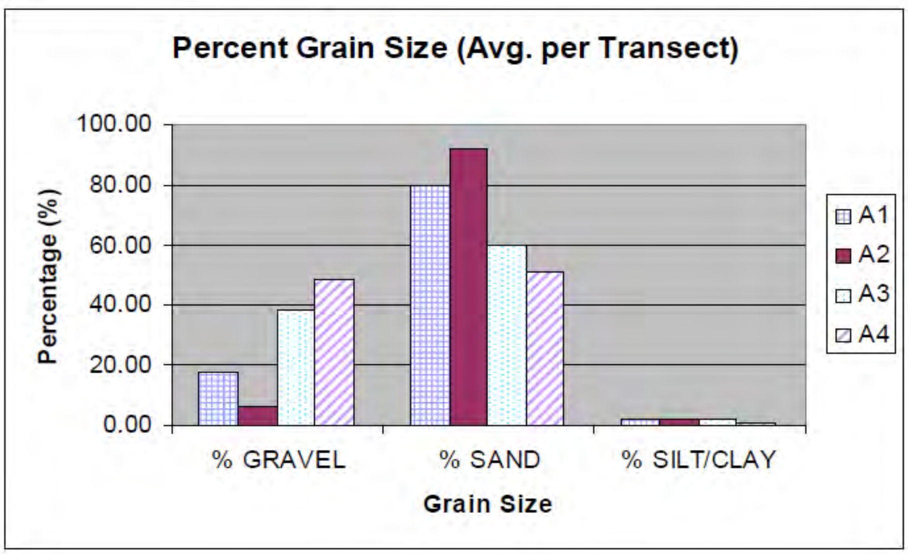


Figure 14. Percent grain size per transect for Asharoken*

*Transects in Asharoken are labeled as ‘A[Transect #]’. Transect 5 was conducted in Northport Harbor and was not included in this analysis.

3.3 Climate

The climate in the vicinity of Asharoken, New York, is temperate, with an average annual temperature of 54 degrees Fahrenheit (°F). January and February, the coldest months, have a mean temperature of approximately 34°F, and July and August, the warmest months, have a mean temperature of 74.5°F (Figure 10) (NWS, 2012). The total annual precipitation is, on average, 45.86 inches (in) (NWS, 2012), and in 2011 was 59.19 in (Figure 10) (NOAA, 2014). The predominant winds are to the east-northeast or the west with an average speed of 6 miles per hour (Windfinder, 2014). Damaging waves are produced by northerly clockwise to easterly winds, which occur approximately 36.5 percent of the time throughout the year. Winds that persist through numerous tidal cycles have caused the most severe wave and erosion damages along the study area (Windfinder, 2014).

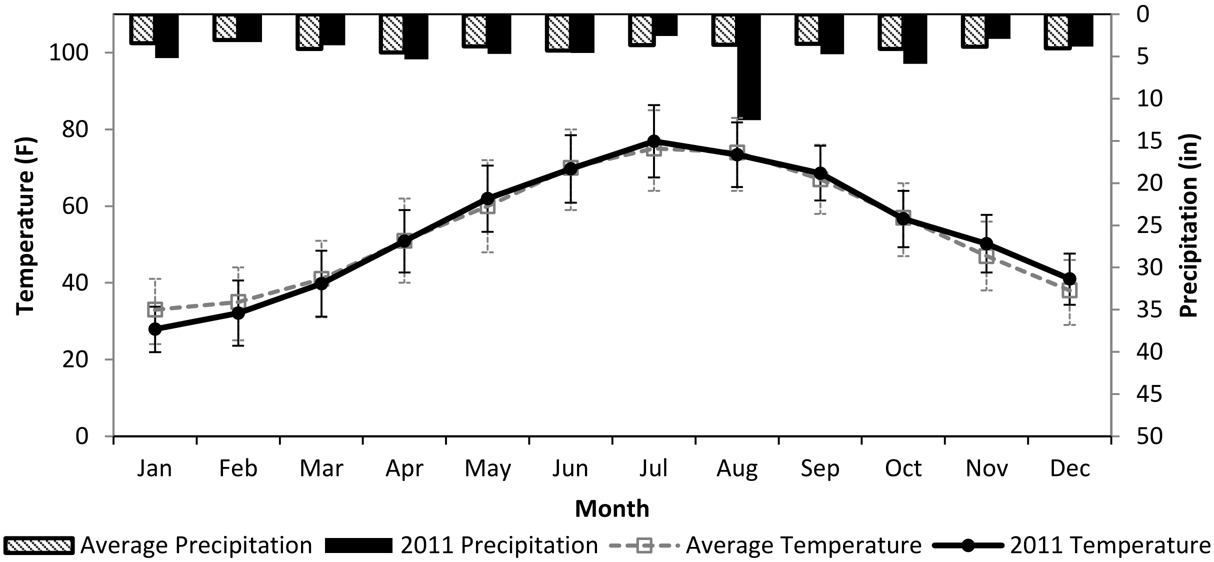


Figure 15. Average and 2011 Monthly Temperature and Precipitation for Asharoken, NY.

The two major types of storms that can affect the study area are (1) Hurricanes and (2) Northeasters. Hurricanes typically occur between June and November, and are uncommon in the study area. Extra-tropical storms, such as northeasters, tend to be less intense than tropical storms, such as hurricanes, but are usually longer in duration. Northeasters occur between October and March, often cause high water levels and intense wave conditions, and can be responsible for significant damage and flooding in the northeastern United States.

3.4 Water Resources

3.4.1 Regional Hydrogeology and Groundwater Resources

Nearly all of the 2.8 million residents of Nassau and Suffolk counties obtain their drinking water from large underground aquifers associated with the glacial moraine. The upper glacial aquifer lies just below the ground surface. Beneath the upper glacial aquifer lies the extensive Magothy aquifer, which supplies drinking water for most of the residents of Nassau and about one-half the residents of Suffolk County. Most of the residents of Eaton's Neck obtain their water from the Suffolk County Water Authority. Asharoken Beach and Eaton's Neck are located within distribution area 9, which has seven active wells on the mainland. There are few private wells in service on Eaton's Neck today.

In the immediate vicinity of the proposed Project Area, the soils are saturated at about 25 ft below the road surface, which corresponds to 5 ft above mean higher high water. Groundwater springs are present at the toe of slope. Groundwater seepage is particularly evident during low tide due to the steep hydraulic gradient, in conjunction with the excessively drained soils. The high velocity of the groundwater flow contributes to slope failure by undermining the toe of the slope (USACE-NYD, 2004).

3.5 Surface Water

Tides along Asharoken in Long Island Sound are semidiurnal (twice daily) with a mean tide range of 7.1 ft and spring range of 8.2 ft (Table 4). Tidal inundation in the study area is caused by storm-induced water level rise combined with astronomical tide. Storm-induced water level rise has several causes: storm surge, which consists of storm winds that exert shearing forces on the water surface and decreased atmospheric pressure; and wave setup, which consists of storm waves that raise the water level along the shore. Stage frequency curves, which relate storm water elevations to the expected risk of occurrence, were developed for Long Island Sound and Northport Bay based on the calculated water elevations for the range of storm return periods. A storm with a return period of 100 years is calculated to have an associated water level elevation of 14.25 ft NGVD with wave setup on Long Island Sound and 12.16 ft NGVD on Northport Bay.

At Eaton's Neck, the average maximum current velocity is 2.4 feet per second (fps) for both flood and ebb tides. The tidal current velocity at Asharoken Beach is expected to range from 0.3 to 0.8 fps along the study shoreline. The 1976–2011 mean water temperatures in the Long Island Sound (LIS) are: 39ºF for winter; 51ºF for spring; 67ºF for summer; and 53ºF for fall (LISS, 2014). The mean salinity at the western end of LIS is approximately 23 parts per thousand (ppt), increasing to 35 ppt at the eastern end (LISS, 2014).

Water quality measurements were taken at a depth of 1 meter in five locations on Asharoken beach during six sampling events between September 2003 and July 2004; water temperature ranged from 54ºF to 76ºF; salinity ranged from 24.30 ppt to 27.50 ppt with a mean of 26.38 ppt; dissolved oxygen ranged from 3.98 mg/L to 8.15 mg/L with a mean of 6.40 mg/L; and pH ranged from 6.97 to 8.20 with a mean of 7.70 (USACE-NYD, 2005).

The north shore wave regime is dominated by wind-generated waves across the Long Island Sound fetch. For Asharoken Beach, only waves originating from the northwest clockwise to the east-southeast would impact the nearshore area due to the orientation of the shoreline. Table 5 also contains information on the deep water and nearshore (breaking) waves used to design the project alternatives (USACE-NYD, 2013). Surface freshwater supplies (permanent ponds, streams) do not exist in Asharoken Village or on Eaton's Neck due to the coarse nature of the unconsolidated glacial sediments that underlie the surficial geology of the area.

3.5.1 Sea Level Rise

The design and implementation of coastal restoration projects requires consideration of the effects of climate change, including global sea level rise. The primary impact of sea level rise on coastal environments and infrastructure is the direct loss of land and habitat from inundation. A secondary impact is the migration of coastal landforms inland (transgression). However, in urbanized areas such as New York City, the likelihood of this process taking place is severely restricted as a result of centuries of shoreline development and re-alignment (Titus, et al., 2009). Accelerated rates of sea level rise have the potential to increase the risk of storm damages beyond the evaluations of this project.

Sea Level Change (SLC) is the combined effect of the eustatic (i.e. global average) sea level increase due to increasing temperature and the land movement in the region. The New Jersey coastline is one of the areas experiencing land subsidence due to geologic process; therefore, the net relative sea level change at the project area is higher than the eustatic SLC. The future SLC for the project area is estimated based on the National Research Council (NRC) and Intergovernmental Panel for Climate Change (IPCC) estimates of eustatic SLC and corrected to include the local land subsidence. Both the historic SLC trend and the future accelerated rate are identified and used for planning, design, sensitivity and risk & uncertainty analysis if required. The most recent guidance recommends both the National Research Council report (NRC, 1987) and the Intergovernmental Panel for Climate Change report (IPCC, 2007) findings for prediction of future sea level change.

Projections of SLC are estimated by combing the following:

1) An extrapolation of the historic rate of local mean-sea-level rise used as the low rate. The local SLC chart and curve are calculated based on the online calculator provided by USACE. Both the USACE and NOAA curves and charts are calculated and presented in the project engineering appendix. The online calculator is located at:

http://www.corpsclimate.us/ccaceslcurves.cfm

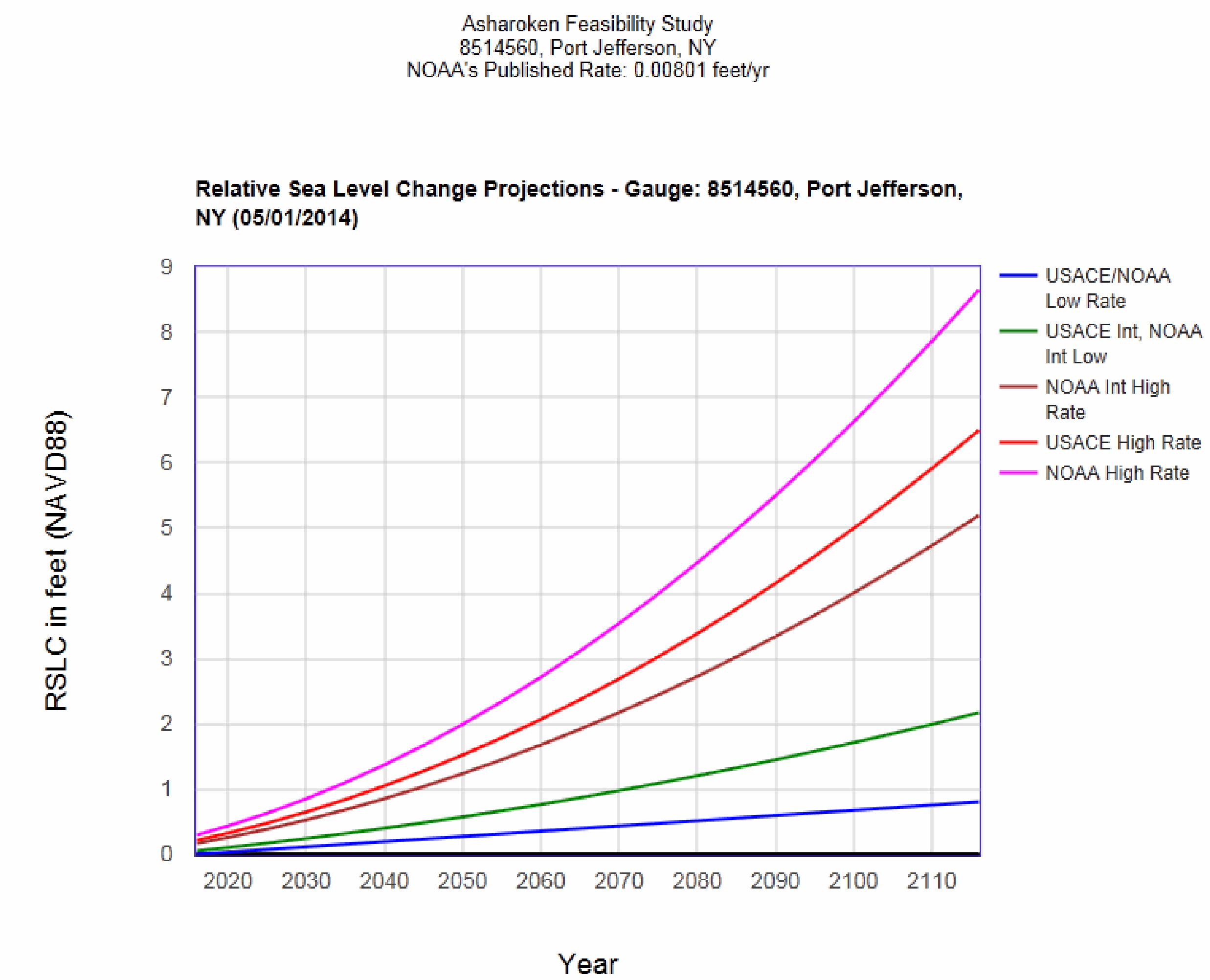
2) An intermediate rate of local mean sea-level change utilizing the modified NRC Curve equations, combined with the local rate of vertical land movement.

3) An upper rate of local sea level change estimated by considering the modified NRC high value, and combining these numbers with the local rate of vertical land movement. This scenario of high rate of local mean sea level rise exceeds the upper bounds of the IPCC estimates from both the 2001 and 2007 and also includes additional sea-level rise to accommodate the potential for rapid loss of ice from Antarctica and Greenland.

4) The sensitivity, risk, and uncertainty analysis were not conducted since it is not required for this designed and authorized project.

The local SLC chart and curves for both USACE and NOAA rates for year 2016 to 2116 in 5-year interval are estimated based on the on-line calculator and shown Figure 16 below (also see Table 6).

Figure 16



The following local Sea Level Rise (SLR) rates are recommended for use: The extrapolation of historical rate of +0.7 ft/50 years or 1.4 ft/100 years with 95% confidence is used for project planning, design, and analysis. Sensitivity, Risk and Uncertainty analyses will be conducted to determine how sensitive recommended designs are to these various rates of future local mean SLR, how this sensitivity affects calculated risk, and what design of operations and maintenance measures can be implemented to minimize adverse consequences while maximizing benefits. The intermediate rate of +1.3 ft and high rate of +2.6 ft in year 2060 will be used for sensitivity, risk & uncertainty analysis.

3.6 Vegetation

A coastal vegetation survey of the Asharoken study area was conducted by the USACE-NYD in September 2001 (Table 7; USACE-NYD, 2002). The study area encompasses a dynamic marine environment with coastal beach, dune, estuarine marsh, maritime scrub-shrub, and maritime woodland habitats. The beach and frontal dune plant community consists mainly of American beach grass (*Ammophila breviligulata*) and seaside goldenrod (*Solidago sempervirens*). Smaller numbers of seaside spurge (*Chamaesyce polygonifolia*), sea rocket (*Cakile edentula*), common saltwort (*Salsola kali*), and halberd-leaved orach (*Atriplex patula*) were also observed. Scattered patches of American Beach Grass, sea rocket, beach pea, and sea chickweed (*Honckenya peploides*) occur along the northern reach of Asharoken Beach (Eaton's Neck) (USACE-NYD, 2002).

Backdune and roadside areas contain a mix of native and non-native species including: Virginia creeper (*Parthenocissus quinquefolia*), water dock (*Rumex orbiculatus*), prickly pear (*Opuntia drummondii*), yucca (*Yucca aloifolia*), woolly mullein (*Verbascum thapsus*), ragweed (*Ambrosia artemisiifolia*), common cocklebur (*Xanthium strumarium*), Japanese knotweed (*Polygonum cuspidatum*), *Aster* spp., field pepperweed (*Lepidium campestre*), pitch pine (*Pinus rigida*), American beach grass, and seaside goldenrod (USACE-NYD, 2002).

In some areas, property owners have landscaped the backdune and roadside areas with native and non-native vegetation. Reach 1A was planted with American beach grass to provide habitat benefits and dune stabilization during emergency shoreline protection project in 1997. A sand-dune plant community occurs adjacent to the *Spartina* marsh in Duck Island Harbor at the intersection of Asharoken Avenue and Bevin Road to the north of the emergency shoreline protection project (Figure 11). Characteristic plant species in this area include beach grass, seaside goldenrod, dusty miller (*Artemisia stellariana*), beach pea, poison ivy (*Rhus radicans*), and common reed (*Phragmites australis*). A woodland and open meadow area occurs on the upland bluff of Eaton's Neck adjacent to Reach 1A.

A variety of vegetation has developed on the Reach 1B/2A study area backdune as a result of property owners landscaping the backdune and roadside areas with native and non-native vegetation. In Reach 2A, a scrub-shrub area developed in the backdune and a woodland community supports a variety of deciduous trees, shrubs, and evergreens (USACE-NYD, 2002). A scrub-shrub area has developed west of the Northport Power Station, containing autumn eleagnus (*Elaeagnus umbellata*), and common reed, with a ground cover of seaside goldenrod, American beach grass, field pepperweed, ragweed and mugwort (*Artemisia vulgaris*). A maritime woodland including northern bayberry (*Myrica pensylvanica*), red cedar (*Juniperus virginiana*), pin oak (*Quercus palustris*), staghorn sumac (*Rhus hirta*), large-toothed aspen (*Populus grandidentata*), Norway maple (*Acer platanoides*), with a ground cover of ragweed, beach heather (*Hudsonia tomentosa*), seaside goldenrod and a variety of grasses exists further west of the power station (USACE-NYD, 2002).

Figure 17. Sand-dune habitat on bayside of Asharoken Avenue at Duck Island Harbor.

3.7 Aquatic Resources

The project area and surrounding waters support diverse assemblages of marine biota. A Nearshore Investigation (USACE-NYD, 2005) gathered baseline biological information near Asharoken and Bayville, New York, from fall 2003 through summer 2004. Sampling activities included beach seining to characterize fish assemblages, beach cores to characterize benthic macroinvertebrate communities, and water quality measurements. A concurrent Borrow Area Investigation characterized fish and benthic macroinvertebrates at Borrow Areas A and B from 2003 to 2004.

3.7.1 Finfish

Nearshore waters are recognized as an important habitat for numerous fish species. Seasonally many individuals in the surf zone are small (e.g., anchovies or silversides) or juvenile stages of larger species. Nearshore and intertidal shallows are considered to be important pathways for juveniles moving in and out of estuarine nursery areas, as well as for adult fish migrating along the coast. Fish which occupy the surf zone are typically small species or juveniles taking advantage of the shallow water refuge, tending to be opportunistic feeders and will change their dietary preferences according to season and prey availability. The USACE-NYD's Nearshore Aquatic Resources Investigation along Asharoken Beach in 2003–2004 (Appendix B), resulted in the collection of 6,407 fish and macroinvertebrates representing a total of 20 species Table 8, (USACE-NYD 2005).

The two most abundant species were Atlantic silverside (*Menidia menidia*) and Atlantic menhaden (*Brevoortia tyrannus*), which accounted for 46 percent and 38 percent of the total catch respectively. Atlantic menhaden were observed in large schools offshore of the beach, which made them particularly susceptible to capture using a beach seine. Additional fish species collected in relatively high abundance in nearshore habitats included bay anchovy (*Anchoa mitchilli*), weakfish (*Cynoscion regalis*), striped killifish (*Fundulus majalis*), and mummichog (*F. heteroclitus*).

Seasonal patterns in relative abundance and distribution were evident. The fall beach seine catch was dominated by Atlantic menhaden and Atlantic silversides, along with striped killifish and mummichog. The spring catch was dominated by bay anchovy, along with American sand lance (*Ammodytes americanus*), bluefish (*Pomatomus saltatrix*), and Atlantic silversides. The summer catch was dominated by Atlantic silversides and Atlantic menhaden, along with bluefish, weakfish, and blueback herring (*Alosa aestivalis*). Taxa richness was comparable among the three seasons, with 11, 11 and 14 total taxa present in the fall, spring and summer catches, respectively.

Concurrent with the Nearshore Investigation, a Borrow Area Investigation monitored the biological resources at Borrow Areas A and B during 2003–2004 (USACE-NYD 2007, Appendix A). A total of 34 species of fish and 10 species of macroinvertebrates (including several species for which Essential Fish Habitat [EFH] is designated in the study area) were collected during fall, winter, spring and summer sampling events (Table 9). Species diversity was the highest during spring with 25 species, followed by fall (23 species), summer (22 species), and winter (10 species). Excluding a very large number of bay anchovies collected during summer and fall sampling events (2,443 and 45,606 respectively), scup (*Stenotomus chrysops*) was the dominant fish species collected among the two borrow areas, accounting for 60.7 percent of the total. Other common species collected were winter flounder (*Pseudopleuronectes americanus*), spider crab (*Libinia dubia*), weakfish, Atlantic butterfish (*Peprilus triacanthus*) and long-finned squid (*Loligo pealei*). Together these six species represented 88.5 percent of the total abundance across all four seasonal borrow area collections.

Seasonal patterns in relative abundance and distribution (exclusive of bay anchovy) were again evident. Spring catches were dominated by spider crabs and winter flounder; summer catches were dominated by winter flounder and blueback herring, along with windowpane flounder (*Scophthalmus aquosus*), spider crabs, and Atlantic horseshoe crabs (*Limulus polyphemus*); fall catches were dominated by scup, along with weakfish, Atlantic butterfish and long-finned squid; and winter catches were dominated by grubby (*Myoxocephalus aenaeus*) and cunner (*Tautogolabrus adspersus*), along with winter flounder and Asteriid seastars (*Asterias forbesi*).

Total biomass across all four seasons was dominated by horseshoe crabs (*Limulus polyphemus*; 23.6 percent), bay anchovies (22.0 percent), and spider crabs (20.4 percent). Horseshoe crabs and spider crabs represent biomass disproportional to their abundance due to the presence of heavy exoskeletons (USACE-NYD 2007).

3.7.2 Benthic Invertebrates

3.7.2.1 **Nearshore Benthic (Infauna) Invertebrates**

USACE-NYD conducted a Nearshore Aquatic Resources Investigation at Asharoken Beach in LIS during 2003-2004. This sampling program included characterization of shallow water and intertidal benthic infaunal invertebrates along nearshore transects at Asharoken Beach as well as in the bay (back-barrier) side of Eaton's Neck (USACE-NYD 2005). A total of 8 phyla consisting of 47 taxa were collected and identified throughout the study period (Table 9).

The most commonly abundant phylum was Annelida which represented 84.1% of the total macroinvertebrates encountered. The majority of the Annelids identified were Oligochaetes of various species. The Nematoda phylum was also abundant (9.2%) followed by Mollusca (2.6%) and Nemertinae (2.0%) to lesser degree. Despite the relatively low abundance of Mollusca, it represented 15.1 grams or 77.3% of the total biomass. This was largely composed of the Gastropods *Crepidula fornicate* and *Ilyanassa obsolete*. Annelida (20.5%) and Arthropoda (1.34%) also significantly contributed to the total biomass.

During both seasons surveyed (fall 2003, spring 2004) nearshore assemblages were dominated by annelids (84–90 %) and nematodes (4.3–9.3%). Greater taxonomic richness/diversity was observed during spring (8 phyla, 31 individual taxa) relative to fall (5 phyla, 19 individual taxa) (USACE-NYD 2005).

3.7.2.2 **Offshore Benthic Invertebrates**

Concurrent with the Nearshore Investigation, a Borrow Area Investigation monitored the biological resources at Borrow Areas A and B, located offshore of Asharoken during 2003-2004 (USACE-NYD 2007 Appendix A). Infaunal invertebrates were sampled at the two borrow areas during fall (2003) and spring (2004). The benthic sampling design allocated a greater number of grab samples at Borrow Area A than at Borrow Area B (35 vs. 15) during both seasonal sampling events. The disproportionate sampling effort due to the size of the borrow areas, Borrow Area A being larger, probably influenced the observed higher taxonomic richness/diversity in Borrow Area A.

During fall 2003, a total of 86 macroinvertebrate taxa, represented by >26,700 individuals was collected in both borrow areas (Table 10). Taxa richness was considerably higher in Borrow Area A (83 taxa) than in Borrow Area B (51 taxa). Nematodes, annelids, and oligochaetes were abundant at both borrow areas. Representative polychaete taxa included *Ampharete spp.*, *Ampharete lindstroemi*, *Cossura longocirrata*, *Cirratulidae spp.*, *Nephtys spp.*, *Scalibregma inflatum*, and *Polydora cornuta*. Molluscs and arthropods were consistently present in both borrow areas, but were markedly less abundant than annelids.

Nematodes were the numerically dominant taxon in Borrow Area A, accounting for 49.9 percent of the total fall assemblage. Cirratulid polychaetes and oligochaetes were secondary dominants, each representing 13.3 percent of the total. Two additional polychaetes, *Polydora cornuta* and *Cossura longocirrata*, accounted for 5.3 percent and 2.4 percent, respectively. Nematodes were also the numerically dominant taxon of the total fall assemblage in Borrow Area B, accounting for 70.5 percent. Oligochaetes and cirratulid polychaetes were secondary dominants in Borrow Area B, representing 9.4 and 8.5 percent of the total, respectively. The tube-dwelling amphipod *Ampelisca abdita* accounted for 2.5 percent.

During spring 2004, a total of 88 invertebrate taxa, represented by > 26,900 individuals was collected in the borrow areas combined (Table 11). Taxa richness was considerably higher in Borrow Area A (85 taxa) than in Borrow Area B (67 taxa). Nematodes, annelids, and oligochaetes were abundant at both borrow areas. Representative polychaete taxa included *Ampharete finmarchica*, *A. acutifrons, Streblospio benedicti*, *Nephtys picta*, *Capitella capitata*, *Spionids* spp. (lowest possible identification level [LPIL]), *Tharyx acutus*, *Glycera* spp. (LPIL), and *Polydora ligni*. Neither gastropods nor bivalves were abundant in either of the two borrow areas, with fewer than 100 individuals of each collected. Arthropods were present in moderate abundance, primarily represented by the copepod, *Temora longicornis*, and the tube-dwelling amphipod, *Ampelisca abdita.*

Nematodes were the numerically dominant taxon in Borrow Area A, accounting for 50.9 percent of the total assemblage. Oligochaetes were a secondary dominant, representing 7.7 percent of the total. Three additional polychaetes, *Temora longicornis, Ampharete finmarchica* and *Streblospio benedicti* accounted for 4.4 percent, 4.1 percent and 3.6 percent, respectively. The tube-dwelling amphipod *Ampelisca abdita* represented 3.3 percent. Nematodes were also the dominant taxon in Borrow Area B, accounting for 62.5 percent of the total assemblage. Oligochaetes were secondary dominants in Borrow Area B, representing 6.2 percent of the total. Other abundant taxa included the polychaetes *Streblospio benedicti, Capitella capitata* and *Ampharete finmarchica* at 5.5 percent, 5.5 percent and 3.8 percent, respectively.

3.8 Terrestrial Wildlife

3.8.1 Reptiles and Amphibians

Marine reptiles that may potentially occur seasonally within the study area include the green sea turtle (*Chelonia mydas*), loggerhead sea turtle (*Caretta caretta*), leatherback sea turtle (*Dermochelys coriacea*), Kemp's ridley sea turtle (*Lepidochelys kempii*). Of these species the green and the leatherback are the least likely to occur in the western Sound. In addition, the northern diamondback terrapin (*Malaclemys terrapin, a brackish water species*) may be found in the Project Area (USACE-NYD, 2004).

Most of the sea turtles that have been observed in Long Island Sound have been juveniles which have migrated north during the summer to take advantage of the abundant food resources offered by inland embayments. Green sea turtles feed primarily on vegetation and may be the least likely of the turtles to be seen in the Sound due to the relative paucity of sea grasses found in the Sound. Ridleys and loggerhead turtles prey largely on marcro-crustateans and bivalves which are found in abundance in nearshore areas. The leatherback turtle's diet consists largely of jellyfish. The leatherback turtle is a highly pelagic fast swimming open water animal and not an expected visitor to the western Sound. Marine turtles do not nest further north than Delaware.

Diamondback terrapins are medium-sized turtles that live in brackish water, primarily in the vicinity of cordgrass (*Spartina* spp.) marshes, from Massachusetts to Texas. They occur throughout the Hudson River Bight (Burke 2006). Diamondback terrapins are known to nest in and around the sandy marsh areas like those associated with the of the project site.

Non-marine reptiles which could potentially occur proximal to the study area (in adjacent fields, wetlands or woodlands) may include the eastern box turtle (*Terrapene carolina*) and the eastern garter snake (*Thamnophis sirtalis*) Few amphibians are expected to occur in the immediate vicinity of the Project Area because of the high salinity regime and salt spray within the beach and adjacent dune systems. However, spring peeper (*Pseudocris crucifer*), Fowler's toad (*Anaxyrus fowleri*), and gray tree frog (*Hyla versicolor*) may be present within maritime forests near the boundaries of the project site should moist/wet conditions persist

3.8.2 Birds

A variety of avian species use habitats in Asharoken Beach as a breeding area (Table 12). Confirmed breeding species include: piping plover (*Charadrius melodus*), barn swallow (*Hirundo rustica*), black-capped chickadee (*Parus atricapillus*), eastern tufted titmouse (*Parus bicolor*), Carolina wren (*Thryothorus ludovicianus*), American robin (*Turdus migratorius*), gray catbird (*Dumetella carolinensis*), European starling (*Sturnus vulgaris*), yellow warbler (*Dendroica petechia*), northern cardinal (*Cardinalis cardinalis*), common grackle (*Quiscalus quiscula*), brown-headed cowbird (*Quiscalus major*), and house sparrow (*Passer domesticus*) (USACE-NYD 2002, NYSDEC 2008).

Avian species observed feeding along Asharoken beach include: Laughing gulls (*Larus atricilla*), herring gulls (*Larus argentatus*), ring-billed gulls (*Larus delawarensis*), great black-backed gulls (*Larus marinus*), double-crested cormorants (*Phalacrocorax auritus*) and sanderlings (*Calidris alba*) (USACE-NYD 2002). In addition, an osprey (*Pandion haliaetus*) nest was observed across from the beach on Asharoken avenue during a field visit on 30 December 2013.

Avian species in the tidal wetlands located within or adjacent to Duck Island Harbor include: mallard duck (*Anas platyrhynchos*), black duck (*Anas rubripes*), old squaw (*Clangula hyemalis*), scaup (*Aythya sp*.), snowy egret (*Leucophoyx thula*), great blue heron (*Ardea herodias*), green heron (*Butorides virescens*), black-crowned night heron (*Nycticorax nycticorax*), clapper rail (*Rallus longirostris*), black-bellied plover (*Squatarola squatarola*), semi-palmated plover (*Charadrius semipalmatus*), belted kingfisher (*Megaceryle alcyon*), common tern (*Sterna hirundo*), and yellowlegs (*Tringa sp*.) (USACE-NYD 2002).

3.8.3 Mammals

The maritime scrub-shrub, meadow and woodland landscapes in the vicinity of the project area provide habitat for a variety of terrestrial mammals including: common rat (*Rattus norvegicus*), eastern cottontail (*Sylvilagus floridanus*), white-footed mouse (*Peromyscus leucopus*), white-tailed deer (*Odocoileus virginianus*), gray squirrel (*Sciurus* carolinensis), eastern chipmunk (*Tamias striatus*), northern short-tailed shrew (*Blarina brevidauda*), meadow vole (*Microtus pennsylvanicus*), little brown bat (*Myotis lucifugus*), red fox (*Vulpes vulpes*), opossum (*Didelphis virginiana*), and raccoon (*Procyon lotor*) as well as the possibility of fereal cats and dogs..

Several species of marine mammals have been documented offshore of Asharoken Beach, including gray seal (*Halichoerus grypus*) and harbor seal (*Phoca vitulina*). These two species are increasing in southern New England (including Long Island Sound) and may be present in the Project Area from late fall to April. Sightings of harp seals (*Phoca groenlandic*) and hooded seals (*Cystophora cristata*) have increased in Long Island Sound in recent years. Bottlenose dolphin (*Tursiops truncatus*) are periodically observed offshore of the project area (USACE-NYD 2002; NOAA, 2009).

3.9 Threatened and Endangered Species

3.10 Federal Listed Species

Federally listed threatened/endangered species that may potentially occur in Long Island Sound waters of Suffolk County, New York (and therefore in the vicinity of Asharoken Beach), include five species of marine turtles (green sea turtle, loggerhead sea turtle, leatherback sea turtle, Kemp's ridley sea turtle and hawksbill sea turtle, all of which may seasonally range into western Long Island Sound) and are discussed in Section 3.7.1. (Table 13). However, due to the highly pelagic nature of the leatherback and the dietary requirements (sponges) of the more tropical hawksbill the presence of these two species far less likely than the remaining three species. Atlantic sturgeon (*Acipenser oxyrichus oxyrinchus*) was recently listed as an endangered species under the Endangered Species Act and is known to occur in western Long Island Sound. Because of its potential for interaction with the project, particularly the Borrow Area, life history information is presented in some detail. A Section 7 Consultation biological assessment was submitted to the NMFS as part of the USACE-NYD required NEPA obligations (Appendix C).

Atlantic sturgeons are anadramous, spending the majority of their adult phase in marine waters, returning to their natal freshwater rivers to spawn. Five Distinct Population Segments (DPS) of Atlantic sturgeon were listed as threatened or endangered under the Endangered Species Act, including a New York Bight DPS. Known spawning populations for the New York Bight DPS exist in two rivers: the Hudson and Delaware Rivers. In the Hudson River estuary, spawning, rearing, and overwintering habitats were reported to be intact by Bain (1997), supporting the largest remaining Atlantic sturgeon stock in the U.S. However, a population decline from overfishing has also been observed for this area (Bain 1997, Bain 2001). General factors that may impact Atlantic sturgeon include: dam construction and operation; dredging and disposal; and water quality modifications such as changes in levels of dissolved oxygen (DO), water temperature and contaminants (ASSRT, 2007). Other threats to the species include vessel strikes. Many authors have cited commercial over-harvesting as the single greatest cause of the decline in abundance of Atlantic sturgeon. Although little is known about natural predators of Atlantic sturgeon, there are several documented fish and mammal predators, such as sea lampreys, striped bass, common carp, minnow, smallmouth bass, walleye, grey seal, and fallfish (ASSRT 2007). These predators interact with Atlantic sturgeon over a range of life stages from egg through juveniles. Note that most of the species listed above would not exist in LIS. However, it is likely many species of gulls, loons, cormorants and mergansers may prey on young sturgeon as well as other species of predatory fish such as blue fish and summer flounder.

Sturgeon are bottom feeders that use their protractile, mouth to siphon up sediments containing benthic prey items The diet of adult sturgeon includes mollusks, gastropods, amphipods, isopods and fish, while juveniles generally feed on aquatic insects and other invertebrates.

In regard to the New York Bight, including Long Island Sound (LIS), knowledge of Atlantic sturgeon oceanic habitat is generally limited to information regarding broad-scale marine migrations and an exchange of populations among river systems based on tag recaptures and commercial fisheries data. Satellite tag and fisheries-dependent data indicate that most oceanic Atlantic sturgeon inhabit shallow inshore areas of the continental shelf and are largely confined to depths of less than 65 ft. Concentrations of Atlantic sturgeon appear to occur during the fall and spring corresponding to the mouths of large bays and estuaries, including those that are the outlets of known spawning rivers such as the Hudson. In general, migrations are northerly during summer and southerly during winter. Regional temperatures along the coast likely influence sturgeon movements and migration patterns, thus affecting the length of time sturgeon spend in a particular area of the marine environment. Although little is known about the abundance or distribution of Atlantic sturgeon in LIS, because the Sound is open to both the Atlantic Ocean and the (natal) Hudson River the probability of numbers of sturgeon within the Sound is high. Recent fishery studies within the nearshore areas of the New York Bight have shown that the largest trawl catches of Atlantic sturgeon occurred in the western end of Long Island Sound, confirming their use of the Sound and their seasonal aggregation corresponding to their spawning and overwintering estuaries.

Limited information exists on the feeding behavior and marine diet of the Atlantic sturgeon. Physical parameters including temperature, currents, salinity and sediment character strongly influence the availability of prey resources, and in turn may influence Atlantic sturgeon movements. Some important prey organisms for Atlantic sturgeon include polychaetes, oligochaetes, amphipods and isopods, and mollusks. Results of a study by Johnson et al. 1997, showed polycheates were the primary prey group consumed, although the isopod (*Politolana concharum*) was the most important individual prey eaten. Amphipods were also consumed. In this study mollusks and fish contributed little to the diet. Some prey taxa (i.e., polychaetes, isopods, amphipods) exhibited seasonal variation in importance in the diet of Atlantic sturgeon.

Federally listed bird species known or suspected to occur in proximity to Asharoken Beach includes roseate tern (*Sterna dougallii dougallii*) and the least tern (*Sterna antillarum*.) The recently listed red knot (*Calidris canutus*) may forage at Asharoken Beach during its annual migrations. The piping plover (*Charadrius melodus*) is known to nest on Asharoken Beach. Nesting surveys conducted in recent years reveal that 3 to 4 pairs return to this beach each season. In general they have nested perpendicular to Duck Island.

Piping plovers are very sensitive to disturbance and predation, especially by raccoons and other mammals adapted to the presence of humans. The species was federally listed as endangered in the Great Lakes and threatened along the remainder of its range in 1986 (USFWS 1996b). Piping plovers arrive at breeding grounds in late March–early April and depart by early September. They nest above MHW on beaches, gently sloping foredunes and washover fans. They typically prefer unvegetated habitats, but will occasionally nest under American beach grass or other vegetation. Piping plovers often nest in association with least terns. They typically fledge a single brood per season but may re-nest if broods are lost. Typical clutch size is four eggs (Cairns 1982). Chicks fledge by late July. Piping plovers feed along the lower beach face, or on moist overwash fans, mudflats and along wrack lines (Cairns 1982, Burger 1994). As of the summer of 2013, the Village of Asharoken has installed protective fencing around two beach areas known to support piping plover nesting (Cohen 2013). During the 2000 piping plover monitoring season, two nests within the proposed study area were observed to have a total of six fledged chicks. Four other nesting attempts within the vicinity of the study area were not productive due to possible chick and egg predation or by flooding (USACE-NYD 2002). Piping plover nest locations along Asharoken Beach are found in Figure 12 below. Please note that in 2015 nest occurred seaward of house numbers **405, 359, 307 and 222.** In addition Table 14 summarizes Piping Plover survey results near the Project Area.

Figure 18. Piping Plover Nest Locations for Asharoken Beach

As of January 2015 the rufa red knot *Calidris canutus rufa* was listed as a Federally listed species. The rufa red knot is a medium-sized shorebird about 9 to 11 inches (in.) in length. The red knot migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the Southeast United States (Southeast), the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. During both the northbound (spring) and southbound (fall) migrations, red knots use key staging and stopover areas to rest and feed. There are several major stop over areas along the Atlantic Coast of Long Island. No such areas have been reported for the north shore of Long Island, although it is likely that the Sound side is utilized. Red Knot listed as being found potentially occurring at the project site by USFWS.

The rufa red knot breeds in the tundra of the central Canadian Arctic, flying up to 9,300 miles (mi.) from south to north every spring and reverse the trip every autumn, making the rufa red knot one of the longest-distance migrating animals. Migrating red knots converge on critical stopover areas to rest and refuel along the way. Large flocks of red knots arrive at stopover areas along the Delaware Bay and New York/New Jersey's Atlantic coast each spring, with many of the birds having flown directly from northern Brazil. The spring migration is timed to coincide with the spawning season for the horseshoe crab (*Limulus polyphemus*). Horseshoe crab eggs provide a rich, easily digestible food source for migrating birds. Horseshoe crab spawning May-June.

Rufa red knots also feed on small clams, mussels, and snails, crustaceans and marine worms. On the breeding grounds, knots mainly eat insects. Mussel beds on New Jersey's southern Atlantic coast and intertidal/wrack line areas on New York’s coast are also important forage habitats for migrating knots.

Hard structures such as groins may enhance red knot foraging habitat because shoreline discontinuities like creek mouths, jetties and groins and other artificial obstructions can act to concentrate drifting horseshoe crab eggs creating a feeding hotspot. Such structures often create a localized low energy environment creating highly suitable conditions for horseshoe crab spawning over a wider variation of weather and sea conditions.

Regional threats to the rufa red knot, include stopover roosting and foraging area habitat loss via erosion, coastal development and shoreline stabilization which through various pathways can lead to reduced food availability and greater susceptibility to predation. Commercial harvest of horseshoe crabs has been implicated as a causal factor in the decline of the rufa red knot by decreasing the availability of horseshoe crab eggs. Disturbance by human activity, usually related to recreational activities including exclusion of shorebirds from preferred habitats has been noted throughout the red knot's non-breeding range.

Finback and Humpback whales are listed as potentially occurring in the offshore waters of Long Island Sound offshore of Suffolk County, New York. However, and occurrence in the western Sound would be considered extremely unlikely.

The northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*) potentially occurs along Suffolk County beaches; however, no recent sighting of this species has been reported in the vicinity of Asharoken Beach/Eaton’s Neck.

The recently listed northern long-eared bat may occur in the region that includes the Project Area (Suffolk County NY). Maintenance of long-eared bat populations in the vicinity of Asharoken Beach would depend on the integrity of suitable upland (forested) nesting habitat. Long-eared bat populations throughout the northeastern United States are suffering from a widespread fungal disease (“white nose syndrome”), which could potentially threaten/eradicate the local population under either the FWOP or project implementation scenario.

Federally listed and proposed plant species which may potentially occur in the Project Area include seabeach knotweed (*polygonum-glaucum)* and seabeach amaranth (*Amaranthus pumilus*). All three species have experienced significant population declines along the U.S. Atlantic coast as a result of beach stabilization practices, shoreline development/infrastructure, grazing/disturbance by feral wildlife, and off road vehicle use.

In New York, seabeach knotweed is known only from maritime beaches and the margins of adjacent dunes and salt marshes. It may be the dominant plant in areas of little or no other vegetation. It grows in open conditions on a variety of substrates, including, sand, silt, pebbles or cobbles, and dredging spoils (New York Natural Heritage Program 2011. Therefore it is not expected in the vicinity of Asharoken Beach/Eaton's Neck (NYHP 2015 http://acris.nynhp.org/guide.php?id=8699).

Seabeach amaranth typically occur on barrier island beaches between the fore dune and the wrack line and also on open overwash areas behind the fore dune. In New York, it is only known from Long Island, ranging from Coney Island to near the east end of the South Fork along the southern shore (NYHP 2015 http://acris.nynhp.org/guide.php?id=8699). Therefore it is not expected in the vicinity of Asharoken Beach/Eaton's Neck.

3.10.1 State Listed Species

In New York State there are three classifications for evaluating the status of rare or declining species; endangered, threatened and species-of-special-concern. The New York listings duplicate some of the Federal listings but also add species that have been documented as in decline or warrant monitoring for changes in their populations in New York.

Several bird and marine reptile species listed as endangered or threatened by the State of New York occur in the Asharoken Project Area. These include least and common tern, which are listed as endangered and threatened respectively in New York. Piping plover, listed as endangered, and bald eagle, listed as endangered in New York (although de-listed federally since 2007). Both terns and piping plover are known to nest in the vicinity of Eaton's Neck. Osprey are listed as threatened in New York State and an osprey nest was observed adjacent to Asharoken Beach during a field visit on 30 December 2013.

Kemp's ridley sea turtle is listed as endangered and the loggerhead sea turtle is listed as threatened in New York State and both may use the western Sound as important early developmental habitat in late summer and early fall.

3.11 Essential Fish Habitat (EFH)

The regional fisheries management councils, with assistance from NOAA-Fisheries, are required under the 1996 amendments to Magnuson-Stevens Fishery Management and Conservation Act to delineate Essential Fish Habitat (EFH) for all managed species, to minimize to the extent practicable adverse effects on EFH, and to identify other actions to encourage the conservation and enhancement of EFH. In compliance with the Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA 16 United States Code §1801-1883), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), the New District of the USACE submitted to NOAA Fisheries, an EFH assessment for the Asharoken Shore Protection Project is located in Appendix E. This assessment includes an analysis of the direct, indirect, and cumulative effects of the proposed project on EFH, including prey and forage species of EFH-managed species that might use the habitat, and on EFH-managed species and life stages for which the Project Area has been designated as EFH (Tables 15 and 16).

EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (NOAA-Fisheries 2004). In addition, the presence of adequate prey species is one of the biological properties that can define EFH. The regulations further clarify EFH by defining "waters" to include aquatic areas that are used by fish (either currently or historically) and their associated physical, chemical, and biological properties: "substrate" to include sediment, hard bottom, and structures underlying the water; areas used for "spawning, breeding, feeding, and growth to maturity" to cover a species' full life cycle; "prey species" as being a food source for one or more designated fish species (NOAA-Fisheries 2004).

In regard to EFH for this project, 16 species of finfish (various life stages) were identified within the appropriate 10 degree by 10 degree North Shore of Long Island, Long Island Sound EFH Quadrant which is bounded by the following coordinates; N 41 00.0, E 73'N 20.00, S 40 50.0, W 73 30. This area includes Atlantic Ocean/Long Island Sound waters from Northport NY west to Cooper Bluff NY. This square includes Northport Bay, Huntington Bay, Oyster Bay and Cold Spring Harbor as well as the quadrant bounded waters of LIS proper.

The following list (may pertain to one or several life stages) contains EFH species potentially found within waters of the project site; *, Red Hake, Windowpane Flounder, Winter Flounder, Black Seabass, Bluefish, Atlantic Mackeral, Scup, Summer Flounder, Little Skate, Cobia, Spanish Mackeral, Winter Skate, Sand Tiger Shark, Atlantic Herring, King Mackeral,z Pollock.*

The nearshore and borrow area fisheries surveys conducted 2003–2005 documented the occurrence of several EFH species in varying abundance in the vicinity of the Project Area, as well as the borrow areas. These include windowpane flounder, winter flounder, bluefish, and scup in the nearshore Project Area and Atlantic herring, black sea bass, bluefish, red hake, scup, windowpane, and winter flounder in the vicinity of the offshore borrow areas (USACE-NYD 2005, 2007).

3.12 Socioeconomics

The northwestern half of Asharoken Beach (Reach 1) is backed by the upper limit of Duck Island Harbor and a row of residences located on the southwestern side of Asharoken Avenue. To the northwest of Asharoken Avenue is an eroded dune area fronted by a beach berm sloping seaward towards the Long Island Sound. The southeastern half of the 2.4-mile stretch (Reach 2) consists of a set-back section of Asharoken Avenue with a single row of residential structures, most of which are near a bulkhead line of protection and overlook a low sloping beach about 100–150 ft wide (USACE-NYD, 2002; USACE-NYD, 2013).

Demographics

Detailed studies of future population growth and other projections for the Asharoken study area have not been undertaken. Although modest population growth (less than 1 percent annually) is projected over Suffolk County as a whole for the next 25 years, recent data indicate that the study area is currently experiencing an overall decline in population (USACE-NYD, 2013).

The decrease in population from 1990 to 2000 in Asharoken is assumed by the Village Master Plan to result from several factors: many children of families that moved to the area in the 1980s and 1990s have matured and moved away to college or employment, and, because of the current high cost of property, homes that are currently coming onto the market tend to be purchased by older people whose children no longer live at home. Census data support this explanation, as the 5 to 19 age group showed a significant decrease in the years 1990 to 2000, and the largest increase was found in the 75 to 84 age group. The population of Eaton's Neck has not declined as much over the decade 1990 to 2000, but there has been a decrease in people under 45 and an increase in people of retirement age. In the light of this data and the probable resistance of the local community to significant further development, the study has not used projected future population levels in the analysis and has assumed 0 percent population growth over the project life (Table 17, USACE-NYD, 2013).

Census data indicate that more than 150 residents in the study area have disability status. In the event of evacuation, special treatment for such people may tend to increase evacuation costs. However, due to the lack of precise data regarding the nature of these disabilities and the difficulty in quantifying the cost of special evacuation treatment, these data have not been included in the analysis (USACE-NYD, 2013).

Commuters

In the sense that anyone who travels to a place away from their residence for a particular purpose on a daily or otherwise regular basis can be considered a commuter, commuters may include both those who travel to their place of work and those who travel to a place of education. Because no schools exist on the peninsula, all residents enrolled in school are at risk from being cut off from their homes, hence their inclusion in the commuter data. These assumptions form the basis for estimating the number of residents who may be impacted by a significant storm event. Temporary accommodation may be required if residents are cut off from their home and travel delays would result in economic losses.

According to census data, residents use private and public transport, which is assumed to include railroad and bus services. As the study area is not served by any scheduled public transport links, this study assumes that public transport refers to the majority of the commute to the workplace and does not include journeys, primarily by personal vehicle, to reach transport nodes such as the Long Island Railroad Station in Northport. Since residents must also leave the peninsula for all services and shopping, the number of people affected by blockage or severance of Asharoken Avenue may be assumed to include all of the residents of the peninsula.

Income/Employment

Comparisons with county and state statistics for household income and the value of owner-occupied housing units suggest that the peninsula is a relatively affluent area, with median household incomes in the study area 50 percent higher than in the county as a whole, and median house values 2–3 times greater than the county median. The 2000 census also reported that only eight families were living below the designated poverty level in the study area and that unemployment in the study area was greater than the county average, but lower than the state average.

Environmental Justice

Executive Order 12898 mandates that Federal Actions address Environmental Justice requiring the fair treatment and meaningful involvement of all people with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. No group of people (including racial, ethnic, or socioeconomic groups) should experience a disproportionate share of negative environmental impacts from any private, state, or federal action, program, or policy. In general Environmental Justice obligates each federal agency to identify and address potential disproportionately high and adverse human health or environmental effects of its activities on minority populations and low income populations.

A cursory analysis was conducted to determine the potential applicability of Environmental Justice issues. The analysis took into account a comparison of minority and low income populations. Comparisons with local (County) and State statistics for household income and the value of owner-occupied housing units suggest that the peninsula is a relatively affluent area, with median household incomes in the study area 50% higher than in the County as a whole, and median house values 2-3 times greater than the County median. The 2000 census also reported that only 8 families in the study area were living below the designated poverty level, and that unemployment in the study area was greater than the County figure but lower than the State average.

3.13 Historic and Cultural Resources

The Area of Potential Effect (APE) for this project includes the project area as identified above (see Figure 2), the near shore area and the proposed borrow area. Although there are no confirmed prehistoric sites within the limits of the shoreline areas of the APE, a total of 17 previously documented prehistoric sites lie within a 1-mile radius of the project corridor (USACE-NYD, 2004). However, due to land use actions and shoreline erosion within the project area, there is a low probability that any remains of the incidental use of the shoreline by Native Americans have been preserved (USACE-NYD, 2004).In 1646, Theophilus Eaton, Governor of New Haven, acquired what is now Eaton's Neck from the Matinnecocks. During the 19th century, a number of sand and gravel mining industries were situated in Eaton's Neck and Asharoken. Mining facilities were located: on the West Beach spit in southwestern Eaton's Neck; on Eaton's Neck Beach, where Asharoken Beach joins the mainland; and near the Coast Guard Station and lighthouse, constructed in 1849. The Coast Guard Station is the oldest such facility in New York State (USACE-NYD, 2002).

There are four sites listed on the National Register of Historic Places for Eaton's Neck and Asharoken Village, just outside APE: the Delameter-Bevin Mansion on Bevin Lane, the New Jersey Felix House on the west side of Asharoken Avenue in Asharoken, the Harry E. Donnell House on Locust Lane, and Eaton's Neck Lighthouse. The latter property is the second oldest lighthouse on Long Island, first lit in 1799 (USACE-NYD, 2002). There are four potential National Register of Historic Places-eligible architectural resources identified within the APE: the Chesebrough House, the Chesebrough Servants House, the Laura S. Stewart House, and the Rube Goldberg House (USACE-NYD, 2003).

A Remote Sensing Survey was conducted along Asharoken Beach in 2003 to determine the presence or absence of submerged or shoreline cultural resources that may be eligible for inclusion in the National Register of Historic Places within the nearshore, and offshore areas that might be affected by the proposed alternatives. Comprehensive magnetic, acoustic, and bathymetric remote sensing and hydrographic surveys were conducted within the nearshore sand placement area, as well as within two proposed offshore sand borrow areas. The magnetic survey of the tidal zone identified a total of 28 magnetic targets within the study area, seven of which had signatures potentially consistent with a buried shipwreck or shipwreck-related debris. The remote sensing survey of the nearshore area identified one side-scan sonar target, which was evaluated as not being potentially significant. No targets were identified within the offshore survey areas (USACE-NYD, 2004).

3.14 Coastal Zone Management

The proposed project would affect coastal zone resources of the State of New York. Therefore, it is necessary to analyze the project in greater detail with respect to its consistency with the State Coastal Policies of the NYS Coastal Zone Management Plan (CZM) as well as the Long Island Sound Coastal Management Plan (LICMP). The New York State Department of State administers the state's CZM and has established 44 coastal policies which are the basis for determining if an action is consistent with the state's program. Similarly the LICMP contains 13 policies that must be evaluated. Each policy was reviewed in the context of the proposed shore protection plan, and where an interaction occurred, a responsive statement was prepared which evaluated the plan's consistency with that policy. Pursuant to Section 307(c) of the Coastal Zone Management Act of 1972 as amended (16 U.S.C. 1456 [c], the U.S. Army Corps of Engineers New York District has reviewed all the policies listed in the both the state and the Long Island Sound coastal management programs and is provided in Appendix F.

The primary interaction between the proposed project and coastal resources is the construction of the shore protection structures (groins), initial and subsequent beach nourishment and excavation of sand from offshore borrow areas.

3.15 Hazardous, Toxic and Radioactive Waste

In 1995 USACE-NYD conducted a Hazardous, Toxic, and Radioactive Waste (HTRW) assessment for the North Shore of Long Island as far west as Little Neck Bay and as far east as Fishers Island, with particular emphasis on the Bayville and Asharoken Beach areas (Appendix H). This assessment consisted of a regulatory agency file review and a site survey. The file review involved Federal and state database searches that included regulated sites located within the project corridor and within a 0.5-mile area from the project corridor. A site survey was conducted to verify the database information and to identify potential sites of concern that were not included in the database report.

The Northport Power Station, owned by National Grid is the largest oil-burning power plant in the northeast. This facility houses various storage tanks for petroleum products and is listed in the Leaking Underground Storage Tanks database. The power station is a small quantity generator Resource Conservation and Recovery Act site, has an active water discharge permit, and has an emission permit under the Clean Air Act. At present, the operation of the Northport Power Station does not directly impact any of the proposed project elements by virtue of the distance of the station from the designated Project Areas, either along the Asharoken Beach shoreline or at the offshore borrow areas within Long Island Sound.

To confirm the absence of any HTRW concerns data bases maintained by the NYSDEC and the US Environmental Protection Agency (EPA) were reviewed. EPA data bases reviewed were National Priorities List (NPL), Resource Conservation and Recovery Information System (RCRIS), Toxic Release Inventory System (TRIS) and Comprehensive, Environmental Response, Compensation and Liability Information System (CERCLIS). Review of these data bases showed no sites in proximity of the project area.

Review of NYSDEC databases for Spills, Brown Fields and State Superfund sites showed no incidents/locations in the proposed project area. It must be mentioned that the National Grid Power Plant is located approximately 1/3rd mile from the project's southern limit. Review of EPA and DEC data bases showed the National Grid power plant is in compliance in water, air and solid waste discharges and management.

3.16 Air Quality

As required by the Clean Air Act of 1970, National Ambient Air Quality Standards (NAAQS) have been established for six major air pollutants identified by the United States Environmental Protection Agency (USEPA) as being of nationwide concern: carbon monoxide (CO), nitrogen oxides (NO_x), ozone (O_3), particulates (PM), sulfur oxides (SO_x), and lead (Pb). Primary standards are intended to protect public health, while secondary standards are intended to protect public welfare (e.g., physical damage to structures, ecological damage).These standards have also been established as the ambient air quality standards for the State of New York. An air quality conformity analysis was performed in 2005 and 2015 in regard to the Asharoken project site. Data is located in Appendix H.

The Project area is located in the north/central part of Long Island on the Long Island Sound, in Suffolk County, which is part of the New York, Northern New Jersey, Long Island, and Connecticut ozone nonattainment area. Suffolk County has been designated with the following attainment status with respect to the National Ambient Air Quality Standards (NAAQS) for criteria pollutants: marginal nonattainment area for the 2008 8-hour ozone standard and a maintenance area for the 2006 particulate matter less than 2.5 microns ($PM_{2.5}$) standard (40 CFR §81.333). Oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) are precursors for ozone and sulfur dioxide (SO_2) is a precursor pollutant for $PM_{2.5}$. Suffolk County is in attainment of the NAAQS for all other criteria pollutants.

Emissions from the Project are associated with non-road construction equipment working on the site and on-road trucks moving on public roads to and from the Project site. Emissions from these two source categories are primarily generated from their diesel engines, with emissions that include NO_x, VOCs, SO_2, and $PM_{2.5}$. Emissions from Federal Actions, such as the Proposed Project, are regulated under 40 CFR §93 Subpart B General Conformity. Fugitive dust on the worksite can potentially be generated due to trucks and equipment moving on unpaved surfaces, but can be significantly reduced through the use of best management practices relating to site work dust mitigation. Fugitive dust is made up of PM and can contain $PM_{2.5}$.

3.17 Noise

Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying. Noise can be intermittent or continuous, steady or impulsive, and can involve any number of sources and frequencies. It can be readily identifiable or generally nondescript. Human response to increased sound levels varies according to the source type, characteristics of the sound source, distance between source and receptor, receptor sensitivity, and time of day. Affected receptors are specific (e.g., schools, churches, or hospitals) or broad areas (e.g., nature preserves or designated districts) in which occasional or persistent sensitivity to noise above ambient levels exists.

Existing sound sources in the project area include sounds originating from natural sources such sound from waves, wind, the movement of vegetation, birds, and other sources. These may have a substantial effect on the existing sound environment but under normal conditions would not be interpreted as noise. Noise would come form and traffic, air traffic, boat usage, residential including power and lawn tools, barking dogs etc. Transportation sounds are also potentially important noise sources. Sensitive sound receptors in the vicinity of the study area include residences and natural receptors, such as osprey and other nearby fauna.

4.0 ENVIRONMENTAL EFFECTS

For each of the sections below, the potential environmental impacts that would be expected under both the FWOP and TSP are discussed.

4.1 Future Without Project

As described in Section 2.2, natural forces in concert with existing shoreline modifications would continue to shape and alter the Asharoken peninsula under the FWOP. Erosive forces would potentially lead to adverse impacts to shoreline residances and wildlife. Continued erosion could lead to the eventual failure of sections of the roadbed of Asharoken Avenue and a temporary closure in Reach 1 between Duck Road and Bevin Road. With the failure of the road, several critical utilities such as water, sewer, and electricity would be severed. The Section 103 revetment structure constructed by the USACE in 1997 was designed for a 15-year lifespan and, with a series of repairs including replacements with larger stones, now has a life span through 2020. This structure would eventually fail if no further substantial modifications are made to the structure and no other erosion protection measures are initiated within the study area (USACE-NYD, 2013).

4.1.1 Land Use/Recreation/Transportation

Under the FWOP, beach and to a lesser extent, upland erosion, would continue in the Project Area. This would result in reduced beach frontage, increased potential for structural damage with the possibility of the loss of homes and municipal civil buildings (i.e. Village Hall and Fire Department) in Asharoken. Under extreme circumstances, extreme erosion and loss of elevation and width of the tombolo might resulting loss of recreational usage, the road and road bed and the suitability for residential existence.

Storms consistent with historic trends, including frequent minor to moderate events, are likely to result in moderate scale adverse impacts to land use and communities, with repeated damage to structures followed by subsequent rebuilding. These impacts, loss of beach front for recreational use, increased traffic due to road maintenance, and loss of emergency access routes, would be expected to be short- to long-term, depending on storm frequency and severity.

4.1.2 Geological / Topography and Soils

Littoral sediments would continue to be transported west along Asharoken Beach at rates similar to those estimated in the 1997–2001 sediment budget. The updrift shoreline to the east of the Northport Power Station, supplied by sediment from the north shore of Long Island to the east, would continue to accrete, and approximately 15,000 cy/yr would be transported into the Northport Basin. Of the sediment transported to the Northport Basin, approximately 5,000 cy would be retained or lost offshore and approximately 10,000 cy would be dredged each year by LILCO and deposited in Reach 2A/2B. Assuming this dredged material continues to be deposited in this location, Reach 2B/2A would continue to erode at approximately 10,000 cy/yr. If this deposition is discontinued, Reach 2B/2A would erode at 20,000 cy/year. Reach 1B would experience minor shoreline erosion at approximately 4,000 cy/yr and Reach 1A would erode at approximately 18,000 cy/yr. These rates of erosion create a risk of structural failure for Asharoken Avenue and residences, particularly in Reach 1A.

During storm events of sufficient strength, littoral sediments in Reach 1A would continue to be transported across Asharoken Avenue to Duck Island Harbor, periodically depositing sand atop the existing salt marsh at the terminus of the Harbor, adjacent to Asharoken Avenue. The frequency and magnitude of these sedimentation events would determine the area of burial/loss of native salt marsh vegetation (i.e., *Spartina* sp.). This sedimentation and increased elevation would likely promote establishment of non-native common reed (*Phragmites australis*) especially in highest elevation zones such as the upland edges of the roadside. These overwash events would also deposit sand on top of Asharoken avenue requiring removal and deposition elsewhere, probably back on the beach.

The FWOP which precludes any beach/dune construction measures, would result in a progression of the erosion threats to the remaining beach dunes and upland areas. Exisitng dune or back dune habitat that are not protected by hard structures may become shoreline. to beachfront in areas that are not yet bulkheaded and still exist in a natural state. Under extreme conditions if enough sediment was eroded away formation of a breach could occur, resulting in a significant change to local hydrological and geological function.

4.1.3 Climate

The extant wind regime, consisting of winds to the east-northeast and the west, is assumed to continue in the FWOP. Under this regime, waves, produced by predominately northerly clockwise to easterly winds, would occur throughout the year driving erosion. Northeasters would commonly occur in this area between October and March, creating large waves and wave setup with the risk of accelerated storm-induced erosion in the study area. The FWOP condition is not expected to affect these regional climate parameters.

Dune, back dune and possibly more upland habitats could be converted to beachfront or other shoreline type habitats both removing or creating micro-climate habitats via creation of shade and wind protection or the removal of such protection and full exposure to the sun and wind etc.

4.1.4 Water Resources

4.1.4.1 Regional Hydrogeology and Groundwater Resources

Under the FWOP alternative, no significant impacts to groundwater from natural forces would be anticipated. Ground water would continue to discharge at the toe of slopes along the beach during low tide, which may be contributing to the potential for slope failure and increased rates of erosion. However, heavy damages to residential, municipal or industrial structures could result in the discharge of any number of household or commercially available products that could contaminate ground or surface waters, if not stored in an appropriate manner.

No changes to the tidal regime are anticipated under the Future Without Project scenario. In the event of a complete breach of Asharoken Avenue, temporary or permanent impacts to the tidal prism, salinity and temperature gradients as well as general water quality of bayside waters may occur as a result of breach and the increased exchange of LIS water this condition would persist until the breach was closed, either by repair/closure of the breach or through eventual re-distribution of sediments by future storm events so as to close the breach naturally (USACE-NYD, 2013).

4.1.4.2 **Sea Level Rise**

Relative sea level rise in the Asharoken study area under the FWOP scenario is anticipated to continue at a rate of approximately 2.7 mm/yr, which exceeds the global average of 1.8 mm/yr (IPCC 2007, IPCC 2014). The higher observed average rate of sea level rise in the this area is partially the result of post-glacial rebound, exacerbating the amount of observed wetland/shoreline subsidence attributed to eustatic sea level rise (i.e., that brought about by an increase in the volume of the world's oceans, because of the thermal expansion) alone (Hartig et al. 2002, Needelman et al. 2012). Along with increases in mean sea level, storm intensity/frequency is predicted to increase, and a shift in storm intensity towards Polar regions is anticipated, such that more frequent and damaging storms are expected to occur throughout the north Atlantic (NWF 2011). These processes are complementary, as an increase in mean sea level will exacerbate the surge effects associated with more intense and frequent coastal storms. Should a future climate scenario for the northeastern U.S. coastline include a less predictable and more dynamic weather regime, a greater frequency of coastal storm events could represent a considerable threat to coastal communities in this region over time.

4.1.5 Vegetation

Under the FWOP scenario, further deposition of sand onto the bayside of Asharoken Avenue at Bevin Road during coastal storm/overwash events may further bury existing areas of *spartina* salt marsh which would likely continue to increase the coverage of the area by common reed (*Phragmites australis*) which has been negatively impacting the wetland for some time. Under an extreme event, such as in Hurricane Sandy, a complete breach of Asharoken Avenue near Bevin Road could re-deposit large volumes of sand in Duck Island Harbor filling in areas of cord grass and spartina marsh. After a number of filling in events, this area would be converted to a dune plant community which would probably include invasive *phragmites*. Marsh peat and decomposing vegetation can act as a source of nutrients in newly covered areas and could result in relatively rapid colonization by characteristic plant species, such as American beach grass (USACE-NYD, 2013). While new dune like areas may arise via the redistribution of littoral material during a catastrophic breach, existing dunes and vegetation at or proximal to the site of a breach would be lost, or significantly reduced. Furthermore, maritime woodland coverage may be lost on the northeast portion of Eaton's Neck as the bluff is eroded (USACE-NYD, 2013). . Areas opened up would become intertidal or supratidal habitat. Areas not subject to constant tidal flow may develop into salt marsh if they accrete to the required elevation.

4.1.6 Aquatic Resources

The FWOP may result in changes aquatic habitats associated with the beach and dune complex along Asharoken Avenue. The recurring pattern of change to nearshore habitats caused by ongoing erosion and storm events followed by repair and recovery efforts would continue in the FWOP. Emergency repair, including rebuilding bulkheads and the addition of sand to restore beaches and dunes would be expected in the future, but these efforts would have not be long term and lack coordination over the full length of the Project Area. As a result, sediment movement would continue across Asharoken avenue as well as pace more winnowed fine particles into the intertidal and nearshore north of Asharoken in LIS.. As a result more bay side wetlands would be lost or degraded and the intertidal and near shore benthic habitat may be degraded and/or changed by accumulation of silts and muds fine particles.

Changes such as these would reduce the amount of wetlands which act has forage areas and nursery areas for many species. These wetlands also provide refuge to many organisms especially early life stages for many fish and invertebrate including EFH species. On the Sound side where the additional fine particles may increase turbidity during periods of higher wind and waves displacing many species of fish. Where quantities of fines settle out it is likely that the benthic community will shift from once that favors course sediments to one that is supported by mud and silt. The latter is generally considered a decrease in environmental quality.

4.1.6.1 **Fish and Invertebrates – Nearshore and Intertidal Communities**

Fish and invertebrates (both macrocrustaceans and benthic infauna) that utilize the surf zone and nearshore waters along beaches are adapted to the dynamic nature of these habitats. These organisms are in general capable of moderate short term changes in water quality, turbidity changing water levels, currents, associated with tidal action. The fish and invertebrates reported to be using the existing beaches and nearshore waters can be expected to continue to utilize these habitats in the FWOP. However, if significant changes in accretion patterns, benthic substrate type, turbidity and localized water quality etc occur during the FWOP the relative abundance and distribution of these species can be expected to change in response to the (long term) changes to aquatic habitat. Accelerated level rise would exacerbate habitat instability as discussed above . The aquatic habitats associated with the wetlands in Duck Island Harbor would likely experience continuing loss when storm events carried sand across Asharoken Avenue.

During a powerful coastal storm existing shallow water habitats within the project site, notably those which currently provide nursery function or a predation refuge may be affected by sedimentation from adjacent littoral sources or impacted by sediments derived form landward erosion. Demersal eggs and larval forms and demersal macroinvertebrate resources may be subject to burial or other deleterious sediment impacts under the FWOP conditions, potentially causing direct loss of the benthic populations and as well as secondary inhibition of foraging success of various predators in the study area. Species that may be affected by such changes/events in the nearshore habitat would (seasonally) include summer flounder (*Paralichthys dentatus*), winter flounder, windowpane flounder, black sea bass (*Centropristis striata*), as well as forage species such as common mummichog, striped killifish, Atlantic silverside and bay anchovy. Macroinvertebrates subject to events/changes to demersal habitat include blue crabs, horseshoe crabs, spider crabs, and possibly juvenile American lobsters.

Violent short term storm events have the capacity to move large volumes of littoral and terrestrial sediments into the near shore that can result in the direct impacts to immobile organisms. Burial can result in mortality while extreme increases in suspended sediments can also cause significant harm to respiratory functions. When turbidity levels are very high, excess silt deposition can suffocate benthic organisms or epifauna. Filter feeders may encounter difficulty locating and capturing food due to increase in suspended non-edible particulates.

Deposit feeders may encounter an increase in non-edible particulates along the surrounding sea floor, following a severe storm event. Long term coastal erosion along Asharoken Beach would encompass such short term events as well as contributing to the conversion of existing beach and dune habitats to submerged intertidal surf zone or shallow marine habitats that would increase open water/benthic habitats supporting marine invertebrates, and finfish.

Under the Future Without Project conditions, nearshore benthic communities would be subject to direct and indirect impacts associated with natural stochastic processes such as major coastal storm events which result in the redistribution of littoral and upland sediments and changes in bathymetric topography. Existing nearshore/intertidal habitats, including natural benthic features, may be altered by extreme storm events. Nearshore benthic communities are susceptible to burial under storm conditions, especially sessile species with little mobility. Loss of these organisms can constitute an indirect impact by decreasing foraging success of fish and other demersal predators in the study area.

4.1.6.2 **Fish and Invertebrates – Borrow Area, Offshore Community**

Under the Future Without Project conditions fish and invertebrate communities would be subject to direct and indirect impacts associated of natural processes such as seasonal changes in temperature and salinity, and occasional short term (regional) changes in water quality related to storm events. Basic existing conditions at the borrow site are expected to remain unchanged. Under the FWOP, both targeted species and "by catch" species with be affected by commercial and recreational fishermen. Predation by birds, seals and fish will continue to occur.

4.1.7 Wildlife

4.1.7.1 **Reptiles and Amphibians**

Under the FWOP, impacts to any marine reptiles in the vicinity of the Project Area would be minimal, relative to natural processes including predation. Adult sea turtles have very few natural predators, except for certain species of large sharks which are not known to inhabit the waters surrounding the Project Area. Any sea turtles within the Project Area vicinity would seek the shelter of deeper water in the event of a storm and avoid any storm related impacts. Sea turtles are known to be susceptible to capture in commercial fishing nets and traps and this could occur in or near the project borrow area, however it would be considered an extremely rare occurrence. Direct impacts to sea turtles during the FWOP are much more likely to occur from accidental contact with any of the fast moving vessels that may utilize the Sound during the widow of sea turtle residence (June – October)

In regard to resident reptiles and the FWOP, locally occurring, common species, are be exposed to vehicle strikes while crossing Asharoken Avenue. This potential impact may increase for female diamond back terrapin which undergoes short upland migrations from the water during late spring early summer nesting season. Coastal storms could impact diamond back terrapin and box turtle nesting areas by flooding them with salt water as well. In general near shore upland habitats such as the maritime forest zones adjacent to the project site are utilized by the terrestrial reptiles and amphibians common to the regions. These habitats may be altered by powerful coastal storms, over wash events, and salt spray under the FWOP. Loss of these areas or portions of them would constitute loss of habitat to these regional species. All of the reptiles found within the vicinity of the project site would be susceptible to predation pressure from various natural predators including raccoons, foxes and several species of raptors, as well as dogs cats and rats.

4.1.7.2 **Birds**

Under the FWOP, available beach and intertidal foraging, and resting habitats utilized by many species of shorebirds may be reduced as a result of storm-related and long term erosional processes (USACE-NYD, 2013). Beach nesting species may also experience an analogous loss of habitat. However, storms may also increase elevated disturbance areas which are beneficial to species such as least terns and piping plovers. Erosional processes may also increase low lying intertidal beach habitats thus increasing possibly increasing areas of forage. Arboreal bird populations in the vicinity of project site would be exposed to coastal storm events. Impacts from such occurrences would be most significant during nesting season. Nests can be destroyed by wind and rain and habitat features including essential vegetation can be destroyed as well. Long term erosion would also be a source of habitat loss and could act to remove trees and ground cover required by many local avian species for nesting, feeding and roosting.

4.1.7.3 **Mammals**

Under the FWOP, there exists significant potential for vehicle strikes to resident terrestrial mammals (squirrels, raccoon, fox, opossum, deer etc) due to traffic associated with Asharoken Avenue. The only marine mammals likely to be associated with the general vicinity of the project site would be harbor and grey seals, winter residents of the Project Area. These animals would move offshore or seek sheltered areas during storm events. Storm related and long term erosion of the shore line might reduce the amount of beach usable as "haul out areas" for these species. However, low lying areas created by overwash and/or loss of elevation may form new areas of beach suitable for hauling out as well. Long term erosional processes that decreased the area of maritime forest would likely be detrimental to abundance and diversity of those mammal species that presently reside in and around the Project Area.

4.1.7.4 **Threatened and Endangered Species**

Federal Species

Within and around the project site Atlantic sturgeon would have several sources of potential direct impacts during the FWOP. Since the nearshore areas of the LIS including the western portions are heavily used by recreational boaters, vessel strikes may pose a threat to sturgeon. However, since the Atlantic sturgeon is generally considered a highly dermersal species, its frequency at or near the surface is probably very limited, therefore the threat of a boat strike is probably relatively unlikely. Under the FWOP by-catch captures of Atlantic sturgeon by commercial and recreational fishermen is probably the most common (human caused) direct impact to Atlantic sturgeon, with the potential to cause serious injury or death to this species. Predation on this species especially on juveniles and sub adults will continue to occur during the

FWOP. The frequency of direct impacts due to fishing by catch and natural predation are expected to remain the same for all project alternatives

Under the FWOP, conditions suitable for foraging/nesting activity by federally listed bird species, principally the piping plover, are expected to persist in the absence of project implementation. Existing sandy habitat on the bayside of Eaton's Neck is potentially suitable as a foraging area for adult plovers if future sediment transport processes continue to form a spit within Duck Island Harbor. However, if beachfront habitat in other areas continues to erode, nesting habitat for piping plovers will be continue to be limited and may decrease (USACE-NYD, 2013). In addition, if the beachfront was diminished, there would be an increased potential for overlap among plover nesting areas and recreational beach areas. Without implementation of project motivated management measures, such as restricting beach use by the local community during nesting and brood rearing periods, this increased overlap has the potential to cause significant disturbance to nesting habitat for these two federally protected bird species (USACE-NYD 2013). Project site usage by the red knot is unknown. However, it can be anticipated that horseshoe crabs do utilize the beach to some degree for spawning and thus it is likely that this foraging resource is available at some level.

Another additional species that was recently listed and which may occur in the study area (Suffolk County, New York) include the northern long-eared bat. Maintenance of long-eared bat populations in the vicinity of Asharoken Beach would depend on the integrity of suitable upland (forested) nesting habitat. Should suitable habitat decline over time as a result of coastal (storm-induced) erosion, local long-eared bat populations may be impacted. Simultaneously, long-eared bat populations throughout the northeastern United States are suffering from a widespread fungal disease ("white nose syndrome"), which could potentially threaten/eradicate the local population under either the FWOP or project implementation scenario.

The recently listed northern long-eared bat (*Myotis septentrionalis*) potentially occurs in Suffolk County; however no recent sightings of this species have been reported in the vicinity of Asharoken Beach/Eaton's Neck. Should any species suitable habitat decline over time during the FWOP (as a result of coastal erosion) this would represent a secondary impact to the bats even if none were residing there.

Federally listed sea turtle species, including green sea turtle, loggerhead sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, are not expected to be significantly impacted in the vicinity of Asharoken Beach under the FWOP. Changes in beach morphology, including net loss of beach habitat over time as a result of storm-induced erosion will not directly affect sea turtles in or near the study area. The potential for strikes with commercial or recreational vessels will continue to exist.

Finback and humpback whales are listed as potentially occurring in the waters of Long Island Sound, however their occurrence in this area of LIS is considered extremely unlikely and impacts to those species would remain unchanged under the FWOP.

As there have been no recent sightings of the northeastern beach tiger beetle in the vicinity of Asharoken Beach/Eaton's Neck; conditions would not change under the FWOP.

Federally listed plant species which may potentially occur in the Project Area include sandplain gerardia and seabeach amaranth. Both species are adapted to the dynamic beach/dune environment, therefore under the FWOP, these species, if present would likely persist, although their patterns of spatial distribution may shift as a result of beach and dune erosion and re-establishment over time.

State Species

The Atlantic sturgeon is also listed as a state species. The potential effects under the FWOP were addressed in Section 4.1.7.4.1

Under the FWOP, several bird and marine reptile species listed as endangered or threatened by the state New York may experience impacts of varying degrees including continuing erosion of habitat associated with coastal storms, as well as the existing potential for impacts related to human activity such as vehicle contact, recreational disturbance, and predation or disturbance via domestic animals (pets). During the FWOP predation may also occur from native species which could include fox, raccoon and opossum. State species potentially affected during the FWOP could include least and common terns, which are listed as endangered and threatened, respectively, piping plover and osprey (listed as threatened in New York State). A potential benefit associated with further landward erosion during the FWOP is that beachfront converted to intertidal or shallow marine habitat over time, may increase the available feeding for shorebirds.

Sea turtles including the green, loggerhead and Kemp's ridley are also listed by the State of New York but they are not expected to be significantly affected by natural events under the FWOP scenario. The potential for strikes by commercial or recreational vessels or entanglement /entrainment in fishing gear will continue to exist.

The northern diamondback terrapin, recently removed from the list of Special Concern Species, is documented to breed and nest in the protected waters and embayments of the study area, including Duck Island Harbor and the surrounding salt marshes and mud/sand flats. Under the FWOP, terrapins would be subjected to existing levels of nest disturbance and predation on eggs/juveniles by small mammals such as raccoons/feral cats and rats. In addition, terrapins will continue to be subject to vehicle strikes along Asharoken Avenue, especially females during migrations associated with breeding/nesting season.

4.1.8 Essential Fish Habitat

EFH and its designated species within the Project Area will continue to experience long term beach erosion and the effects of storm events as it has for many years. In the long term under the FWOP, the physical aquatic habitat (intertidal and nearshore littoral) on the Sound foreshore would expand as a result of beach erosion and sea level rise, however, intertidal and nearshore areas of the back bay may decrease due to overwash of sand across Asharoken Avenue and deposition into the bay.

It is likely that some of the erosion of beach habitat would be counteracted by short term action to restore beaches to protect upland areas. Powerful storm events (short term) will move large amounts of sediment and are likely to bury and possibly cause some mortality to various benthic invertebrates utilized EFH species. This would represent a direct impact to EFH and a secondary impact to EFH species. Events like this would be expected to occur on an infrequent but regular basis and not have any significant impact on the fisheries. During storm events EFH species would seek deep water refuge from areas where wave activity was an issue.

Other impacts to EFH and species during the FWOP would include commercial and recreational fishing effects to habitat as well as targeted EFH species including summer and winter flounder, tautog, and bluefish. Under the FWOP, impacts to EFH from "natural events" will be insignificant. On the other hand commercial and recreational fishing will continue to be the greatest concern to fishery populations and habitats.

4.1.9 Socioeconomics

The FWOP alternative increases threats to both critical infrastructure which includes Asharoken Avenue, the Coast Guard Station, the Fire House as well as to the residential structures in Reach 2. As the only link to Eaton's Neck, Asharoken Avenue is expected to be maintained by the Village of Asharoken in the future regardless of Federal actions. If no comprehensive erosion protection measures are implemented, it is expected that the Village would continue to spend resources in repairing the road and clearing it following overwash events. In the past, the Village and utility companies have expended anywhere from $10,000 to $60,000 annually (in 1988 dollars) on repairing utility lines and dunes, and clearing as well as repairing the road (USACE-NYD, 2013).

The potential consequences of continued erosion in the absence of Federal project implementation could range from likely events (with the highest probability) to extreme events (with the lowest probability) as listed below (USACE-NYD, 2013):

- Loss of beach for recreation (Reaches 1 and 2).
- Failure of bulkheads and damage to structures west of the power plant due to wave impacts (Reach 2).
- Overwash and temporary closure of Asharoken Avenue, including buried and overhead utility line damage and road closures isolating Eaton's Neck (Reach 1).
- A severe undermining of Asharoken Avenue anywhere between Duck Island Lane and Bevin Road, isolating Eaton's Neck (Reach 1). Additional damage to structures in Reach 2.
- A complete breach of Asharoken Avenue anywhere between Bevin Road and Duck Island Lane (Reach 1), isolating Eaton's Neck. Severe damage to structures in Reach 2.

Each of the types of storm damage has a certain risk or probability, expected cost of repairs, and impacts on Asharoken Avenue. All the impacts, except a breach, have been experienced by people in the Village of Asharoken. However, with worsening beachfront conditions, a breach of Asharoken Avenue could be a reality. Under the most severe damage mechanisms, closure of Asharoken Avenue may require the relocation of the population of Eaton's Neck to temporary housing. A temporary closure of Asharoken Avenue would result in the stranding of 1,600 to 1,700 people and the severance of normal emergency services and vital utilities (USACE-NYD, 2013).

There would also be increased emergency costs incurred by the Village of Asharoken and the Town of Huntington. A major storm event would necessitate calling in all available police officers for emergency duty. This emergency duty would be performed by officers being paid overtime and would greatly increase the emergency budget for the Village. Increased emergency costs would result from borrowing extra equipment from other municipalities to respond to fires or other emergencies and for extra resources to be put in place. Special vehicles to transport residents would have to be leased from outside the Village of Asharoken to access Eaton's Neck if Asharoken Avenue is damaged but still passable. If Asharoken Avenue were impassible, any evacuation of Eaton's Neck would have to be done by boat or helicopter, and such an evacuation would be difficult until storm conditions subside. A closure of Asharoken Avenue would isolate the population of Eaton's Neck from most emergency services and other utilities such as water and electricity (USACE-NYD, 2013).

The continued threat of damage to structures abutting Northport Bay and Long Island Sound would also increase over time. The increase would be the result of the expected rise in sea level and the reduced protection from diminishing beach berms that are eroding over time. As the beachfront is depleted for the impacted 2.4 miles of shoreline, wave impact damages to the bulkheads, road, and structures would increase in severity and frequency (USACE-NYD, 2013).

Environmental Justice

No Environmental Justice issues are anticipated as a result of the FWOP alternative.

4.1.10 Historic and Cultural Resources

Under the FWOP scenario the four sites currently listed, as well as the four additional sites potentially eligible for inclusion in the National Register of Historic Places for Eaton's Neck and Asharoken Village are at risk for structural failure as erosion of Asharoken Beach continues in the absence of Federal project implementation.

4.1.11 Coastal Zone Management

The FWOP would not conflict with Coastal Zone Policies.

4.1.12 Hazardous, Toxic and Radioactive Waste

Under the FWOP condition there exists the possibility of a coastal storm damaging and possibly destroying any number of residences that lie along Asharoken Avenue. Should such an event take place, hazardous materials such as heating oil, gasoline, pesticides, solvents etc., could be released into the surrounding ecosystem which include LIS and tidal marsh.

4.1.13 Air Quality

Suffolk County is located in the New York-New Jersey-Long Island Air Quality Control Region. Similar to most urban industrial areas, emissions from automobiles, manufacturing processes, utility plants, and refineries have impacted air quality in the Project Area. Based on the National Ambient Air Quality Standards (NAAQS) six primary pollutants, *Suffolk County is designated as* *a non-attainment area for ozone and carbon monoxide and an attainment area for sulfur dioxide, respirable particulate matter (PM10), lead and nitrogen oxide*.

In the Asharoken study area, ambient concentrations of CO, O_3, and Pb are predominantly influenced by vehicle emissions; NO_x and particulates are emitted from both motor vehicle and stationary sources (i.e., power generation), and emissions of SO_x and sulfates are mainly from stationary sources. The location of the study area next to Northport Power Plant, the largest oil-burning power plant in the northeast, may result in abnormally high levels of criteria pollutants produced by fossil fuel combustion, such as CO, NO_x, PM, and SO_2. However, the coastal location of the study area, with prevailing northeasterly winds, may reduce the direct impact of emissions from the Northport Power Plant. Under the FWOP air quality conditions/issues are expected to continue as they presently exist.

4.1.14 Noise

Under the FWOP, ambient noise sources may include various types of vehicle on Asharoken Avenue, occasional noise from infrastructure repair along the road, residential noise from lawnmowers and power tools etc., fly overs from commercial or private aircraft and engine noise from boats and personal watercraft. Primary receptors at the beach along Asharoken Avenue and within the general vicinity of the project include residents of Asharoken/Eaton's Neck, visitors to the area, and terrestrial birds and mammals.

4.2 Tentatively Selected Plan

Description

As described in Section 2.1, the Tentative, Federally Supported Plan (TSP) would involve the construction of three groins, the deposition of beachfill, and periodic beach nourishment. The source of the initial sand for the beachfill will be borrow area A (Figure 6).

The TSP will increase the width of Asharoken Beach and provide a line of protection landward of the berm. The project offers a combination of "hard" and "soft" engineering techniques. The proposed plan for Asharoken Beach includes the dredging and placement of approximately 600,000 cy of fill material to rebuild 12,400 ' of beach and berm and the construction of three rock groins on the Western end of the project to retain sand and decrease erosion (Figure 4). Periodic renourishment is anticipated at a frequency of 80,000 cy every 5 years with the renourishment sand trucked in from an upland source. Additional post storm nourishment is estimated at 25,000 cy every 5 years. Another re-nourishment source will be sand dredged from the LILCO power station inlet to the east and "by passed" to the project site.

Initial fill will cover approximately 75 acres of intertidal and littoral nearshore benthic habitat seaward of mean high tide limit. Sand will be dredged from a nearby offshore borrow area (Area "A") and will require dredging an area of about 55 acres to a depth estimated to be 10' below the ambient benthic surface. Average depth of the dredge foot print will be increased from about 35 to 45 feet (MLW). The project will also the require the construction of a western (critical area) groin field consisting of a total of 3 stone groins (152', 132', 112' X 64'), with a cumulative foot print area (berm, intertidal and littoral lands) of about 0.58 acres.

Adverse environmental impacts from the initial implementation of the TSP will be localized short-term, direct and indirect impacts. They will be associated with groin construction, beachfill (berms), and dredging of sand for beachfill. Impacts will consist of direct and indirect impacts to benthic infauna, demersal fish and macroinvertebrate species at the construction and placement sites .

4.2.1 Land Use/Recreation/Transportation

The TSP would result in the addition of groins and the widening of the berm to the landscape/seascape. There will be a resulting change in beach/berm elevation including the structures of the groins. There will be a change in the view-shed from both landward and seaward of the directions. The berm may partially obstruct the water view from some residences and Asharoken Avenue Implementation of the project will result in both temporary and permanent land use .

Implementation of the project will cause temporary disruption of traffic patterns on Asharoken Avenue due to the delivery of stone and other Project materials and equipment. These impacts would be minor and limited to the construction period and renourishment periods. Project activities may affect boat traffic in the vicinity of the Project Area. No long-term impacts on transportation resources in the Project Area are anticipated.

As part of the TSP, public access crossovers will be built requiring former private property to be utilized by the public. Additionally more parking spaces will be required such that public parking is available. These two aspects of the TSP which represent minor land use changes are required by law, however, they will not constitute a significant change to Land Use of the property site or its vicinity.

No significant or long-term adverse impacts to recreational resources in the Project Area are anticipated as a result of the proposed project. Temporary disruption of recreational activities along the beach may occur in the Project Area as a result of construction activities. These impacts would be minor and would be limited to the duration of construction activities in the Project Area. Placement activities will require a safety buffer that will make areas of the beach off limits. This buffer zone will progress down the beach along with project construction. Potential long-term benefits to recreational resources in the Project Area include the expanded beach area, and increase in diversity and productivity of marine life in the area of the groins, additional fishing access from atop the groins and the existence of public access to the beach.

4.2.2 Geological/Topography and Soils

Beachfill and the construction of the groins at will directly impact beach topography and the topography of the area to be dredged. Soils will be disturbed and redistributed through excavation, placement and re-grading. The three rock groin structures, 152’, 132’, and 112’ by 64’ respectively, will be erected on top of the existing land surfaces creating new topography on Asharoken Beach, the intertidal zone and in the near shore

Excavation for the groins, dredging for beach nourishment sand offshore, and placement of sand on the beach constitute the project direct impacts to soil and geology. The grain size of sand placed on the beach will be similar to the grain size of the pre-construction beach. This will be the case for any re-nourishment as well. The project is not expected to involve any clearing of maritime forest where soil development is most advanced. Most of the physical disturbance associated with the project (grading and bulldozing of sand) will be located along the shoreline and upper beach and dune areas where some upland soils may have accumulated. While erosion as a result of routine wind and wave forces, as well as future storm events, will take place across the entire Project Area, it is anticipated that the portion of Reach 1A near the rock groins would erode at a slower rate than the surrounding area, which would continue to erode at an estimated rate of approximately 18,000 cy/yr. During storm events, much of the littoral material in Reach 1A would remain on Asharoken Beach as a result of the presence of the three rock groins.

Future direct impacts associated with the TSP on soils will consist of the five-year periodic nourishments of 80,000 cy of sand sourced from upland sites. To reduce the costs of transporting the sand to the site, the sand will be sourced on Long Island where sand mines are generally located within forested areas and occasionally within the Central Pine Barrens.

Direct impacts to soil and geology include dredging actions resulting in changes in bottom bathymetry and the sediment characteristics of the offshore borrow area. The bathymetry of borrow area A will be altered but as most of the sand removed is coming from a ridge of sand of higher elevation a significant depression is not expected to occur. The expected result of the dredging operation is the reduction of the size of the sand ridge. Dredging will re-suspend sediments in the water column. Most of the suspended sediment load will consist of medium to coarse sand and gravel which will settle back to the bottom almost immediately. A small amount (by volume) of suspended sediments will be finer particles which will remain in the water column longer and is likely to form a localized area of higher turbidity. These finer particles may settle out farther afield. This localized area of higher suspended sediments will exist throughout the duration of dredging. As the sediment is pumped onto the beach, a second area of localized higher turbidity will be created at the placement site. This situation will be present as long as placement operations are active. The zone of localized suspended sediment will migrate along the beach along with the filling operations.

In general the TSP will have a direct impact on the topography of Asharoken Beach by providing a wider beach of greater elevation. In addition, at the borrow area there will be direct impacts associated with altered bathymetry and potential alterations of surface sediment type. However, because no significant depression is expected as a result of the dredging, long term infilling with fine materials should not occur and the surface sediments should remain similar to the existing surface sediments.

4.2.3 Climate

Implementation of the TFSP will have negligible impacts on climate on large scale local, (project wide), or regional scope. Micro-climate within the project site may be affected both long and short term, depending on location, project action and project feature Longer term affects such as shading from planted vegetation will exist as long as these features endure. The berm and vegetation will also affect impacts to due to wind as they will act as barriers. The significantly enlarged beach and berm can also act as heat source as it absorbs and radiates the suns energy.

4.2.4 Water Resources

In general, the TSP will not have significant impacts on water resources. Localized increases in turbidity at the dredge and placement sites are to be anticipated for the duration of the placement activities. No changes to dissolved oxygen (DO) are anticipated. Decreases to DO are linked to the re-suspension of organics and nutrients into the water column acceleration microbial activity and removing oxygen from the water. Because the sediments being dredged are over 90% sand, detrimental increases in microbial respiration due to increased organics is not anticipated. Another factor that will lower the likelihood of decreases in DO will be the cooling water temperatures and increased mixing accompanying the fall season.

The Asharoken project will not place any effluents into the Long Island Sound. The only materials placed in contact with the water (permanently) will be sand and stone. However, as with any marine construction project, there is a threat of direct impacts to water quality in the event of an oil, fuel or hydraulic fluid spill from the graders, dredges, barges or support vessels etc.. These impacts, in most cases, can be prevented to a large extent via implementation of precautionary and responsive protocols outlined in a project-specific Environmental Protection Plan. A 404(b) Evaluation has been completed and the District is submitting a Water Quality Certification (401) application to the State.

4.2.4.1 Regional Hydrogeology and Groundwater Resources

Implementation of the TSP is not anticipated to have any direct negative impacts on ground water supplies within the general or immediate Project Areas. Best Management Practices will be implemented to prevent/minimize any potential for a spill that might affect ground water.

4.2.4.2 Surface Water

No changes to the tidal regime are anticipated under the TSP, either along Asharoken Beach or in the back-barrier waters of Duck Harbor. A catastrophic breach of Asharoken Avenue will be less likely as a result of implementing the TSP, minimizing the potential for influx of higher salinity, waters to Duck Harbor.

During dredging and placement, turbidity at the action sites is likely to increase . However, due to the nature of the sediments (medium to coarse sands), the areas of high turbidity will remain very localized (on a scale of 100s of meters) in relationship to the action area. This condition will exist for the duration of the dredging/placement operation.

4.2.4.3 Sea Level Rise

Relative sea level rise in the study area under the TSP is assumed to continue at a rate of 0.8 ft per 100 years. In-water activities associated with dredging sand at the borrow area and construction activities associated with building the groins and berm will not have an impact on sea level rise. The TSP will not change the rate of SLR in the Project Area.

4.2.5 Vegetation

Implementation of the TSP will cause direct impacts to upland vegetation within staging areas, use of the required equipment, and within the placement footprint. Any losses will be limited to the loss of common dune vegetation (where it exists) this may include beach grass and seaside goldenrod in the temporary bulkhead and dune area (Reach 1A) (USACE-NYD 2002). No significant clearing of maritime woodlands or the understory would occur. Ultimately, implementation of the TSP will increase suitable habitat for beach grass and other dune stabilizing plants along Asharoken Beach. All dune areas will be replanted with native species.

Historically eelgrass, (*Zostera marina*) and widgeongrass (*Ruppia maritima*) may have occurred in this area of Long Island Sound. However, the former species was largely extirpated during the mid-20th century as a result of "eelgrass wasting disease." Recent surveys (USACE and other) did not indicate the presence of eelgrass or widgeongrass beds offshore of Asharoken Beach. (USACE-NYD 2005, 2007). Because of the relatively poor light transmission in the LIS, only sparse submerged vegetation (SAV) is expected to exist, if at all, at the borrow area. Therefore significant loss of SAV is not expected to occur as a result of dredging.

Storm-induced migration of sand across Asharoken Avenue at Bevin Road (into Duck Harbor) is expected to decrease; however, it is unlikely that this will alter the distribution of invasive common reed, which has already taken hold in the area, encroaching the upper limits of the saltmarsh cordgrass in this area.

4.2.6 Aquatic Resources

Direct effects associated with implementation of the TSP will occur in the intertidal, adjacent nearshore habitats, and the borrow area. In regard to the intertidal and near shore areas and as discussed in Section 4.1.6, many species associated with beaches and adjacent habitats have evolved physical and behavioral adaptations to cope with the extremely dynamic environment of the shoreline. Typical adaptations include movement with the tide, high reproductive potential, and only spending a portion of their life cycle in the intertidal or nearshore littoral zone. Although placement of sand onto the intertidal and the near shore zones will cause significant mortality to those animals incapable of avoiding burial, it is anticipated that recovery of the preconstruction populations will be rapid due to the highly dynamic nature of the habitat and the organisms that occupy it.

The TSP will have direct and indirect impacts to habitat and communities of the borrow area. These include removal and burial of organisms as well as temporary and long term changes to the habitats affected. Water quality will experience minor adverse effects through temporary localized elevated turbidity for the duration of the in water construction activities. Benthic feeding fish species (e.g., winter flounder) as well as other fish species may experience temporary spatial displacement from the dredging and construction areas. The (temporary) loss of benthos at the borrow area would also represent an indirect (foraging) impact to fin-fish or other benthic feeders. If a hopper dredge is utilized there may be direct mortality to highly demersal species such as flounders, skates and various types of none swimming crabs. In general most of local species present at the time of construction will move away from disturbance areas to feed in the surrounding areas and, therefore, would be unaffected by the temporary localized reduction in available benthic food sources. Benthic communities will naturally begin to re-establish shortly after construction is completed, forming a similar community, generally within about a one to two year period

4.2.6.1 **Finfish**

Under the TSP, finfish can be impacted by dredging at the borrow area and at the beach. It is unlikely that groin construction will have any significant direct impacts to finfish. Potential impacts of beach nourishment activity on fish communities, at the dredge site include potential entrainment, however adults of most species have the mobility to escape the dredge. Juveniles, larvae and eggs are most susceptible to entrainment or other injuries via the dredging process especially if a hopper dredge is employed. However, if a hopper is used it must be equipped with a deflector device which greatly reduces the likelihood of entrainment by pushing surface sand off to the side of the draghead. These same life stages are also more likely to be vulnerable along the beach placement site as a result of burial or physiological impairment of respiratory function. The scales of these potential impacts to mobile forms should be minor, given the observed responses of beach nourishment projects elsewhere in the northeast Atlantic region (Wilber et al. 2003, Able et al. 2010), where fishes such as bluefish were demonstrated to be able to avoid turbidity plumes and other species were actually attracted to plumes because of feeding opportunities.

The timing of beach nourishment activities is a primary determinant of the magnitude of anticipated impacts to fish and macro-invertebrate resources. Early spring through summer coincides with spawning and the critical period of early life-stage development for many inshore fish and macroinvertebrate species. The young-of year of many of these species rely on shallow, nearshore habitats throughout the late summer and early fall as nursery and feeding areas and as a refuge from predation. Because of the declining population of winter flounder The NYSDEC has established a no dredging window from January through May. The State of New York has also stated concerns regarding the potential effects of project dredging on multiple species of finfish and mega-invertebrates who's spawning and early life history stages occur during the late summer, and implemented and additional no dredge window through September (January-September). The District reviewed the reproductive life histories of these regional species of concern and determined that there were a dozen species that had a moderate to high potential for impacts to early life stages from a hopper dredging and possibly sand placement. These species included Atlantic Herring, Clearnose Skate, Fourspot Flounder, Goosefish, Hogchoker, Northern Sea Robin, Red Hake, Winter Skate, Summer Flounder, Long Fin Squid and Blue Claw Crab. Of these 12, summer flounder, long fin squid and blue claw crab have the highest potential for entrainment or contact injury due to hopper dredging.

Thus late fall to mid-winter would be the most advantageous time to conduct the sand dredging to avoid impacting the majority of fish and macro-invertebrate species likely to occur in the nearshore and offshore habitats associated with Asharoken Beach. It should also be noted that by November many species will have already started to migrate to deeper overwintering habitats and be out of harms way. Also the most effective method of dredging sand from an offshore site and placing on the beach at Asharoken will be by the use of a cutterhead pipeline dredge not a hopper, however at this time there has not been a final determination in regard to the method of dredging to be utilized. Because of the seasonal no dredging window, the likely use of a cutterhead dredge, and /or best management practices including the use of a deflector if a hopper is used, the District does not anticipate any significant adverse impacts to fin fish or mega invertebrate species from implementation of this project. Table 18 displays potential project impacts to EFH and mitigation strategies.

4.2.6.2 **Benthic Invertebrates**

4.2.6.2.1 **Nearshore Benthic Invertebrates**

Common benthic invertebrate species occupying the lower intertidal and shallow subtidal portions of beaches along the U.S. Atlantic coast include annelid and nematode and other marine worms, amphipods and dedcapods (crabs and shrimp) and copepod crustaceans, bivalve mollusks, snails and other forms. Asharoken beach produced similar species during monitoring and as with the borrow area, nearshore observations revealed annelid and nematode worms were the dominant forms.

Many of the marine invertebrate species will potentially be impacted by placement of fill material on intertidal or subtidal portions of Asharoken Beach. In general, the types of invertebrates found in or above the sediment surface are able to persist in the dynamic beach environment because they have adapted to conditions such as high wind and wave energy and periodic burial. The ability of most benthic invertebrates to survive a fill event depends on their ability to burrow up into the newly deposited substrate. Substrate composition and depth of the newly deposited layer are the major factors determining survival rates and vertical migration capabilities of beach invertebrates subjected to instantaneous burial (Culter and Mahadevan 1982, Nelson 1985). Alternate means of beach invertebrate re-colonization include recruitment of juveniles and adults from adjacent areas, and deposition of invertebrates onto the beach by dredged material pipelines during sand placement (Van Dolah et al. 1994). Near shore benthic invertebrate communities both intertidal and littoral have been shown to recover very rapidly due to the nature of their adaptations as previously discussed. Generally speaking this can be within 6 months to a year depending on the construction season. Placement of offshore sand onto the beach via a slurry, introduces an abundance of small prey items into the nearshore water column. Some may recolonize but many become prey for a variety of predators. This feeding opportunity is localized and moves along with the process of beach building. Once the initial abundance is depleted the newly filled intertidal and subtidal area will take time to fully reestablish. During this interim, the area will not offer an abundance of forage. Under this condition the recovery period represents a secondary impact to any organisms that might ordinarily find and abundance of prey at the project site.

Of concern in Long Island Sound is the potential for impacts to horseshoe crab populations. Beaches represent important spawning habitat for horseshoe crabs and juveniles are typically concentrated in shallow nearshore habitats. Nourished beaches can potentially create additional spawning habitat for horseshoe crabs, which lay eggs in shallow burrows along the beach; sand placement on the intertidal beach can potentially smother/suffocate horseshoe crab eggs and the female crabs may encounter difficulty constructing burrows or depositing eggs in sand that differs from native substrate. Best management plans would place the fill outside of the spawning season and match grain size of the donor sites with that of the beach site.

The completed groins will create a reef like environment offering habitat to many invertebrates including crabs, lobsters mussels, barnacles and other invertebrates that require hard substrates to attach to. The three dimensional groins will significantly increase diversity and abundance at all levels of the marine eco-system in comparison to the sand bottom that they will cover.

4.2.6.2.2 **Offshore Benthic Invertebrates**

Nematodes, and annelid marine worms were the numerically dominant organisms at the borrow area. Crustaceans including the tube-dwelling amphipod, *Ampelisca abdita.* and bivalve and gastropod mollusks were also consistently present in moderate abundances during initial pre-construction surveys. The presence of the copepod *Temora longicornis*, was an artifact of capture methods, they being planktonic and microscopic and not functionally members of the benthos. These types of invertebrates are the least likely to be affected by any project actions. Unavoidable impacts to the benthic community at the designated borrow area(s) offshore of Asharoken Beach are anticipated with implementation of the TSP. Benthic invertebrates will be removed when surface sediments are excavated. Large scale mortality will occur especially to infauna (marine worms, bivalves etc.) removed with the sediment and are buried by successive loads of sediment as it is delivered to Asharoken Beach. However, many of these smaller forms will wash out of the placed sediment and be returned to the near shore. Larger organisms, that fail to escape the dredge will be destroyed as they are passed through the dredge pump or are cast up on and buried in the new beach. Certain crustacean species which area highly mobile and wary such as blue claw and lady crabs have a good chance of avoiding the dredge. As discussed previously, the dredge plan and accompanying BMP’s will ensure that the altered bathymetry will not cause significant water quality issues or density stratification (via temperature or salinity) thus preventing potential low dissolved oxygen conditions.

Dredging is likely to increase bottom turbidity levels on a very localized scale. When turbidity levels are very high, excess silt deposition can suffocate benthic organisms or epifauna. Filter feeders may encounter difficulty locating and capturing food due to increase in suspended non-edible particulates. Deposit feeders may encounter an increase in non-edible particulates along the surrounding sea floor. Typically, elevated turbidity is limited in duration to the time of actual dredging and impacts on benthic fauna are generally confined to the immediate vicinity of dredging operations (USACE 2014). Furthermore, as the dredge moves on to new areas the increased turbidity move along with it, thus this increase in turbidity affects any given area on a very temporary basis.. The low silt content of fill sediments involved in this project would greatly limit the probability of turbidity-related impacts on any fish or macroinvertebrates.

Abundance and diversity of the affected benthos is expected to return to pre-dredging levels within 6 to 12 months, depending on the time of year construction occurs and, the the type of benthic organism being monitored. However, if the characteristics of the site are changed such that the borrow area fills in with a different type of sediment (e.g., silt or clay) or if local hydrodynamics are affected by topographic changes, different species may recolonize the area and original species may be excluded through competition (Van Dolah et al. 1994). Should the designated borrow area experience changes in sediment texture (e.g., reduced average grain size) a longer time to recovery may result. It should be noted that the open-water setting of the borrow area should enhance the water circulation within the dredged depression such that water quality impacts would be very improbable.

As part of this project a pre and post construction remote sensing program will be conducted to further characterize the offshore benthic habitats will be that will be affected by dredging.

4.2.7 Wildlife

4.2.7.1 **Reptiles and Amphibians**

Sea turtles may be directly impacted by beach nourishment activities via entrainment (hopper dredge) or other direct contact injuries (all dredges). Sea turtles may experience displacement due to turbidity, noise or visual cues. Sea turtles may also experience indirect impacts associated with implementation of the TSP through loss of prey, or the ability to locate prey. In general, cutterhead dredges and clamshell type dredges are regarded as having the least likelihood of directly impacting sea turtles. Hopper dredges on the other hand, are known to pose significant threats to sea turtles, in regions where marine turtles are relatively abundant and display seasonal behaviors which cause them to congregate and/or also causes them to bury in the sediment. For the Asharoken project the risk of entraining, injuring or killing sea turtles with a hopper dredge will be minimized by installation of sea turtle deflectors on the dragheads. Also part of the BMP's required for this project qualified turtle and sturgeon observers will be placed on board a hopper dredge should one be utilized. Because project dredging is proposed for the fall (October) the likelihood for any direct impact to sea turtles by any type of dredge will be further decreased because by this time sea turtles will have begun to move east out of the western sound beginning their migration back to the south east Atlantic and Caribbean.

Northern diamondback terrapins are present in the tidal marsh west and south of Asharoken Beach, and although the planned construction is not expected to have any direct impacts on these marsh areas, terrapin do on occasion move overland and cross roadways. Movement of traffic and construction equipment associated with implementing the TSP may put turtles directly at risk of injury or death. During nesting season, the threat of vehicle impacts would be much greater, however, terrapin nesting generally takes place in the spring and early summer, not in the fall.

Other common reptiles and amphibians such as garter snakes, box turtles and toads may be present in the marshes and within the areas of maritime forest. These organisms would also be susceptible to vehicle/equipment impacts during construction activities.

However, most reptiles and amphibians commonly found on Long Island are rarely associated with beach habitats such as the project site. The TSP is not expected to have any significant direct or indirect impact on amphibian populations during the initial phase of the replenishment of Asharoken Beach due to the scarcity of standing fresh water in the area. One possible exception is the potential impact of the TSP on American toads or Fowler's toads, which are known to frequent the uppermost portion of intertidal beaches in the study area, primarily at night, foraging for insects. Should project implementation result in an increased area of high intertidal beach face with accompanying rack, this species may ultimately benefit from project implementation, although the initial construction activity, including movement of vehicles and equipment, would likely represent a disturbance or worse and would be considered as adverse impacts to these species.

4.2.7.2 **Birds**

Bird species that use beaches and nearshore habitats for nesting, foraging or overwintering are more likely to experience impacts from beach nourishment activities than those bird species for whom the beach and shoreline habitats are not essential. Species that could be impacted at Asharoken project site include the common tern (*Sterna hirundo*), least tern, roseate tern, oyster catcher, and black skimmer. However, by October, all of these species will have migrated out of the region. Significant direct adverse impacts to most bird shorebird species within and around the project site is expected to be minimal provided project construction is implemented outside of the nesting season which is the planned construction schedule. Overwintering birds such as gulls and sea ducks, etc., are unlikely to be significantly impacted as they will move away from any undue disturbances, to forage, roost etc. elsewhere. During fill operations an abundance of small invertebrates are cast up on the beach and exposed as the slurry water washes them out of the sand as it runs down to the surf zone. Generally speaking there is feeding frenzy of shore bird that are present, most likely to be gulls. This would be a beneficial indirect impact for those species available to take advantage of it.

Groin building is not expected to cause any significant impacts to shorebirds. Construction is expected to parallel the beach fill process, and should be completed before spring. Once completed, the groins will act as roosting and foraging areas for a variety of shorebirds including gulls and sand pipers etc. especially at low tide, when the intertidal areas are exposed. Groins also act as convenient “anvils” for gulls, to use in the cracking of shells of invertebrate prey.

Of greatest concern is the piping plover, a federal and state listed species that build its nests in sparsely vegetated sandy areas above the intertidal zone. This species is known to nest within the project site and will be discussed in Section 4.2.8 Threatened and Endangered Species, which follows.

Implementation of the TSP construction activities are scheduled during the fall and winter. This will avoid critical nesting seasons of listed and non listed species. No significant direct or indirect impact to birds are anticipated during the initial phase of construction, the completed project or from follow re-nourishment cycles.

4.2.7.3 **Mammals**

Project related direct impacts to marine mammals (including seals, dolphins and whales) are a potential concern with regard to proposed dredging activity at the borrow area. However, the nature of the Project Area, including its location, make it unlikely that any species of whale or dolphin would at any season be in the vicinity of the project. Most cetaceans (whales, dolphins and porpoises) are usually found in the eastern Sound. None the less, contact with a vessel or dredging the western Sound would be possible. Due to the moderate possibility that turtles or sturgeon may be in or near the project site, observers/monitors will be required onboard the dredges. Environmental duties would include observations of any large marine mammals in the vicinity, thus vessel personal would be made aware of their presence. Most large marine mammal incidents occur during transit when vessels/dredges are traveling at speeds greater than 10 knots. As there will be no transiting of a hopper or laden barges for pump out, it is unlikely that a such collisions would occur at the project site if any whales were present. A working hopper dredge moves relatively slowly (3-4 knots) and cutterhead and clamshell dredges remain almost stationary.

The species most like to be in the Asharoken Beach Project Area are overwintering grey and harbor seals. There is a possibility of direct contact impacts to either of these species, however both are extremely agile, powerful swimmers and can easily avoid any of the typical vessels and equipment used for beach nourishment projects. A more likely and much less harmful direct impact would be disturbances to seals from equipment noise or movement. Overwintering seals are known to haul out on the beaches of the Sound. Project construction has the potential to prevent seals from utilizing areas of the project site beaches during construction.

In addition to the possibility of minor direct impacts to marine mammals, indirect impacts associated with the Asharoken project may include disruption of the prey base i.e., fish and macro-invertebrates, displaced or removed from the area as result of construction activity and/or decreased feeding success due to turbidity issues. Of potential benefit to seals is the exposure of macro-invertebrates which may become more readily available prey during dredging and placement. Small fish may be attracted to the abundance of prey churned up by dredging and placement action and seals may be able to take advantage of this scenario as well.

Impacts to terrestrial mammals will be very limited. Most of the mammals likely to be within or close to the project site are small species, such as squirrels, mice, shrews, chipmunks and rabbits etc. Other mammals may include foxes and raccoons and white tailed deer. In general most of the direct impacts anticipated would be those of disturbance/displacement related to noise and the movement of equipment. It is also possible that mortality could occur from impacts related to vehicle movement, excavation and grading etc.. This is expected to be minor. The frequency of vehicle mortality may increase if there is a project related increase in traffic. Also, once the project is completed the higher elevation of the berm may act as a visual barrier tending to keep animals on the road for longer periods of time thus increasing the possibility of vehicle contact.

4.2.8 Threatened and Endangered Species

4.2.8.1 **Federal Species**

Although Atlantic sturgeon are not expected to be found in the surf zone or very shallow near shore their presence within the “action area” of the placement operation is possible. Direct impacts such as physical injury are highly unlikely. Physical injury due to the various components of the placement/groin construction is unlikely because the majority of the construction activities takes place on land or in very shallow surf or swash zone areas, and the equipment moves very slowly. Depending on how sheet pile will be set, noise disturbance from pile driving or jetting may displace fish to an adjacent area. Disturbance/avoidance due to increases in turbidity due to placement sediment dispersion is also possible, although sturgeon are known to be tolerant of relatively high levels of turbidity.

Within and around the borrow area Atlantic sturgeon may be present year round, including individuals from any of the east coast sturgeon populations. Numbers of Atlantic sturgeon may increase during the fall and spring correlated to the migratory periods with the river and estuary known to occur in spawning rivers such as the Hudson. Sturgeon from the NY Bight disperse south throughout the Mid-Atlantic Bight during the winter.

Direct impacts including entrainment or other contact injury would have the potential to occur during periods when dredges and associated vessels were working at the borrow area. This potential for direct impact may increase during seasonal periods when adult and sub-adult sturgeon are congregating or actively migrating to or from the Hudson estuary. Direct impacts from entrainment (and other contact) appear to be rare occurrences. Sturgeon entrainment rates derived from USACE screening of dredged material from hopper dredging operations along the Atlantic coast (Virginia, New York and New England) between 1990 and 2005 resulted in an observed take of 0.6 sturgeon per year (USACE-NYD 2006, as cited by ASSRT 2007).

Vessel strikes also appear to be rare and the few that have been noted have occurred in situations where there was minimum depth in relation to draft of the vessel. Sturgeon are highly demersal and dredging will be occurring in unconfined open water, not a narrow channel. Impacts to sturgeon in the upper reaches of the water column due to vessel strikes appear unlikely. General disturbance resulting in avoidance behavior may occur.

No significant impacts to water quality are expected from the actions of a dredge. There may be a minor, localized increase in total suspended sediment along the path that the dredge takes as it obtains sediment. However, as the target material is 90% sand or better, any turbidity will localized to the immediate vicinity of the drag or cutter head. At most this might cause an avoidance reaction from a sturgeon which is a minor effect.

Direct impacts to sturgeon resulting from construction actions of the proposed project are not expected to significantly affect or jeopardize any Atlantic sturgeon population.

Atlantic sturgeon feed on polychaetes, oligochaetes, amphipods, isopods, mollusks, shrimp, gastropods, and fish (Johnson et al. 1997, Haley 1998). These benthic species will be lost along with the sand during dredging. The borrow area utilized for the beach fill of the proposed project will be lost as a foraging area to sturgeon until it can recover which is expected to occur relatively rapidly. However, the areas adjacent to the borrow area are regional in size and offer similar types of prey. Sturgeon will be able to find prey outside the borrow area therefore this temporary loss of forage is not a significant indirect impact to regional sturgeon.

Three species of sea turtles may seasonally occur in the vicinity of the project site (loggerhead ,Kemps ridley and green). Potential impacts to these marine turtles were previously discussed in Section 4.2.6.1. If a hopper dredge is utilized dredging impacts will be minimized by utilizing hopper dredge best management practices including use of the turtle deflector head and on board lookouts and monitors. The NMFS completed their Asharoken consultation under section in a letter dated 18 November 2015 (see Appendix C) in which they concurred with the District's determination that the project may affect, but is not likely to adversely affect, any (NMFS') species listed by as threatened or endangered under the ESA of 1973, as amended.

The piping plover, which is federally listed as threatened and state-listed as endangered utilizes the project site beach for nesting and foraging. From 2008 – 2015 nests have been identified within the Project Area (Figure 12 and Table 14). No significant direct impacts are anticipated during construction as the beach fill and groin construction will take place outside he season and both adults and chick will have migrated out of the area. Stabilization of coastal habitats using either "hard" or "soft" coastal engineering techniques can have adverse effects on plovers by eliminating natural disturbances, such as overwash events, which are optimal habits for plover foraging and nesting habitats. However, the Asharoken beach, the residential areas and its various erosion shore protection elements have been repaired and re-nourished constantly effectively preventing overwash for many years. Further prevention of this phenomenon would not represent a significant adverse impact to the plovers which nest there. On the other hand, the significant increase in berm width should increase the potential habitat available for the piping plover nesting and may act as and attractant to this species. This has been the case on many nourished beaches along the south shore of Long Island.

Additional (public) access points are a project construction feature that has the potential to manifest in a post construction disturbance factor to plover nesting or brood rearing at Asharoken. Within the 2.5 mile project reach Individuals (residents and non-residents) when utilizing the access points have the potential disturb plovers nesting or brood rearing in the vicinity of these public access corridors. To minimize any potential adverse impacts of the public access ways, a plover management/monitoring program will be developed with the town and local state, and federal resource agencies to prevent or minimize these potential impacts. Such a plan would be developed within the next project phase.

As it is anticipated that construction will take place between October and April 1, it is unlikely that the rufa red knot would be present at or near the project site. Thus it is unlikely that any construction activities will significantly affect the red knot. However, the additional sand resulting from the fill process may off a more compatible horseshoe crab spawning substrate than the rock and cobble that is presently in the intertidal. Groins may also yield benefits to the red knot because shore perpendicular structures such as groins may enhance red knot foraging habitat trapping eggs. Shoreline discontinuities like creek mouths, jetties and groins and other artificial obstructions can act to concentrate drifting horseshoe crab eggs creating a feeding hotspot. Such structures often create a localized low energy environment creating advantageous conditions for horseshoe crab spawning over a wider variation of weather and sea conditions.

As previously discussed sea beach amaranth and sea beach knotweed are Federally listed plants that may occur in the region. Frequent federal construction work including environmental assessments has not yielded observations of these plants on site and there are not records that show that they once existed there. Preconstruction surveys will again take stock of what is on site but the presence of these species is not anticipated.

4.2.8.2 **State Species**

Several New York state listed species may be present at or near the project site during various seasons of the year. These would include piping plovers and the sea turtles discussed above in the Federal section. NY State avian species include common loons which overwinter in the sound including in the vicinity of Asharoken beach, ospreys, (spring through fall) which have been accommodated along Asharoken Beach with nesting platforms, and common terns (spring through fall). Because of the fall/winter construction schedule (Ospreys and terns will have finished nesting and migrated from the area) loons may be the only species impacted by the noise and disturbance caused by the offshore sand dredging and placement activities. Additionally, turbidity associated with placement activities may impede visibility when loons dive and hunt for fish. This would constitute an insignificant impact as these birds will easily find other areas in which to fish.

Common terns may directly benefit from the TSP in that areas of sparsely vegetated sand would increase, increasing viable nesting habitat. It should be noted that the increase in available nesting habitat to both terns and plovers will likely be concurrent with greater use of the beach as a recreational area.

4.2.9 Essential Fish Habitat (EFH)

The proposed actions under the TSP are not expected to have significant or long-term impacts on the "spawning, breeding, feeding, or growth to maturity" of the designated EFH species that occupy the nearshore or borrow zones. However, proposed activities may have short-term, direct and indirect impacts on EFH designated fish species and life history stages that occur in the immediate vicinity of project action areas. Changes to EFH habitat may be long term and include changes in depth and bathymetry and sediment composition or heterogeneity.

Species spawning during or just prior to construction especially ones with demersal eggs larvae or juveniles are at greatest risk during project implementation from entrainment or potentially adverse affects of increased concentrations suspended particulates. There are no known areas of contamination within the borrow area therefore significant exposure to any HTRW is not anticipated in relationship to dredging or placement of sand.

By implementing the proposed TSP long term shoreline erosion rates will be decreased and a more stable shoreline will be present. The project will protect the Duck Island Harbor wetlands, from further infilling which will benefit early life stages of many EFH species that utilize such protected back waters as protection and foraging areas. These same marsh areas also produce many of the forage species that adult EFH species prey on.

During dredging operations at the borrow area, most EFH species would avoid the immediate area of dredge activity, but would continue to use the borrow area as they have in the past once dredging is completed. There would be no long term effects on EFH or the designated species for this project. Localized areas of increased turbidity on expected to occur in the vicinity of the draghead or cutterhead of the dredge. This may impact visual acuity and impede feeding. However, fish will be able to move into areas where this is not a problem and forage there. Highly demersal fish such as winter flounder and skates would be the most susceptible to direct (contact) impacts from suction and mechanical dredges. Hopper dredges would be the greatest threat to these bottom dwelling species but the sturgeon/turtle deflector will greatly reduce the potential of contact or entrainment. The greatest indirect impact will be the loss of benthic prey within the dredging footprint. EFH species dependent on these organisms will be forced to forage in the surrounding waters. This is not expected to represent and significant impact. Re-colonization is expected to occur rapidly within 1 to two years. Because an elevated ridge of sand is the source for the initial beach fill, none of the potential secondary affects of an excavated area of the bottom, such as long term infilling with finer particles, density stratification or decreases in dissolved oxygen are anticipated.

Placement of large amounts of dredged sand will temporarily increase turbidity in the intertidal and nearshore zones, localized to within hundreds of meters form the outfall. This disturbance zone will move down the beach as the fill template is constructed. In comparison a moderate storm increases the turbidity orders of magnitude greater than placement operations, an this occurs over entire regional areas. (NJ BMP 2001?) This increase in turbidity is not expected to cause significant impacts due to its localized nature and the mobility of species and that near shore environments are often very turbid because of storms or wind events. Species that utilize these areas have the ability to survive such events. Impacts to dissolved oxygen are also not expected to be of concern because of the naturally low organic content of the placement sand and the shallow nature of the LIS nearshore which is well oxygenated from wind mixing and wave action.

Beach restoration at the Asharoken shoreline would result in the placement of large quantities of sand on the beach causing intertidal and subtidal benthic zones and their associated communities to be largely buried, leaving little biological baseline other than those organisms carried along with but not buried by the fill sand. Re-colonization is expected to be rapid but duration of recovery will be dependent on the time of placement. Diversity and abundance is expected to be similar to, but probably not identical to preconstruction conditions at least initially.

Beach nourishment will have a temporary indirect effect on EFH by burying infaunal and epifaunal prey organisms underneath new sand in the intertidal and the nearshore subtidal zone. Mortality and/or burial of benthic prey organisms is not expected to have a significant impact on the feeding success of EFH species since they will re-locate to nearby undisturbed areas. Placing sand can also have beneficial impacts to nearshore EFH species as many species of fish will feed on benthic invertebrates that are being delivered into the water during pumping and re-grading operations.

Benthic communities in the construction site will recover, probably within 1-2 year's time, depending on the type of community and the season of construction completion. If beach nourishment occurs prior to the spring recruitment of benthic organisms to intertidal and adjacent sub-tidal habitats, recovery would be quicker. Species composition may change in accordance with physical characterization of the new sand. An alteration in benthic community structure is not likely to significantly affect the quality of EFH in the LIS nearshore zone since common bottom-feeding species like winter flounder, summer flounder, windowpane, and scup are opportunistic predators and will switch from less abundant to more abundant species. Pelagic-feeding species will not be affected.

In addition, due to the increased slope of the new beach front, the intertidal zone will become significantly narrower until the new intertidal profile equalizes with time. This is not likely to affect bottom-feeding EFH species since they feed on a wide variety of intertidal and sub-tidal prey species and the amount of area changed by the project is only a fraction of the available forage habitat adjacent to the filled beach. Eventually, this slope will level out under the influence of tidal action, waves and storms. Impacts to early life stages will be minimized by constructing the project between the prime winter and summer spawning seasons.

Impacts related to any re-nourishment cycles will be similar to those resulting from the initial fill but will occur to lesser degree in terms of both changes in diversity and scale. Sand will be trucked in so there will be no dredging impacts. Asharoken beach re-nourishment cycles will consists of a significantly smaller volumes of fill than the initial fill , thus a smaller zone of the intertidal and littoral benthos will be affected. The EFH and analysis of impacts can be found in Appendix E.

4.2.10 Socioeconomics

The TSP will have immediate positive benefits for the local community of Asharoken Village in that the project will provide stability of Asharoken Avenue assuring continued access to Eaton's Neck by first responders and vehicles in the event of a medical or weather emergency that may necessitate evacuation. Additionally, the property values of those homes situated closest to the beach, as well as on Eaton's Neck will likely remain stable after the initial replenishment (Hoagland et al. 2012). Although the cost of the TSP is significant, the value of the homes directly affected by potential storm damage along Asharoken Avenue is approximately three times the cost of the project.

No significant adverse impacts to demographics, income, or employment are anticipated as a result of project implementation. Some economic benefits may be realized through local purchases made by project workman (gas meals etc.) for the duration of project construction. Traffic patterns are likely to be disrupted along Asharoken Avenue during construction but these too will last only as long as the construction period.

Likewise no significant socioeconomic impacts have been realized in association with the planned five year with renourishment cycles of the project. All sand and mining activities will occur at a previously permitted facility, no significant adverse impacts to the environment or to socieo-economic resources are anticipated. Minor local (project site) impacts analogous to those discussed above will occur. However, there will be a significant increase in heavy vehicle traffic along Asharoken avenue due to trucks arriving and leaving the Project Area. This may accelerate wear and tear on the road as well as increase disruption of traffic patterns.

4.2.11 Historic and Cultural Resources

The four listed sites and the four potentially eligible sites for the National Register of Historic Places for Eaton's Neck and Asharoken Village and within the APE would not be affected by implementation of the TSP. Placement of beach fill would provide an additional measure of protection to these sites.

Based on within Borrow Area A. The seven magnetic targets identified within the nearshore sand placement area would not be affected by the placement sand. These targets are located at the central section and eastern end of the APE. The construction of the western groin field should have no effect on the seven identified targets (USACE-NYD 2004).

Use of the borrow area has the potential to disturb submerged archaeological sites, such as prehistoric sites. It is recommended that controlled, periodic monitoring of the beach fill surface be conducted immediately following sand placement to look for archaeological materials that may have been disturbed by dredging. Because additional sand will be deposited on the shoreline and tidal zone of the survey area, buried pre-historic land surfaces and associated cultural resources, if these exist, would receive additional protection as a result of the proposed project action. (USACE-NYD, 2004).

the remote sensing survey, no magnetic or acoustic remote sensing targets were identified

4.2.12 Coastal Zone Management

Coastal Zone Management policies would be adhered to during the construction and maintenance of the TSP. Appropriate coastal permits/authorization would be obtained from the NYSDEC. The proposed action would be consistent with CZM (Appendix G).

4.2.13 Hazardous, Toxic and Radioactive Waste

Implementation of the TSP will involve operation of multiple vehicles, pumps, excavators, and other heavy motorized equipment on the beach and adjacent staging areas and local roadways. At the borrow areas, dredges and support vessels/barges will operate on-station for extended time intervals. As with any project of this nature, there is a threat of direct impacts to water and habitat quality in the event of an oil or hydraulic fluid spill, which calls for the outlining of precautionary and responsive tactics. An Environmental Protection Plan will be developed and implemented for the Asharoken project. The presence of the completed project does not have any potential for impacting any source of HTRW materials. On the contrary, the storm damage protection plan will help protect against the potential release of common hazardous residential materials.

4.2.14 Air Quality

The Tentatively Selected Plan will produce temporarily localized emission increases from the diesel powered construction equipment working onsite. The localized emission increases from the diesel powered equipment will last only during the project's construction period and then end when the project is over, thus any potential impacts will be temporary in nature.

As stated in Section 3.16, Suffolk County has been designated with the following attainment status with respect to the National Ambient Air Quality Standards (NAAQS) for criteria pollutants: marginal nonattainment area for the 2008 8-hour ozone standard and a maintenance area for the 2006 particulate matter less than 2.5 microns ($PM_{2.5}$) standard. The county is part of the Ozone Transport Region. Ozone is controlled through the regulation of its precursor emissions, which include oxides of nitrogen (NO_x) and volatile organic compounds (VOCs). VOCs are emitted at a fractional rate compared to NOx emissions. Sulfur dioxide (SO_2) is a precursor for $PM_{2.5}$. Because of these designations and since the project is a Federal Action taken by the USACE, this project triggers a General Conformity Review under 40 CFR §93.154.

General Conformity ensures that Federal Actions do not have a negative impact on State Implementation Plans (SIPs).

The emissions associated with the project are estimated as part of the General Conformity Review and are summarized below, by calendar year.

Applicable General Conformity Emissions

	Year of Construction Activity	
Pollutant	**2017**	**2018**
NOx	2.28	8.35

As per the annual de minimis trigger levels for General Conformity review (40 CFR §93.153 (b)) the Tentatively Selected Plan's General Conformity-related emissions are significantly below the de minimis levels for NO_x (100 tons in any year), VOC (50 tons in any year), $PM_{2.5}$ (100 tons in any year), and SO_2 (100 tons in any year). Therefore by rule, the Tentatively Selected Plan is considered de minimis and will have only a temporary impact around the construction activities with no significant impacts. A record of non applicability is located in Appendix H.

The primary greenhouse gas (GHG) emitted by diesel fueled engines is CO_2. The project is estimated to generate a total of 585 tons of CO_2 which is equivalent to 112 passenger vehicles annual CO_2 emissions[1]. The GHG emissions associated with the project are temporary and insignificant compared to over 1.1 million registered passenger vehicles in Suffolk County.[2]

4.2.15 Noise

Construction noise impacts would occur for the duration of the construction of the TSP. Sound sources include increased truck and commercial vehicle traffic along Asharoken Avenue in support of beach nourishment and groin construction. Operation of heavy machinery on the beach during sand placement, and operation of dredges and support vessels during dredging of the offshore borrow area will also occur. Increased traffic noise and construction noise will occur during the initial fill activity and groin building as well as every 5 years during re-nourishment cycles. However, the duration and level of noise associated with the periodic re-nourishment cycles is expected to be significantly less due to the small volume of material to be placed.

Primary receptors at the beach and adjacent Asharoken Avenue include residents of Asharoken/Eaton's Neck, visitors to the area, and terrestrial birds, shorebird and waterfowl and possibly terrestrial mammals, and seals (grey and Harbor seals). Primary receptors of noise impacts at the offshore borrow areas include a variety of finfish, including EFH-designated species, shorebirds and waterfowl, potentially grey seals and harbor seals. Operational measures to minimize potential noise impacts to these human and animal receptors include proper safety procedures to protect workers, signage where appropriate, proper maintenance of equipment including upkeep of noise reducing systems such as mufflers and sound barriers when applicable.

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[1] EPA Greenhouse Gas Equivalent Calculator, *www2.epa.gov/energy/greenhouse-gas-equivalencies-calculator*, accessed October 7, 2015

[2] NYS Department of Motor Vehicles, NYS Vehicle Registrations on File – 2014, *dmv.ny.gov/statistic/2014ReginForce-Web.pdf*, accessed October 7, 2015

The noise associated with the beach dredging and placement may also pose a direct disturbance impact to fish and other aquatic organisms at the proposed borrow area and the nearshore placement zone. Several noise-producing activities are associated with active dredging, such as collection sounds produced by the rotating cutterhead, a suction draghead running along the bottom, or the dropping of a clamshell dredge, all coming in contact with the sediment bed. Other dredging related noise may include the pumping/movement of slurry through pipes to holds aboard the vessel, and transport of the slurry to shoreline pump substations and the beach.. Other offshore noise would include various ship operations including any mechanical operations as well as engine noise and anchoring (Reine et al. 2012).

It is likely that the only affect construction noise will have will be temporary displacement.

4.2.16 Environmental Justice

Under Executive Order 12898, Federal agencies are required to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and/or low-income populations. Completion of this project will provide local coastal storm damage reduction. In addition, the project will provide benefits to the village of Asharoken and adjacent communities. Likewise, no significant Environmental Justice issues are anticipated during the planned five year with re-nourishment cycles of the project. The project will not have disproportionate negative impact (demographics, income, or employment) on minority or low-income groups in the community. Traffic patterns are likely to be disrupted along Asharoken Avenue during construction but these too will last only as long as the construction period.

The project area is confined within the existing storm damage control project and is not anticipated to result in adverse impacts on the surrounding area. Beneficial impacts are expected, as the community will be less at risk from flooding once emergency repairs is complete. Recent demographic trends include a 28.4% increase over the age of 64 and 2010 Census data Census data indicates that more than 150 residents have disability status. In light of this data , storm damage reduction measures that lower the probability of an evacuation and thus the need for special treatment would be beneficial to the community as a whole as well as those seniors requiring special care.

5.0 CUMULATIVE IMPACTS

No significant cumulative impacts are expected as a result of implementing the proposed action. There are no other Federal or State projects being constructed in the project region at the same time or within the near future or the recent past. The nearest proposed Federal project is the Bayville, N.Y. Storm and Flood Protection Project, which if implemented, is 10.5 miles to the west and would be unlikely to add any measurable cumulative impacts to the Asharoken analysis if Bayville is built.

Since 1997 when it was built, the NY District Section 103 erosion/shore protection project has been severely damaged and repaired multiple times. The project is relatively small and initially consisted of rock revetment and beach nourishment from an upland source. The area covered by rock has changed from a sandy intertidal to that of a rocky intertidal. Since the initial construction coastal storms repeated repairs has kept the 103 site in a state of relative disturbance. Since the 103 activities have been ongoing for almost 20 years they are part of the existing conditions and do not represent a significant cumulative impact additional to the TSP. The same can be said for all of the “protection” measures (bulkheads, rubble walls, cement blocks etc.) that have been implemented on private property by the residents for many decades.

Before, during and after project construction annual dredging at the power plant channel along with the by passing of approximately 15,000 cy is expected to occur. This sand will be placed along the eastern portion of the project area as it has been for many years. Sand covering the intertidal may cause some organisms to perish do to burial. Depending on the depth of the sand placed, may organisms can move up to occupy their natural depth in the sand. Natural re-colonization would be expected within a year. Placement of the power plant sand may represent a minor adverse cumulative impact in regard to certain benthic invertebrates. On the other hand additional sand may be a benefit to other benthic invertebrates including the horseshoe crab. Addition sand may also be a benefit to seasonally resident beach nesting birds.

6.0 COORDINATION

USACE-NYD will continue to coordinate with New York State Department of Environmental Conservation (NYSDEC) to obtain a Section 401 Water Quality Certificate, and the New York State Office of Coastal Zone Management to obtain a consistency determination for the Project. In addition USACE-NYD will continue to coordinate with U.S. Fish and Wildlife Service (USFWS) pursuant to Section 2(b) of the Fish and Wildlife Coordination Act. Coordination with the USFWS is ongoing pursuant to completing consultations in compliance with Section 7 of the Endangered Species Act (ESA). USACE-NYD is consulting with the National Marine Fisheries Service in accordance with Section 7 of the ESA and Section 305(b)(2) of the MSFCMA.

In addition, this DEA will be distributed to appropriate Federal, State, and local agencies and interested parties. All applicable Federal, State, and local policies will be complied with during review and implementation of the Project. A record of pertinent correspondence is located in Appendix K.

Summary of Primary Laws and Regulations Applicable to the Proposed Project

Legislative Title	U.S. Code/Other	Compliance
Clean Air Act	42 U.S.C. §§ 7401-7671g	An air quality analysis has been completed for the project. Based upon the analysis, the emissions from the project are considered to have an insignificant impact on the regional air quality, and according to 40 CFR 93.153 (f) and (g) the proposed project is presumed to conform to the SIP. A Record of Non-Applicability is located in Appendix I.
Clean Water Act	33 U.S.C. §§ 1251 et seq.	The Corps is awaiting a water quality permit from NYSDEC to fulfill the requirements of Section 401 of this act. A Federal 404(b) Evaluation is located in Appendix K.
Coastal Zone Management Act of 1972	16 U.S.C. §§ 1451-1464 N.J.A.C. 7:7 and N.J.A.C. 7:7E	A Coastal Zone Consistency Statement is included in Appendix G The Corps is a applying for a Coastal Zone Consistency Determination from the NYDOS.
Endangered Species Act of 1973	16 U.S.C. §§ 1531 et seq.	Section 7 Consultation was initiated with the U.S. Fish and Wildlife Service and NMFS. Coordination with the USFWS has indicated that Section 7 will be concluded informally with an NLAA determination from FWS. A draft BA was submitted to NOAA and the District is awaiting comments or the draft BO.
Fish and Wildlife	16 U.S.C. § 661 et seq.	The Corps has coordinated with the U.S.

Coordination Act		Fish and Wildlife Service and is awaiting a draft FWCAR.
National Environmental Policy Act of 1969	42 U.S.C. §§ 4321-4347	The circulation of this Draft Environmental Assessment fulfills requirements of this act.
National Historic Preservation Act of 1966	16 U.S.C. §§ 470 et seq.	The Corps is in coordination with the State Historic Preservation Office to fulfill requirements of this act. Cultural
Executive Order 11990, Protection of Wetlands	May 24, 1977	Circulation of this report for public and agency review fulfills the requirements of this order.
Magnuson Stevens Act	16 United States Code §1801-1883, 1966	The Corps has submitted a EFH evaluation and is awaiting a determination from NOAA-Fisheries

7.0 CONCLUSIONS

Given the existing and expected without-project shoreline conditions, it is clear that the primary storm damage mechanisms including wave attack and over topping of dunes and bulkheads will continue to result in short and long term erosion and shoreline recession. The TSP would reduce the risk of damages from wind and wave forces emanating from Long Island Sound. The implementation of the proposed Project will have significant overall beneficial impacts to the environment and surrounding communities, including benefits to aquatic habitats and species, an increase in the availability of suitable habitat for Federal and state-listed species and a diversity of shorebird communities, protection of the wetlands south of the roadway, improved shoreline stabilization and flood protection, and recreational opportunity.

Impacts to environmental resources in the proposed Project Area are expected to be minor and temporary. There will be some short-term adverse impacts to, terrestrial and aquatic habitats and the species that utilize the habitats. These impacts would be limited to a localized area and temporary in nature coinciding with periods of construction and nourishment activities. There will be project life duration impacts in terms of changes to habitat once the project is completed. Such impacts include the habitat created by the installation of groins, changes to profile of the beach, berm and nearshore and the new topography created at the borrow area. Direct adverse impacts during construction are expected to be minor because most affected mobile species will move off and utilize other suitable habitat nearby. Sessile and those living within the sediments species will be lost, but are expected to rapidly re-colonize once the disturbance has ended, returning to pre-project levels of abundance and diversity within two years.

The use of Best Management Practices (BMP) during construction will be implemented through all phases of construction and include measures to be implemented prior to, during and after completion of the project.

- To minimize depth related impacts to water quality such as the potential for low oxygen , excavation will be conducted along the side of a ridge which is expected to all but eliminate typical impacts related to creating a deep pit with steep side slopes. avoid the creation of deep steep sided pits.

- To minimize impacts to sensative early life stages of important aquatic organisms dredging will be conducted during specific seasonal window (October to mid-January) as regulated by the NYSDEC.

- Use of a cutterhead pipeline dredge is the expected method of dredging to be used for this project. Other than the direct impact to sediment born organisms and a temporary localized no other significant impacts to water quality or biota are anticipated. If used hopper dredges would be equipped with state of the art turtle and sturgeon deflectors to decrease the probability of impacting or taking either species.

- Qualified individuals will be placed on board all dredges to monitor for the presence of any ESA species in the vicinity of the dredge as well as monitor for ESA takes due to entrainment.

- Plover monitors will be made available to provide protection and guidelines if this species arrive at the project site in March.

- All construction activities will be guided by USFWS and NMFS recommendations.

- The dredging contractor will submit a QA/QC plan including a HASP plan that will include all contingencies of environmental protection including HTRW issues and noise.

- A pre and post construction benthic characterization program as requested by the NYSDEC will be implemented to assess the any impacts to the project site habitats.

- A piping plover management/protection plan to prevent/minimize impacts to plovers will be implemented during construction in coordination with local state and federal resources agencies. An analogues post construction management/protection plan will be developed in cooperation with the Town of Asharoken together with the aforementioned agencies. Monitoring will serve to collect information on plover utilization of the project site, and implement appropriate protection measures as needed under the recommendation of the resource agencies. This will include any measures related to utilization of the public access sites.

8.0 REFERENCES

Able, K.W., D.H. Wilber, A. Muzeni-Corino, and D.G. Clarke. 2010. Spring and summer larval fish assemblages in the surf zone and nearshore off northern New Jersey, USA. Estuaries and Coasts 33:211-222

Atlantic Sturgeon Status Review Team (ASSRT). 2007. Status review of Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus). Report to NMFS, Northeast Regional Office. 174 pp

Auld, A.H. and J.R. Schubel. 1978. Effects of suspended sediment on fish eggs and larvae: a laboratory assessment. Estuarine and Coastal Marine Science 6:153-164.

Avissar, N. G. 2006. Modeling potential impacts of beach replenishment on horseshoe crab nesting habitat suitability. Coastal Management 34: 427-441.

Bain, M.B. 1997. Atlantic and shortnose sturgeons of the Hudson River: common and divergent life history attributes. Environmental Biology of Fishes 48:347-358.

Barrios, Jennifer 4/26/14 New York Newsday (American Lung Association Report)

Burger, J. 1994. The effect of human disturbance on foraging behavior and habitat use in piping plover (*Charadrius melodus*). Estuaries 17: 695-701.

Burke, R.L. 2006. Movement, Population Size, and Habitat Use of Diamondback Terrapins (*Malaclemys terrapin*) in the Hudson River. HRF Grant 002/00A Final Report. Hudson River Foundation, New York, NY.

Cairns, W.E. 1982. Biology and behavior of breeding piping plovers. Wilson Bulletin 94: 531-45.

Cohen, Marty. 2013 Asharoken Visitors – Diamondback Terrapins. Asharoken News: July-August 2013. http://asharoken.com/newsletter/Asharoken-Newsletter-2013JulyAugust. pdf

Culter, J.K. and S. Mahadevan. 1982. Long-term Effects of Beach Nourishment on the Benthic Fauna of Panama City, Florida. Misc. Report No. 82-2., U.S. Army Corps of Engineers, Coastal Engineering Research Center, Fort Belvoir, VA.

Dunton, K. J., A. Jordaan, K. A. McKown, D. O. Conover, and M. G. Frisk. 2010. Abundance and distribution of Atlantic sturgeon (Acipenser oyxrinchus) within the Northwest Atlantic Ocean, determined from five fishery-independent surveys. Fishery Bulletin 108:450-465.

Haley, N., and M. Bain. 1997. Habitat and food partitioning between two co-occurring sturgeons in the Hudson River estuary. Paper presentation at the Estuarine Research Federation Meeting, Providence, Rhode Island, October 14, 1997.

Hartig, E.K, V. Gornitz, A. Kolker, F. Mushacke, and D. Fallon. 2002. Anthropogenic and climate change impacts on salt marshes of Jamaica Bay, New York City. Wetlands 22:71-89.

Hitchcock, D.R., R.C. Newell, and L.J. Seiderer. 1998. Investigation of benthic and surface plumes associated with marine aggregate mining in the United Kingdom. Final Report. U.S. Department of the Interior, Minerals Management Service. Contract No. 14-35-0001-30763.

Hoagland, P, J., Di, and H.L. Kite-Powell, 2012. The costs of beach replenishment along the U.S. Atlantic Coast. Journal of Coastal Research 28: 199-204.

Johnson, J.H., D.S. Dropkin, B.E. Warkentine, J.W. Rachlin, and W.D. Andrews. 1997. Food habits of Atlantic sturgeon off the central New Jersey coast. Transactions of the American Fisheries Society 126:166-170.

IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

IPCC. (2013). Climate Change 2013. The Physical Science Basis.

Kraft, J. C., Bellknap, D. F., & Kayan, I. (1983). Potentials of discovery of human occupation sites on the continental shelves and nearshore coastal zones. *in P.M Masters and N.C. Flemming (Eds.) Quaternary coastlines and marine archaeology: towards the prehistory of land bridges and continental shelves*, 87-120.

LISS. (2014). *Long Island Sound - By the Numbers*. Retrieved Jan. 2, 2014, from http://longislandsoundstudy.net/about-the-sound/by-the-numbers/

LISS. (2014). *Surface Water Temperature*. Retrieved April 3, 2014, from Long Island Sound Study: http://longislandsoundstudy.net/2010/07/surface-water-temperature/

Milliman, J. D., & Emery, K. O. (1968). Sea Levels during the Past 35,000 Years. *Science Vol. 162 no. 3858*, 1121-1123.

NOAA. (2009). Surveys Show Increasing Populations of Gray and Harbor Seals in New England.

NOAA. (2013). *Sea Level Trends*. Retrieved 1 3, 2014, from Tides & Currents: http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml

NOAA. (2014). *National Climatic Data Center*. Retrieved April 3, 2014, from Annual Summaries Station Details: http://www.ncdc.noaa.gov/cdo-web/datasets/ANNUAL/stations/COOP:301309/detail

NWF. (2011). Practical Guidance for Coastal Clime-Smart Conservation Projects in the Northeast: Case Examples for Coastal Impoundments and Living Shorelines. National Wildlife Federation.

NWS. (2012). *Monthly Averages for Asharoken, NY*. Retrieved April 2, 2014, from The Weather Channel: http://www.weather.com/weather/wxclimatology/monthly/USNY1658

NYSDEC. (2008). The Second Atlas of Breeding Birds in New York State.

NYSDEC. (2010). Air Quality Management Plan. Division of Air Resources.

Titus, J. G., Hudgens, D. E., Trescott, D. L., Craghan, M., Nuckols, W. H., Hershner, C. H., et al. (2009). State and local governments plan for development of most land vulnerable to rising sea level along the US Atlantic Coast. *Environmental Research Letters 4*, 1-7.

USACE 1995. Storm Damage Protection and Beach Erosion Control Reconnaissance Study, North shore of Long Island, New York.

USACE 2006. Y-Long Branch beach renourishment project market survey. Solicitation number W912DS-06-SSAPL-174-01. 41. Hazardous, Toxic and Rediological Waste Study

USACE - NYD 2001 The New York District's Biological Monitoring Program for the Atlantic Coast of New Jersey, Asbury Park to Manasquan Section Beach Erosion Control Project

USACE-NYD. (2002). Hurricane and Storm Damage Reduction at Asharoken, Suffolk County, New York. Environmental Scoping Document. New York District.

USACE-NYD. (2004). Remote Sensing Survey. Tidal Zone, Near Shore and Borrow Pit Project Areas. Village of Asharoken, Suffolk County, New York.

USACE-NYD. (2004). Draft Environmental Assessment, Northport Harbor Section 14, Village of Northport, New York.

USACE-NYD. (2004b). Sediment Transport Analysis, Village of Asharoken, New York. New York.

USACE-NYD. (2005). Asharoken and Bayville Nearshore Investigation. Final 2005 Finfish, Invertebrate Infauna, and Water Quality Summary Report. New York, New York.

USACE-NYD. (2007). Long Island Sound Asharoken Borrow Area Investigation. Final Fishfish/Benthic Invertebrate Summary Report. New York, New York.

USACE-NYD. (2013). Draft Feasibility Report. Storm Damage Reduction, Village of Asharoken, New York.

Van Dolah, R.F., R. M. Martore, A. E. Lynch, P. Al Wnedt, m. v. Levisen, D. J. Whitaker, and W. D. Anderson, 1994 final Report. Environmental Evaluation of the Folly Beach Nourishment Project. Prepared by the Marine Resources Division , South Carolina Department of Natural Resources for US Army Corps of Engineers, Charleston, SC 101p.p. and appendixes

Wilber, D. H., D. G. Clarke, G. L. Ray, & M. Burlas. "Responses of surf zone fish to beach nourishment operations on the northern coast of New Jersey, USA"; Marine Ecology: 250: 231-246 (2003).

Windfinder. (2014, February). *Windfinder*. Retrieved April 3, 2014, from Wind & Weather Statistics Asharoken/The Neck: http://www.windfinder.com/windstatistics/asharoken_the_neck

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TABLES

Table 2 TSP Figure Beach Profile Characteristics

Reach No.	General Location	Approx. Length (ft)	Dune Elevation (ft NGVD)	Berm Elevation (ft NGVD)	Dry Beach Width to MHHW (ft)	Foreshore Slope (x V on y H)	Offshore Slope (x V on y H)
1a (2006)	Bevin Road (0+00) to Rock Groin (9+00)	900	12.5 (Bulkhead)	+6	0 to 20	1 on 8	1 on 100
1b (2001)	Rock Groin (9+00) to Duck Island Lane (62+00)	5,300	15.5	+4 to +12	80	1 on 8	1 on 100
2a (2001)	Duck Island Lane (62+00) to 1,200' West of West Jetty (112+00)	5,000	+14 (Bulkhead) +15 (Dune app.1,000 ft)	+4 to +12	0 to 120	1 on 8	1 on 100
2b (2001)	1,200' West of West Jetty (112+00) to West Jetty (124+00)	1,200	+17	+8	40 to 60	1 on 8	1 on 100

Land Side

Reach No.	General Location	Approx. Length (ft)	Structure	Average Dune Crest Widths (ft)	Avg. Elevaton At Crest of Dune/Str. (ft NGVD)	Avg. Elevation Behind Dune/Str. (ft NGVD)
1a	Bevin Road (0+00) to Rock Groin (9+00)	900	Dune fronted with Bulkhead	15	+12.5	+9
1b	Rock Groin (9+00) to Duck Island Lane (62+00)	5,300	Dunes	0-5	+15.5	+12
2a	Duck Island Lane (62+00) to 1,200' West of West Jetty (112+00)	5,000	Bulkhead/Dune (approx. 1,000')	0-5	0.93	13
2b	1,200' West of West Jetty (112+00) to West Jetty (124+00)	1,200	High Dunes	0-5	17	14

Table 3. Historical Storms Impacting the Long Island, NY Area

Hurricane		Northeaster	
Date	Name	Date	Name
14 Sep 1904	-	03 Mar 1931	-
08 Sep 1934	-	17 Nov 1935	-
21 Sep 1938	-	25 Nov 1950	-
14 Sep 1944	-	06 Nov 1953	-
31 Aug 1954	Carol	11 Oct 1955	
02 Sep 1954	Edna	25 Sep 1956	
05 Oct 1954	Hazel	06 Mar 1962	
03 Aug 1955	Connie	05 Nov 1977	
12 Sep 1960	Donna	17 Jan 1978	
10 Sep 1961	Esther	06 Feb 1978	
20 Aug 1971	Doria	22 Jan 1979	
14 Jun 1972	Agnes	22 Oct 1980	
06 Aug 1976	Belle	28 Mar 1984	
27 Sep 1985	Gloria	09 Feb 1985	
19 Aug 1991	Bob	30 Oct 1991	
08 Oct 1996	Josephine	01 Jan 1992	
07 Sep 1999	Floyd	11 Dec 1992	
01 Sep 2006	Ernesto	02 Mar 1993	
28 Aug 2011	Irene	12 Mar 1993	
20 Oct 2012	Sandy	28 Feb 1994	
		21 Dec 1994	
		05 Jan 1996	
		06 Oct 1996	
		02 Feb 1998	
		14 Apr 2007	
		15 Nov 2009	Nor'Ida
		13 Mar 2010	
		17 Apr 2011	

1. Northeasters have no assigned names;
2. Hurricane Sandy affected the Project Area in late October, 2012;
3. This table lists only significant storms affecting the Project Area.

Table 4. Astronomical Tide Elevations, Asharoken, New York

Datum	Elevation (ft NGVD)
Highest Observed (6 February 1978)	+9.1
Mean Higher High Water	+3.9
Mean Tide Level	+0.4
Mean Lower Low Water	-3.2
Mean Tide Range (ft)	7.1

Spring Tide Range (ft)	8.2
Lowest Observed (10 January 1978)	-6.6

Note: Highest and lowest observed elevations recorded at Port Jefferson (USACE-NYD, 2013)

Table 5. Design Wave Condition

Return Period (years)	Offshore (deep water) waves		Nearshore (shallow water) Waves (ft)		
	Hs (ft)	Tp (sec)	0 ft NGVD	-10 ft NGVD	-20 ft NGVD
2	8.4	5.9	2.5	10.2	16.8
5	10.5	6.4	6.1	13.6	20.3
10	12.4	6.9	7.2	14.7	21.5
25	14.8	7.3	8.3	15.8	22.7
50	16.4	7.7	9.1	16.6	23.6
100	18.0	7.9	10.0	17.5	24.5

Table 6. Estimated Relative Sea Level Change from 2016 To 2116 - Asharoken

Based on NOAA Tide Gage 8514560, Port Jefferson, NY NOAA's Published Rate: 0.00801 feet/yr

All values are expressed in feet relative to NAVD88

	NOAA Low	USACE Low	NOAA Int Low	USACE Int	NOAA Int High	USACE High	NOAA High
2016	0	0	0	0	0	0	0
2020	0.03	0.03	0.05	0.05	0.09	0.11	0.14
2025	0.07	0.07	0.12	0.12	0.22	0.26	0.33
2030	0.11	0.11	0.19	0.19	0.36	0.43	0.56
2035	0.15	0.15	0.27	0.27	0.52	0.62	0.8
2040	0.19	0.19	0.35	0.35	0.69	0.83	1.07
2045	0.23	0.23	0.43	0.43	0.87	1.06	1.37
2050	0.27	0.27	0.52	0.52	1.07	1.31	1.7
2055	0.31	0.31	0.61	0.61	1.28	1.57	2.05
2060	0.35	0.35	0.71	0.71	1.51	1.85	2.42
2065	0.39	0.39	0.81	0.81	1.75	2.15	2.82
2070	0.43	0.43	0.92	0.92	2.01	2.47	3.25
2075	0.47	0.47	1.03	1.03	2.28	2.81	3.7
2080	0.51	0.51	1.15	1.15	2.56	3.17	4.17
2085	0.55	0.55	1.27	1.27	2.86	3.55	4.68
2090	0.59	0.59	1.4	1.4	3.17	3.94	5.2
2095	0.63	0.63	1.52	1.52	3.5	4.35	5.76
2100	0.67	0.67	1.66	1.66	3.84	4.78	6.34

2105	0.71	0.71	1.8	1.8	4.2	5.23	6.94
2110	0.75	0.75	1.94	1.94	4.57	5.7	7.57
2115	0.79	0.79	2.09	2.09	4.95	6.19	8.23
2116	0.8	0.8	2.12	2.12	5.03	6.29	8.36

Table 7. Asharoken Beach and Frontal Dune Plant Community

Common Name	Scientific Name	Reach of Main Study Area							
		1A			1B/2A		2B		
		FD	BD	UPL*	FD	BD	FD	BD	UPL
Norway maple	Acer platanoides								x
Ragweed	Ambrosia artemisiifolia					x		x	x
American beach grass	Ammophila breviligulata	x	x		x	x	x	x	
Dusty miller	Artemisia stellariana		x						
Mugwort	Artemisia vulgaris							x	
Asters	Aster spp.					x			
Halberd-leaved orach	Atriplex patula				x		x		
Sea rocket	Cakile edentula	x			x		x		
Seaside spurge	Chamaesyce polygonifolia				x		x		
Autumn eleagnus	Elaegnus umbellate							x	
Sea chickweed	Honckenya peploides	x							
Beach heather	Hudsonia tomentosa								x
Red cedar	Juniperus virginiana								x
Beach pea	Lathyrus japonicus	x	x				x		
Field pepperweed	Lepidium campestre					x		x	
Northern bayberry	Myrica pensylvanica								x
Prickly pear	Opuntia drummondii					x			
Virginia creeper	Parthenocissus quinquefolia					x			
Common reed	Phragmites australis		x					x	
Pitch pine	Pinus rigida					x			
Japanese knotweed	Polygonum cuspidatum					x			
Large-toothed aspen	Populus grandidentata								x
Pin oak	Quercus palustris								x
Staghorn sumac	Rhus hirta								x
Poison ivy	Rhus radicans		x						
Water dock	Rumex orbiculatus					x			
Common saltwort	Salsola kali				x		x		
Seaside goldenrod	Solidago sempervirens	x	x		x	x	x	x	x
Woolly mullein	Verbascum thapsus					x			
Common cocklebur	Xanthium strumarium					x			
Yucca	Yucca aloifolia					x			

Key: * = Plant species unspecified, see text for details.
FD: Foredune
BD: Backdune
UPL: Upland

Table 8. Rank Order Abundance and Percentage of Total Fish Collections, Asharoken Nearshore Investigation (2003-2004), all seasons combined.

Common Name	**Scientific Name**	**Abundance**	**Percentage of Total**
Atlantic silverside	*Menidia menidia*	2,940	45.89
Atlantic menhaden	*Brevoortia tyrannus*	2,480	38.71
Bluefish	Pomatomus saltatrix	262	4.09
Bay anchovy	*Anchoa mitchilli*	158	2.47
Weakfish	*Cynoscion regalis*	156	2.44
Blueback herring	*Alosa aestivalis*	108	1.71
Striped killifish	*Fundulus majalis*	105	1.64
American sand lance	*Ammodytes americanus*	65	1.02
Mummichog	*Fundulus heteroclitus*	64	1.0
Winter flounder	*leuronectes americanus*	30	0.47
Northern pipefish	*Syngnathus fuscus*	15	0.24
Atlantic tomcod	*Microgadus tomcod*	8	0.13
Cunner	Tautogolabrus adspersus	7	0.11
Sheepshead minnow	*Cyprinodon variegatus*	3	0.05
Striped mullet	*Mugil cephalus*	1	0.02
Northern sea robin	*Prionotus carolinus*	1	0.02
Striped bass	*Morone saxatilis*	1	0.02
Windowpane flounder	*Scophthalmus aquosus*	1	0.02
Tautog	*Tautoga onitis*	1	0.02
Scup	Stenotomus chrysops	1	0.02

Table 9. Rank Order Abundance and Percentage of Total Fish and Macroinvertebrate Collections, Asharoken Borrow Area Investigation (2003-2004), all seasons combined.

Common Name	Scientific Name	Abundance	Percentage of Total
Bay anchovy	*Anchoa mitchilli*	48,409	N/A*
Scup	*Stenotomus chrysops*	3,250	60.7
Winter flounder	*Pleuronectes americanus*	523	9.8
Spider crab	*Libinia dubia*	511	9.5
Weakfish	*Cynoscion regalis*	226	4.2
Long-finned squid	*Loligo pealei*	123	2.3
Atlantic butterfish	*Peprilus triacanthus*	109	2.0
Grubby	Myoxocephalus aenaeus	96	1.8
Red hake	*Urophycis chuss*	86	1.6
Windowpane flounder	*Scophthalmus aquosus*	76	1.4
Blueback herring	*Alosa aestivalis*	61	1.1
Cunner	Tautogolabrus adspersus	52	1.0
Atlantic horseshoe crab	*Limulus polyphemus*	45	0.8
Asteriid sea star	*Asterias forbesi*	39	0.7
Rock crab	*Cancer irroratus*	30	0.6
Clearnose skate	*Raja eglanteria*	19	0.4
Bluefish	Pomatomus saltatrix	16	0.3
Summer flounder	*Paralichthys dentatus*	13	0.2
Smallmouth flounder	*Etropus microstomus*	11	0.2
Atlantic herring	*Clupea harengus*	9	0.2
Spotted hake	*Urophycis regia*	8	0.2
Tautog	*Tautoga onitis*	8	0.2
Rock gunnel	*Pholis gunnellus*	5	0.1
Lady crab	*Ovalipes ocellatus*	5	0.1
Atlantic tomcod	*Microgadus tomcod*	5	0.1
Silver hake	*Merluccius bilinearis*	4	0.1
Mantis shrimp	*Squilla empusa*	3	0.1
Black sea bass	*Centropristis striata*	3	0.1
Channeled welk	*Busycon canaliculatum*	2	<0.1
Alewife	Alosa pseudoharengus	2	<0.1

Common Name	Scientific Name	Abundance	Percentage of Total
American lobster	*Homarus americanus*	2	<0.1
Stone crab	*Menippe mercenaria*	2	<0.1
Hogchoker	*Trinectes maculatus*	2	<0.1
Banded gunnel	*Pholis fasciata*	1	<0.1
Feather blenny	*Hypsoblennius hentz*	1	<0.1
Northern sea robin	*Prionotus carolinus*	1	<0.1
Lookdown	*Selene vomer*	1	<0.1
Northern puffer	*Sphoeroides maculatus*	1	<0.1
Oyster toadfish	*Opsanus tau*	1	<0.1
Striped searobin	*Prionotus evolans*	1	<0.1
Round herring	*Etrumeus teres*	1	<0.1
Atlantic silverside	*Menidia menidia*	1	<0.1
Atlantic menhaden	*Brevoortia tyrannus*	1	<0.1
*Bay anchovies were excluded from Percent of Total calculations.			

Table 10. Benthic Infaunal Invertebrates Collected at Asharoken Borrow Areas A and B, Fall 2003

Taxa	Borrow Area A		Borrow Area B	
	Abundance	% Composition	Abundance	% Composition
Nematoda (LPIL)	7,995	49.9	5,863	70.5
Annelida: Oligochaeta (LPIL)	2,133	13.3	781	9.4
Annelida: Polychaeta				
Ampharete (LPIL)	187	1.2	134	1.6
Ampharete lindstroemi	158	1.0	132	1.6
Cossura longocirrata	388	2.4	102	1.2
Cirratulidae (LPIL)	2,131	13.3	710	8.5
Tharyx (LPIL)	243	1.5	- -	- -
Nephtys (LPIL)	149	0.9	124	1.5
Nephtys incisa	134	0.8	- -	- -
Aricidae (LPIL)	117	0.7	- -	- -
Cistenides hyperborea	298	1.9	- -	- -
Scalibregma inflatum	101	0.6	109	1.3
Polydora cornuta	854	5.3	155	1.9
Streblospio benedicti	176	1.1	- -	- -
Mollusca: Gastropoda				
Crepidula fornicata	112	0.7	- -	- -
Turbonilla (LPIL)	116	0.7	- -	- -
Mollusca: Pelecypoda (LPIL)	194	1.2	- -	- -
Tellina agilis	144	0.9	- -	- -
Thracia (LPIL)	197	1.2	- -	- -
Nucula proxima	212	1.3	- -	- -
Arthropoda: Amphipoda				
Ampelisca abdita	- -	- -	212	2.5
Total	16,039	100.0%	8,322	100.0%
LPIL – Lowest Possible Identification Level. Totals only include samples where over 100 individuals were collected.				

Table 11. Benthic Infaunal Invertebrates Collected at Asharoken Borrow Areas A and B, Spring 2004.

Taxa	Borrow Area A		Borrow Area B	
	Abundance	% Composition	Abundance	% Composition
Nematoda (LPIL)	8,250	50.9	5,100	62.5
Annelida: Oligochaeta (LPIL)	1,241	7.7	505	6.2
Annelida: Polychaeta				
Ampharete finmarchica	659	4.1	312	3.8
Streblospio benedicti	582	3.6	448	5.5
Clymenella torquata	441	2.7	- -	- -
Nephtys picta	341	2.1	106	1.3
Ampharete acutifrons	327	2.0	156	1.9
Cirriformia grandis	313	1.9	- -	- -
Drilonereis longa	247	1.5	- -	- -
Spionids spp. (LPIL)	231	1.4	135	1.7
Capitella capitata	228	1.4	452	5.5
Glycera dibranchiata	205	1.3	- -	- -
Polydora spp. (LPIL)	204	1.3	- -	- -
Tharyx acutus	196	1.2	170	2.1
Polydora ligni	148	0.9	198	2.4
Leitoscoloplos fragilis	138	0.9	- -	- -
Nephtys bucea	133	0.8	- -	- -
Asychis elongata	132	0.8	- -	- -
Eteone lactea	123	0.8	- -	- -
polytroch larvae	111	0.7	- -	- -
Glycera spp. (LPIL)	111	0.7	104	1.3
Scolecolepides viridis	- -	- -	117	1.4
Mollusca: Gastropoda				
Crepidula fornicata	156	1.0	- -	- -
Mollusca: Pelecypoda				
Nucula proxima	156	1.0	- -	- -
Pitar morrhuanus	130	0.8	- -	- -
Arthropoda: Copepoda				
Temora longicornis	706	4.4	164	2.0

Taxa	Borrow Area A		Borrow Area B	
	Abundance	**% Composition**	**Abundance**	**% Composition**
Arthropoda: Amphipoda				
Ampelisca abdita	539	3.3	187	2.3
Leptocheirus pinguis	157	1.0	- -	- -
Total	16,205	100.0	8,154	100.0

LPIL – Lowest Possible Identification Level.
Total species of all samples only include samples where over 100 individuals

Table 12. . Birds Observed at Asharoken, NY, 2000-2005 (NYSDEC, 2008).

Common name	Scientific name	NY Legal Status
Red-winged Blackbird	Agelaius phoeniceus	Protected
Mallard	Anas platyrhynchos	Game Species
Tufted Titmouse	Baeolophus bicolor	Protected
Cedar Waxwing	Bombycilla cedrorum	Protected
Canada Goose	Branta canadensis	Game Species
Great Horned Owl	Bubo virginianus	Protected
Red-tailed Hawk	Buteo jamaicensis	Protected
Northern Cardinal	Cardinalis cardinalis	Protected
House Finch	Carpodacus mexicanus	Protected
Piping Plover	Charadrius melodus	Endangered
Killdeer	Charadrius vociferus	Protected
Yellow-billed Cuckoo	Coccyzus americanus	Protected
Black-billed Cuckoo	Coccyzus erythropthalmus	Protected
Northern Flicker	Colaptes auratus	Protected
Northern Bobwhite	Colinus virginianus	Game Species
Rock Pigeon	Columba livia	Unprotected
Eastern Wood-Pewee	Contopus virens	Protected
American Crow	Corvus brachyrhynchos	Game Species
Fish Crow	Corvus ossifragus	Protected
Blue Jay	Cyanocitta cristata	Protected
Mute Swan	Cygnus olor	Protected
Prairie Warbler	Dendroica discolor	Protected
Yellow Warbler	Dendroica petechia	Protected
Gray Catbird	Dumetella carolinensis	Protected
Willow Flycatcher	Empidonax traillii	Protected
Common Yellowthroat	Geothlypis trichas	Protected
Barn Swallow	Hirundo rustica	Protected
Wood Thrush	Hylocichla mustelina	Protected
Baltimore Oriole	Icterus galbula	Protected
Orchard Oriole	Icterus spurius	Protected
Eastern Screech-Owl	Megascops asio	Protected
Red-bellied Woodpecker	Melanerpes carolinus	Protected

Common name	Scientific name	NY Legal Status
Song Sparrow	Melospiza melodia	Protected
Northern Mockingbird	Mimus polyglottos	Protected
Brown-headed Cowbird	Molothrus ater	Protected
Great Crested Flycatcher	Myiarchus crinitus	Protected
Osprey	Pandion haliaetus	Protected-Special Concern
House Sparrow	Passer domesticus	Unprotected
Indigo Bunting	Passerina cyanea	Protected
Downy Woodpecker	Picoides pubescens	Protected
Hairy Woodpecker	Picoides villosus	Protected
Eastern Towhee	Pipilo erythrophthalmus	Protected
Scarlet Tanager	Piranga olivacea	Protected
Black-capped Chickadee	Poecile atricapillus	Protected
Common Grackle	Quiscalus quiscula	Protected
Bank Swallow	Riparia riparia	Protected
American Redstart	Setophaga ruticilla	Protected
White-breasted Nuthatch	Sitta carolinensis	Protected
American Goldfinch	Spinus tristis	Protected
Northern Rough-winged Swallow	Stelgidopteryx serripennis	Protected
Least Tern	Sternula antillarum	Threatened
European Starling	Sturnus vulgaris	Unprotected
Carolina Wren	Thryothorus ludovicianus	Protected
Brown Thrasher	Toxostoma rufum	Protected
House Wren	Troglodytes aedon	Protected
American Robin	Turdus migratorius	Protected
Eastern Kingbird	Tyrannus tyrannus	Protected
Warbling Vireo	Vireo gilvus	Protected
Red-eyed Vireo	Vireo olivaceus	Protected
Mourning Dove	Zenaida macroura	Protected

Table 13. Federal Threatened and Endangered Plant and Animal Species known or anticipated to occur in or proximal to the Asharoken Project Area. (USFWS).

Status	Common Name	Scientific Name
E	Sandplain gerardia	Agalinus acuta
T	Seabeach amaranth	Amaranthus pumilus
T	Piping plover	*Charadrius melodus*
T	Green sea turtle	*Chelonia mydas*
E	Hawksbill sea turtle	*Eretmochelys imbricata*
E	Sea turtle, Kemp's ridley	*Lepidochelys kempii*
E	Sea turtle, leatherback	*Dermochelys coriacea*
E	Tern, roseate NE (U.S. nesting pop.)	*Sterna dougallii dougallii*
E	Whale, finback	*Balaenoptera physalus*
E	Whale, humpback	*Megaptera novaeangliae*
T	Tiger beetle, Northeastern beach	*Cicindela dorsalis dorsalis*

Table 14. 2006-14 Long Island Colonial Waterbird & Piping Plover Survey Results

			Piping Plover				
			WINDOW	PRODUCTIVITY			
YEAR	Site Name	Town/Borough	PAIRS	Pairs	Fledges	PRO.	Rate
2006	Asharoken Beach (Private)	HUNTINGTON	4	4	2	0.50	C
2007	Asharoken Beach (Private)	HUNTINGTON	4	NS	NS	NS	NS
2008	Asharoken Beach (Private)	HUNTINGTON	4	3	7	2.33	A
2009	Asharoken Beach (Private)	HUNTINGTON	4	5	4	0.80	A
2010	Asharoken Beach (Private)	HUNTINGTON	4	4	3	0.75	A
2011	Asharoken Beach (Private)	HUNTINGTON	4	4	7	1.75	A
2012	Asharoken Beach (Private)	HUNTINGTON	5	4	2	0.50	A
2013	Asharoken Beach (Private)	HUNTINGTON	3	4	7	1.75	A
2014	Asharoken Beach (Private)	HUNTINGTON	3	4	2	0.50	A
		Averages	3.9	4.0	4	1.23	
2006	Asharoken Beach (LIPA)	HUNTINGTON	4	4	1	0.25	C
2007	Asharoken Beach (LIPA)	HUNTINGTON	2	2	1	0.50	B
2008	Asharoken Beach (LIPA)	HUNTINGTON	3	3	0	0.00	C
2009	Asharoken Beach (LIPA)	HUNTINGTON	1	1	0	0.00	B
2010	Asharoken Beach (LIPA)	HUNTINGTON	1	1	0	0.00	A
2011	Asharoken Beach (LIPA)	HUNTINGTON	0	1	0	0.00	A
2012	Asharoken Beach (LIPA)	HUNTINGTON	1	1	2	2.00	A
2013	Asharoken Beach (LIPA)	HUNTINGTON	1	1	2	2.00	A
2014	Asharoken Beach (LIPA)	HUNTINGTON	1	2	4	2.00	A
		Averages	2	2	1	0.75	

Table 15. EFH Species and Life History Stages Likely To Be Present in Project Area.

Species	Presence in Project Area and Season				Comments
	E	L	J	A	
Atlantic sea herring			No	Possible but unlikely	Project Area depths too shallow for both; Project Area salinity values too low for juveniles
Atlantic mackerel			No	Possible	More common offshore
Atlantic Salmon	No	No	No	No	Project Area lacking freshwater run
Black sea bass			Yes SF	Possible with structure	Juveniles more common than adults
Bluefish			Possible	Possible	
Cobia			No	No	
Pollock			Possible	No	Generally rare in LIS, predominantly caught in July-August; Project Area is at the lower end of preferred salinities
Red hake	No	No	Yes	No	Present at the borrow area in Spring
Scup	No	Yes S	Yes SpSF	Yes SpSF	YOY juveniles more likely in nearshore zone in the fall.
Spanish mackerel	No	No	No	No	
King mackerel	No	No	No	No	
Summer flounder			Yes Sp,S,F	Yes Sp, S	
Windowpane	Yes SpSF	Yes SpSF	Yes All	Yes All	
Winter flounder	Yes W	Yes WSp	Yes SpSF	Yes All	
Sandtiger shark			Yes	Yes	
Little skate			Yes	Yes	
Winter skate			Yes	Yes	

Species	Presence in Project Area and Season				Comments
	E	L	J	A	
Atlantic sea herring			No	Possible but unlikely	Project Area depths too shallow for both; Project Area salinity values too low for juveniles
Atlantic mackerel			No	Possible	More common offshore
Atlantic Salmon	No	No	No	No	Project Area lacking freshwater run
Black sea bass			Yes	Possible	Juveniles more common

			SF	with structure	than adults
Bluefish			Possible	Possible	
Cobia			No	No	
Pollock			Possible	No	Generally rare in LIS, predominantly caught in July-August; Project Area is at the lower end of preferred salinities
Red hake	No	No	Yes	No	Present at the borrow area in Spring
Scup	No	Yes S	Yes SpSF	Yes SpSF	YOY juveniles more likely in nearshore zone in the fall.
Spanish mackerel	No	No	No	No	
King mackerel	No	No	No	No	
Summer flounder			Yes Sp,S,F	Yes Sp, S	
Windowpane	Yes SpSF	Yes SpSF	Yes All	Yes All	
Winter flounder	Yes W	Yes WSp	Yes SpSF	Yes All	
Sandtiger shark			Yes	Yes	
Little skate			Yes	Yes	
Winter skate			Yes	Yes	

1 Shading = life history stage not designated

E = eggs W = winter
L = larvae Sp = spring
J = juveniles S = summer
A = adults F = fall

Table 16. Prey Species for EFH-Designated Fish Species and Life History Stages Likely To Occupy the Northport Bay Project Area.

Species	Life History Stage	Principal Prey
Bottom Feeders		
Winter flounder	Larvae, Juveniles and adults	Mostly nauplii, invertebrate eggs, polychaetes and amphipods (*e.g.*, *Ampelisca abdita*), also *Crangon*, sand dollars, and bivalves.
Windowpane	Juveniles and adults	Small crustaceans (*e.g.*, mysids and decapod shrimp) and fish larvae (hake, tomcod, other flounder, silversides).

Sandbar shark	Adults	Small bottom and pelagic fish with some mollusks and crustaceans.
Little skate	Juveniles and Adults	Primarily decapod crustaceans and amphipods
Bottom and Pelagic Feeders		
Black sea bass	Juveniles	Small benthic crustaceans and small fish.
Black sea bass	Adults	Crabs, mysids, polychaetes, caridean shrimp, and small fish.
Summer flounder	Adults	Crustaceans (*e.g.*, crabs), bivalves, marine worms, sand dollars, and a variety of fish species (other flounders, silversides, mummichog).
Scup	Juveniles	Polychaetes, amphipods, other small crustacea (copepods, mysids), small mollusks, and fish eggs and larvae.
Scup	Adults	Benthic and near bottom invertebrates, small fish.
Winter skate	Juveniles and Adults	Polychaetes, amphipods, fish
Pollock	Juveniles	Primarily crustaceans, fish, mollusks
Red hake	Juveniles	benthic, pelagic crustaceans, amphipod, fish, squid
Sand tiger shark	Juveniles and Adults	fish, crabs, squid
Pelagic Feeders		
Bluefish	Juveniles	Polychaetes, crustaceans (sand and grass shrimp), but mostly fish (bay anchovy, striped killifish, silversides).
Bluefish	Adults	Wide variety of fish species.
Scup	Larvae	zooplankton

Table 17. Key Socioeconomic Data								
Socioeconomic Criteria	**Asharoken**		**Northern Asharoken***		**Eaton's Neck**		**Peninsula***	
	2000	2010	2000	2010	2000	2010	2000	2010
Total Population	625	684	269		1,388	1,406	1,657	
Under 5 years	33		14		96		110	
5-19 years	87	122	37		251	336	288	
20-64 years	392	380	169		837	783	1,006	
Over 64 years	113	144	49		204	262	253	
Number of households	254	255	109		512	519	621	
Number of families	185		80		420		500	
Families with children <18	58		22		170		195	
Housing Occupancy								
Total housing units	307	302	132		554	575	686	
Owner occupied	222	227	95		488	488	583	
Renter occupied	32	28	14		24	31	38	
Seasonal/occasional	45		19		32		51	
Vacant	8	47	3		10	56	13	
Household size (Owner Occ.)	2.5	587	2.5		2.7	1344	2.7	
Household size (Renter Occ.)	1.9	67	1.9		2.4	62	2.2	
Pet Ownership (cats & dogs)	333		143		671		814	
Employment								
Population over16 years	561		241		1,050		1,291	
In labor force	367		158		664		822	
Employed	364		157		626		783	
Unemployed	3		1		38		39	
Unemployed, %	0.8		0.8		5.7		5.8	
Total Commuters	337	267	144		598	651	742	
Motor vehicle (driver)	267		115		473		588	
Motor vehicle (passenger)	15		6		62		68	
Public transport	47		20		46		66	
Pedestrian	8		3		17		20	
Mean travel time (minutes)	42.7				47.9			

Table 17. Key Socioeconomic Data

Socioeconomic Criteria	Asharoken		Northern Asharoken*		Eaton’s Neck		Peninsula*	
School enrollment Total	135		58		340		398	
Preschool/kindergarten	9		4		59		63	
Elementary school	43		18		173		191	
High school	30		13		61		74	
College/graduate school	53		23		47		70	
Disability Status Total	71		30		123		153	
5-20 years	10		4		7		11	
21-64 years	31		13		83		96	
Over 64 years	30		13		33		46	
“go-outside-home” disability	22		9		16		25	
Median Household Income	$103,262				$100,663			
Median Family Income	$118,128				$104,111			
Median House Value	$586,600				$355,200			

*Peninsula: the study area, covering Eaton’s Neck and Northern Asharoken (assuming 43 percent of residences in Asharoken Village are in Northern Asharoken, hence located on the peninsula). (Sources: Census 2000, 2010, U.S. Census Bureau, U.S. Department of Commerce; 2002 Master Plan, Planning Board, Incorporated Village of Asharoken; The Humane Society of the U.S. – www.hsus.org)

Table 18. Potential Impacts and Mitigation Strategies for EFH-Designated Species (Asharoken)

Species	Life History Stage	Potential Impacts	Direct or Indirect Impact	Mitigation
Atlantic Salmon	Juveniles	Not expected to be present at the project site	N/A	
	Adults	Not expected to be present at the project site	N/A	
Pollack	Juveniles	Possible entrainment, displacement	Direct	
	Adults			
Winter flounder	Eggs	Burial/mortality of eggs in intertidal zone	Direct	Avoid spawning season (Feb-May)
	Juveniles	Burial of some fish and their prey (polychaetes, amphipods)	Direct/Indirect	Avoid early larval settlement period
	Adults	Displacement to undisturbed areas, temporary loss of infaunal food items and offshore displacement (no loss) of spawning habitat; long-term improvement of spawning habitat.	Indirect	Beach nourishment in the late summer or fall to speed recovery of benthic community, allow for recovery of spawning habitat
Windowpane	Juveniles	Burial of some fish and their prey	Direct/Indirect	Beach nourishment in the late summer or fall to speed recovery of benthic community, pump sand at low tide
	Adults	Temporary loss of infaunal food items, displacement to undisturbed areas	Indirect	Beach nourishment in the late summer or fall to speed recovery of benthic community
Summer flounder	Juveniles, Adults	Temporary loss of infaunal food items; displacement to undisturbed areas	Indirect	Beach nourishment in the late summer or fall to speed recovery of benthic community
Bluefish	Juveniles, Adults	Temporary displacement of fish and their prey (crustaceans, other fish)	Indirect	NA
Scup	Juveniles	Temporary displacement of fish, burial of some prey organisms	Indirect	Beach nourishment in the late summer or fall to speed recovery of benthic community
King Mackerel	All	Temporary displacement		
Atlantic and Spanish mackerel	Juveniles	Temporary displacement of fish and their prey (other fish)	Indirect	NA
Black sea bass	Juveniles	Burial of some prey organisms (small crustaceans), temporary displacement of fish	Indirect	Beach nourishment in the late summer or fall to speed recovery of benthic community

Atlantic herring	Juveniles	No impact	NA	NA
Red Hake	Eggs,Larvae Juveniles	Entrainment, displacement, loss, gain of prey		
Sandtiger shark	larvae	No impact	NA	NA
Cobia	Juveniles	No impact	NA	NA
Winter Skate	Juveniles	Displacement/ loss of prey	Direct/Indirect	Nourishment in fall to speed recovery
Little Skate	Juveniles	Displacement/ loss of prey	Direct/Indirect	Nourishment in fall to speed recovery

Appendix A

Long Island Sound Asharoken Borrow Area Investigation

Final Finfish/Benthic Invertebrate Summary Report

August 2007

LONG ISLAND SOUND
ASHAROKEN BORROW AREA INVESTIGATION

FINAL FINFISH/BENTHIC INVERTEBRATE SUMMARY REPORT




Prepared by:

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EXECUTIVE SUMMARY

This study was conducted by the U.S. Army Corps of Engineers, New York District, as part of a beach erosion control, storm damage reduction, and related purposes project along the north shore of Long Island, in and adjacent to the community of Asharoken, New York. Monitoring of biological resources within the two proposed offshore sand borrow areas was designed to assess the potential biological impacts of dredging. This report describes the results of a bottom trawl survey of demersal finfish and epibenthic macroinvertebrate resources, benthic infaunal survey, and studies of water quality, sediment chemical-constituents, and grain size in the proposed borrow areas in September 2003 and February, May, and June of 2004.

A total of 43 fish and invertebrate species (33 finfish and 10 invertebrates) were collected during the trawl net survey in the two borrow areas during the September 2003 and February, May, and July 2004 sampling events. Species diversity was the highest for the May 2004 sampling with 25 species, followed by September 2003 with 23 species, July 2004 with 22 species, and February 2004 with 10 species (Figure 10). Finfish abundance accounted for approximately 87% of the total catch versus invertebrates that accounted for 13% (Table 6). Aside from the large number of bay anchovy (*Anchoa mitchilli*) collected in September and July (45,606 and 2,443, respectively), scup (*Stenotomus chrysops*) was the dominant finfish species, accounting for 60.7% of the total catch (Figure 12). Other common species collected were winter flounder (*Pseudopleuronectes americanus*), spider crab (*Libinia dubia*), weakfish (*Cynoscion regalis*) and Atlantic butterfish (*Peprilus triacanthus*). Long-finned squid (*Loligo pealei*) accounted for an additional 2%. Together these six species composed 89% of the total catch in terms of overall abundance. Biomass was dominated by horseshoe crab (*Limulus polyphemus*), spider crab, scup, winter flounder, summer flounder (*Paralichthys dentatus*), and tautog (*Tautoga onitis*). These six species comprised 81% of the total biomass (Figure 15).

Nematode and the oligochaete worms were the first and second most abundant benthic invertebrates collected by benthic grab from the Asharoken borrow areas during both the September 2003 and May 2004 sampling events (Figure17 and 18). Results of both September 2003 and May 2004 benthic grabs showed that gastropods (e.g., snails) and pelecypods (bivalve species) were fairly abundant (over 100 individuals) at Borrow Area A, but rare in Borrow Area B. Other common benthic invertebrates collected in the borrow areas included polychaete worms, copepods and amphipods [e.g., small crustaceans and shrimp-like crustaceans, respectively (Tables 17 nd 18)].

Based on the results of the survey, it was noted that common finfish and invertebrate species such as bluefish (*Pomatomus saltatrix*), weakfish, and blue crab (*Calinectes sapidus*), were not found during the May and July 2004 sampling efforts. Although unexpected, the absence of these individuals is likely the result of the limitations of discreet or point-in-time sampling rather than the complete absence of these species from the project area. Based on the depth, sediment grain size and the length of the winter flounders captured, the borrow areas may potentially be utilized by this species as spawning grounds. Young-of-the year scup were also collected in great abundance in Borrow Area B, which suggests that the borrow area was may potentially serve as nursery ground by both scup and winter flounder, but additional sampling would be needed to confirm this supposition.

The presence of American lobster (*Homarus americanus*) and black sea bass (*Centropristis striata*) in Borrow Area B implies the presence of hard surface or structures (i.e., rock outcroppings) as both of those species are commonly associated with bottom structures. Although no American lobster were caught in Borrow Area A, black sea bass were, and the constant snagging of sampling net in this area suggests that the bottom composition was rocky and intermixed with areas of sand deposits that may provide additional habitat.

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ABBREVIATIONS AND ACRONYMS

°C	degrees Celsius (temperature)
DDT	dichlorodiphenyltrichloroethane
DO	dissolved oxygen
EFH	essential fish habitat
g	gram
Investigation	Asharoken Borrow Area Field Investigation
LPIL	lowest possible identification level
mg/l	milligrams per liter (dissolved oxygen)
Max	maximum
Mean	average
Min	minimum
mm	millimeter
N	number measured
NYSDEC	New York State Department of Environmental Conservation
PAH	polyaromatic hydrocarbon
PCB	polychlorinated biphenyl
ppt	parts per thousand (salinity)
SD	standard deviation
Study	Asharoken Hurricane and Storm Damage Reduction Feasibility Study
TL	total length
USACE	U.S. Army Corps of Engineers
YOY	young-of-the-year

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1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), New York District, in partnership with the project's non-Federal sponsors, the New York State Department of Environmental Conservation (NYSDEC) and the Village of Asharoken, is initiating the Asharoken Hurricane and Storm Damage Reduction Feasibility Study (Study) to evaluate the feasibility of beach erosion control, storm damage reduction and related purposes on the north shore of Long Island in and adjacent to the community of Asharoken, New York (USACE 2002).

The Long Island northern shoreline has historically experienced coastal erosion and storm damage. Asharoken Beach is a narrow section of land in the Village of Asharoken within the Town of Huntington, Suffolk County, New York. Asharoken Beach connects Eaton's Neck with the mainland area of the Village of Asharoken. The length of Asharoken Beach is approximately 2.5 miles, while the width varies from 100 feet at the northwestern section near Eaton's Neck to 1,000 feet at the southeastern limit near the Northport Power Station. Asharoken Avenue is the only vehicular access to Eaton's Neck along Asharoken Beach (USACE 2002).

2.0 OBJECTIVES

One of the proposed alternatives being evaluated for the Study is to utilize sand from locations within Long Island Sound for use as potential beach nourishment and other dune or protection structures. To assess environmental impacts of the proposed Federal action, the District conducted the Asharoken Borrow Area Field Investigation (Investigation) to gather information on the baseline biological conditions of two potential sand source areas in Long Island Sound. Data collected for the Investigation characterize existing fish and benthic communities that utilize the borrow locations, as well as the existing water quality, grain size, and chemical constituents of the sand found within the borrow locations. These data will also be used as a basis to evaluate the potential environmental impacts of the considered Study alternatives.

The USACE has analyzed three potential borrow locations based on sediment type and has limited consideration to two borrow locations based on sediment type and other environmental factors (shellfisheries areas, etc.). These borrow areas are referred to as Borrow Area A and Borrow Area B (Figure 1). The approximate area of Borrow Area A is 8,270,150 square feet or 0.224 square nautical miles (0.29 square miles). The approximate area of Borrow Area B is 4,375,000 square feet or 0.1185 square nautical miles (0.1569 square miles).

3.0 METHODOLOGY

Finfish, benthic invertebrates, sediment grain size and chemistry, and water quality data were collected in the two proposed Investigation areas during September 22–26, 2003 and May 11–14, 2004 aboard the R/V Walford, a research vessel owned by the New Jersey Marine Science Consortium. Sediment samples collected for grain size and soil chemical analyses were taken from the borrow areas on September 22–23, 2003. Additional finfish survey and water quality data were collected in the same Investigation areas during February 18–19 and July 7–8, 2004 aboard the R/V Walford. Northern Ecological Associates, Inc. assisted USACE with field data collection and analysis.

3.1 FISH

Finfish sampling was conducted using a 30-foot otter trawl fitted with a 1/2 inch cod end. The trawls were towed along pre-determined transects at a speed of 1 to 3 knots for a distance of 0.25 nautical miles or an approximate bottom tow time of 8 to 10 minutes. During each sampling effort, trawling was performed for two consecutive days to ensure that each borrow area was sampled during different tidal periods. Thirteen (13) pre-determined transects were selected for the Borrow Area A September 2003 sampling event (Figure 2) and seven pre-determined transects were selected for the Borrow Area B February 2004 sampling event (Figure 3). Bottom trawl coordinates for the September 2003 event are presented in Table 1 and bottom trawl coordinates for the February 2004 event are presented in Table 2. The same trawl coordinates were used for Borrow Area A and B during the May and July 2004 sampling efforts, which are presented in Table 3. Trawl transect coordinates for the May and July 2004 sampling events were the same as previous efforts in Borrow Areas A and B and presented in Figures 4 and 5, respectively.

All catch were processed on the boat and separated by species and identified to the lowest possible identification level (LPIL) taxa. All species were weighed and enumerated. Length measurements were taken using a measuring board consisting of a linear metric scale on a flat wooden base with a rigid headpiece. Total length (TL) measurements (the distance from the closed mouth to the extreme tip of the caudal fin) were recorded to the nearest millimeter. Weight measurements were measured to the nearest gram using Pesola® spring scales. When large numbers of individuals were encountered, a random subsample of 50 individuals per species was collected as a method of estimating total capture.

3.2 BENTHIC INVERTEBRATES

Benthic sampling was only conducted during the September 2003 and May 2004 sampling events. Benthic grabs were collected using a Smith-McIntyre grab (0.1 square meter) at each pre-determined sample station. Each sample was sieved in the field with a 0.5 millimeter (mm) mesh sieve bucket, and preserved in a buffered 10% formalin solution for laboratory analysis. In the laboratory, benthic samples were sieved again, stained with 1% Rose Bengal, and transferred to 70% ethanol for taxonomic analysis. Organisms were sorted from the sediments and enumerated by LPIL taxa. Wet-weight biomass was also determined after combining LPIL taxa into higher-order taxa. For the September 2003 sampling event, 35 pre-determined grab stations were selected for Borrow Area A (Figure 6) and 15 pre-determined grab stations were selected for Borrow Area B (Figure 7). Grab stations for the May 2004 Borrow Area A are presented in Figure 8 and for Borrow Area B in Figure 9. Grab station coordinates of all sampling events are presented in Table 4.

3.3 GRAIN SIZE AND SEDIMENT CHEMISTRY

Each benthic grab also was subsampled in the field for approximately 150 to 250 grams of material for grain size characterization (total of 50). Subsampled materials were collected and stored in a whirlpak to be shipped to the laboratory for analysis. Grain-size distribution was determined in the laboratory using a wet-sieve method. Grain-size analyses were conducted for the following components: pebble, coarse gravel, fine gravel, coarse sand, medium sand, fine sand, and silt or clay.

For the September 2003 sampling event, a select number of grab samples of sediment were subsampled to test the chemical constituents in the sediment. Subsamples were collected and stored in pre-prepared laboratory containers and stored in coolers to be shipped to the laboratory for analysis. Each sediment sample was screened in the laboratory for the following chemical parameters: polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), volatiles, pesticides (dichlorodiphenyltrichloroethane [DDT], Mirex, and Chlordane), and priority pollutant metals (antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc). For Borrow Area A, subsample collection was conducted at every third grab station, starting at grab station #1, for a total of 12 grabs (grab stations #1, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, and 33). For Borrow Area B, subsample collection was conducted at every other grab station, starting at grab station #2, for a total of six grabs (grab stations #2, 4, 6, 8, 10, and 12).

3.4 WATER QUALITY

During all fish and benthic sampling events, water quality measurements were collected at the beginning and end of each event. Water quality parameters such as temperature, dissolved oxygen (DO), salinity and conductivity, pH, and turbidity were collected from the surface, mid-depth, and bottom of the water column using an YSI© 6920 datasonde. In cases where the turbidity parameter was not available on the YSI datasonde, a Secchi disc was deployed to measure (to the nearest 0.5 meter) the light transmission at the sample location.

3.5 STATISTICAL ANALYSIS

Three variables were used to examine the fish data; overall species richness, essential fish habitat (EFH) species richness, and EFH species count. Overall species richness is the count of the number of each unique species found within each trawl. EFH species richness is the count of the number of each unique species found within each trawl that are EFH-designated and special interest species. The representative EFH and special interest species in this variable include the following species; red hake (*Urophycis chuss*), scup, summer flounder, windowpane (*Scophthalmus aquosus*), winter flounder, bluefish, Atlantic herring (*Clupea harengus*), and black sea bass. The EFH species count is the total number of individuals captured within each trawl that are representative EFH and special interest species. Because of the apparent temporal effects on the fish assemblages, each sampling period was examined separately. A two-sample unpaired t-test was used to compare fish variable differences between Borrow Areas A and B.

Similar to the fish variable statistical analysis, overall species richness among benthic invertebrates, defined as the count of the number of each unique species found within each sample, was compared between the borrow areas using a two-sample unpaired t-test.

Grain size data for 2003 and 2004 were pooled and percent compositions for each grain size class were compared between the two borrow areas using a two-sample unpaired t-test (e.g., mean percent fine sand for Borrow Area A vs. mean percent fine sand for Borrow Area B).

4.0 TRAWL RESULTS (FINFISH AND EPIBENTHIC MACROINVERTEBRATES)

Sixty-eight (68) otter-trawls (tows) were conducted in water depths of 29–47 feet and for durations of 8–10 minutes during the September 2003, February 2004, May 2004, and July 2004 sampling events. As a result, a total of 33 finfish species and 10 macroinvertebrate species (including squid) were collected in both Borrow Area A and Borrow Area B (Table 5 and Figure 10). It is important to note that bay anchovy were extremely abundant (in excess of 13,000 individuals in Borrow Area A and more than 31,000 individuals in Borrow Area B) during the September 2003 sampling event. Bay anchovy often form large schools that may become entrained in the trawl net and inadvertently prevent or deter the capture of other species. Additionally, when large numbers of individuals are caught, separating and accounting for similar sized species becomes difficult and less accurate as many non-anchovy species are easily camouflaged and possibly overlooked. Because of this, bay anchovy were excluded from the September 2003 analysis of species composition in order to obtain a more accurate representation of species proportions for commercial and recreational purposes and to make comparisons of species composition data between borrow areas more relative. However, it is important to note that although anchovies are excluded in certain statistical instances, their value as a prey species and as an essential component of the food chain should not be underestimated. Bay anchovy data is included in Appendix A. Scup was the dominant species, accounting for over half or 60.7% of the overall catch (Table 6). This excludes bay anchovy, which if counted, would be 90.0% of the total abundance. The second most abundant species was winter flounder (9.8%), followed by spider crab (9.5%), weakfish (4.2%), long-finned squid (2.3%), and Atlantic butterfish [2.0% (Figure 12)]. The remaining 11.5% was comprised of all other species. Cunner (*Tautogolabrus adspersus*) and winter flounder were the only two species of finfish collected during each of the four sampling events. The asteriid sea star (*Asterias forbesi*), rock crab (*Cancer irroratus*), and spider crab, were the only macroinvertebrates present during every sampling effort. Rocky substrate made bottom fishing extremely difficult and multiple nets were damaged during the process resulting in lost catches and additional attempts.

Differences in species abundance were evident between Borrow Areas A and B (Figure 11) although a low sampling frequency combined with migratory fish patterns allows only for a qualitative observation regarding differences in fish populations between these locales to be made. While scup was clearly the dominant species in Borrow Area B, representing 80 percent of the species abundance, it was only the fourth most common species (11.4%) in Borrow Area A. A quick comparison of the top five species from Borrow Areas A and B shows that winter flounder and spider crab were among the most abundant species in both borrow areas (Figures 13 and 14). Weakfish was among the most common species in Borrow Area A, but not in Borrow Area B.

For all of the sampling events combined, a total of eight (8) EFH-designated species were collected in both borrow areas [i.e., Atlantic herring, black sea bass, bluefish, red hake, scup, windowpane, and winter flounder (Table 6)].

4.1 MONTHLY TRAWL RESULTS

The following section describes the finfish species composition, abundance, and biomass for successful tows completed during each monthly effort. Data for both borrow areas are presented along with information pertaining to EFH species designations. A general description of the relative abundance and frequency of the dominant macroinvertebrate species is also given for each effort.

4.1.1 September 2003: Borrow Areas A/B

A total of 17 finfish species, 5 of which are EFH-designated, and 6 macroinvertebrate species were collected in September 2003 at both borrow areas (Table 6). Anchovy dominated the catch accounting for 92.5%, followed by scup, an EFH-designated species, which represented 6.5% of the catch. With anchovy excluded from the analysis scup was the dominant species, accounting for 87.8% of the catch. Other common species collected during the September 2003 sampling event were weakfish, Atlantic butterfish and long-finned squid. The total catch of all species combined for the September 2003 sampling event was 49,283 with anchovy representing 45,606 individuals. When anchovy are excluded, total catch drops to 3,677 individuals; of which 3,585 were fish, 83 were squid, and the remaining 9 individuals were benthic macroinvertebrates. Besides scup, other EFH-designated species captured included bluefish, winter flounder, Atlantic herring, and black sea bass. However, these accounted for only a small percentage of the catch. Rock crab was the most abundant macroinvertebrate collected, but only 3 individuals were caught.

A total of 13 finfish species, 5 of which are EFH-designated, and 4 macroinvertebrate species were collected in Borrow Area A during the September 2003 sampling event (Table 7). Anchovy dominated the catch of Borrow Area A by 96.6%, due to anchovy representing 13,812 individuals of the total 14,293 finfish and macroinvertebrates that were caught. With bay anchovy eliminated from the analysis, weakfish was the dominant species accounting for 45.5%, and scup was the second most abundant species, accounting for 34.5% of the catch. Other common species collected in Borrow Area A during the September 2003 sampling event were long-finned squid, Atlantic butterfish, winter flounder, and bluefish. With anchovy excluded the total catch of all species combined in Borrow Area A during the September 2003 sampling event was 481 individuals; of which 433 were fish, 44 were squid, and the remaining 4 individuals were benthic macroinvertebrates.

A total of 11 finfish species, 4 of which are EFH-designated species and 4 macroinvertebrate species were collected in Borrow Area B during the September 2003 sampling event (Table 8). Anchovy dominated the catch of Borrow Area B by 90.9%, due to anchovy representing 31,794 individuals of the total 34,990 finfish and macroinvertebrates that were caught. With bay anchovy eliminated from the analysis, scup was the dominant species accounting for 95.8% of the catch. Other common species collected in Borrow Area B during the September 2003 sampling event were Atlantic butterfish and long-finned squid. With anchovy excluded, the total catch of all species combined in Borrow Area B during the September 2003 sampling event was 3,196 individuals; of which 3,152 were fish, 39 were squid, and the remaining 5 individuals were benthic macroinvertebrates.

Length statistic data of the EFH-designated species collected at both borrow areas are presented in Table 9.

4.1.2 February 2004: Borrow Areas A/B

A total of 10 taxa were collected in February 2004 at both borrow areas – less than one half of all other sampling events (Table 6). Of these, 3 were EFH-designated species, and 3 were macroinvertebrates. Grubby (*Myoxocephalus aenaeus*) was the dominant species, accounting for 52.9% of the catch. Cunner was the second most abundant species, accounting for 15.5% of the catch. Other common species collected during the February 2004 sampling event were winter flounder and asteriid sea star. February had the smallest total catch of any sampling event, with only 155 individuals caught compared to over 3,600 collected in September 2003. Of these, 20 individuals were macroinvertebrates. This was also the only month that no squid were collected.

A total of eight species were collected in Borrow Area A during the February 2004 sampling event (Table 7). Grubby was the dominant species, accounting for 54.7% of the catch in Borrow Area A. Other common species collected in Borrow Area A were cunner and winter flounder. The total catch for all species collected from Borrow Area A during the February 2004 sampling event was 95 individuals including 10 EFH-designated winter flounder and 9 benthic macroinvertebrates.

A total of seven species were collected in Borrow Area B during the February 2004 sampling event (Table 8). Similar to Borrow Area A, grubby was the dominant species, accounting for 48.3% of the catch in this borrow area. Of these, three EFH-designated species were collected in February. Other common species collected in Borrow Area B during the February 2004 sampling event were asteriid sea star, Atlantic herring, and winter flounder. The total catch of all species in Borrow Area B during the February 2004 sampling event was 58 individuals, of which 11 were macroinvertebrates.

Length statistic data of the EFH-designated species collected at both borrow areas are presented in Table 9.

4.1.3 May 2004: Borrow Areas A/B

A total of 25 taxa were collected from both borrow areas in May 2004 – the highest diversity of all the sampling events (Table 6). This included 5 EFH-designated species and 7 benthic macroinvertebrate species. Spider crab was the dominant species, accounting for 39.2% of the catch, followed by winter flounder, which accounted for 34.0% of the total collected. During the May 2004 sampling event, 1,167 individual organisms were collected, of which 31 were squid and 517 were macroinvertebrates (457 of which were spider crabs).

A total of 23 species were collected in Borrow Area A (Table 7). Spider crab was the dominant species, accounting for 40.9% of the catch. Winter flounder was the second most abundant species, accounting for 34.1% of the catch. The total catch of all species combined in Borrow

Area A during the May 2004 sampling event was 817 individuals; of which 429 were fish, 25 were squid, and 363 individuals were benthic macroinvertebrates (including 334 spider crabs).

A total of 17 species were collected in Borrow Area B during the May 2004 sampling event (Table 8). Similar to Borrow Area A, spider crab was the dominant species, accounting for 35.1% of the catch, while winter flounder was the second most abundant species, accounting for 33.7% of the catch. The total catch of all species combined in Borrow Area B during the May 2004 sampling event was 350 individuals; of which 190 were fish, 6 were squid, and 154 individuals were benthic macroinvertebrates (including 123 spider crabs).

Length statistic data of the EFH-designated species collected at both borrow areas are presented in Table 9.

4.1.4 July 2004: Borrow Areas A/B

A total of 22 taxa were collected in July 2004 at both borrow areas (Table 6). This included 4 EFH-designated species and 6 macroinvertebrate species. Anchovy dominated the catch by 87.3%, due to anchovy representing 2,443 individuals of the total 2,800 finfish and macroinvertebrates that were caught. With anchovy excluded, winter flounder was the dominant species, accounting for 28.0%, and blueback herring (*Alosa aestivalis*) was the second most abundant species, accounting for 16.8% of the catch. Other common species collected during the July 2004 sampling event were spider crab, windowpane, and horseshoe crab. With anchovy excluded, 357 individuals were collected, of which 254 were finfish, 9 were squid, and 94 were macroinvertebrates.

A total of 18 species were collected in Borrow Area A during the July 2004 sampling event (Table 7). Winter flounder was the dominant species, accounting for 35.4% of the catch. Spider crab was the second most abundant species, accounting for 10.9% of the catch. Other common species collected in Borrow Area A during the July 2004 sampling event were windowpane, horseshoe crab, scup, and spotted hake (*Urophycis regia*). The total catch of all species combined in Borrow Area A was 147 individuals (excluding 4 bay anchovy); of which 99 were fish, 5 were squid, and 43 individuals were benthic macroinvertebrates. Only four anchovy were caught in Borrow Area A during the July 2004 sampling event.

A total of 17 species were collected in Borrow Area B during the July 2004 sampling event (Table 8). Anchovy dominated the Borrow Area B catch by 92.1% due to anchovy representing 2,439 individuals of the total 2,649 finfish and macroinvertebrates that were caught. With anchovy excluded, blueback herring was the dominant species, accounting for 28.6%, and winter flounder was the second most abundant species, accounting for 22.9% of the catch. Other common species collected in July from Borrow Area B were spider crab, cunner, and scup. With anchovy excluded, a total of 210 individual organisms were collected in July, of which 156 were finfish, 4 were squid, and 50 were benthic macroinvertebrates.

Length statistic data of the EFH-designated species collected at both borrow areas are presented in Table 9.

4.2 DISTRIBUTION AND LENGTH OF ESSENTIAL FISH HABITAT DESIGNATED SPECIES BY BORROW AREA

For all of the sampling events, a total of eight different EFH-designated species were collected in both borrow areas. The same EFH-designated species were captured in both borrow areas and consist of Atlantic herring, black sea bass, bluefish, red hake, scup, summer flounder, windowpane, and winter flounder (Table 6). Length statistic data of the EFH-designated species collected at both borrow areas are presented in Table 9.

4.2.1 Borrow Area A

For the four combined sampling events, eight EFH-designated species, including Atlantic herring, black sea bass, bluefish, red hake, scup, summer flounder, windowpane, and winter flounder, were collected in Borrow Area A. Winter flounder was the only EFH-designated species collected during all four sampling events (Table 9). Winter flounder was also the most abundant EFH-designated species collected in Borrow Area A accounting for 22.6% of the total catch. The next most abundant EFH-designated species was scup, accounting for 11.4% of the total catch. Other EFH-designated species of significant value were red hake, accounting for 3.4% of the total catch and windowpane, accounting for 3.2% of the total catch (Table 7).

4.2.1.1 September 2003

The September 2003 sampling event captured the most EFH-designated species (five species) from Borrow Area A. Scup was the most abundant EFH species, accounting for 34.5% of the catch. Winter flounder was the next most abundant species, accounting for 1.5% of the catch and bluefish was third most abundant, accounting for 1.2% of the catch. Only one individual was collected for both Atlantic herring and black sea bass, accounting for 0.2% of the catch (Table 7).

Analysis of length data for the September 2003 sampling event revealed that six bluefish were measured with the smallest at 135 mm and largest at 249 mm, with an average size of 209.33 mm. One hundred three (103) scup were measured with the smallest at 49 mm, largest at 325 mm, and an average size of 83.01 mm. Seven winter flounder were captured with the smallest at 157 mm, largest at 270 mm, and an average size of 192.57 mm. Only one each of Atlantic herring, 105 mm, and black sea bass, 412 mm, were collected during this sampling event (Table 9).

4.2.1.2 February 2004

For the February 2004 sampling event, winter flounder was the only EFH-designated species collected, accounting for 10.5% of the catch (Table 7). Length statistics showed that 10 winter flounder were measured with the smallest at 47 mm, largest at 125 mm, and an average size of 77.10 mm (Table 9).

4.2.1.3 May 2004

For the May 2004 sampling event, winter flounder was the most abundant EFH species, accounting for 34.1% of the catch. Red hake was the next most abundant EFH species, accounting for 6.5% of the catch. These were followed by windowpane, accounting for 4.3% of the catch, summer flounder, accounting for 1.1% of the catch, and scup, accounting for 0.1% of the catch (Table 7).

Analysis of length data from the Borrow Area A May 2004 sampling event revealed that 53 red hake were captured with the smallest at 30 mm, largest at 321 mm, and an average size of 100.19 mm. Nine summer flounder were measured with the smallest at 267 mm, largest at 600 mm, and an average size of 464.44 mm. Thirty-five (35) windowpane were measured with the smallest at 60 mm, largest at 295 mm, and an average size of 174.80 mm. Two hundred seventy-nine (279) winter flounder were measured with the smallest at 45 mm, largest at 321 mm, and an average size of 107.70 mm. Only one scup (322 mm) was collected during this sampling event (Table 9).

4.2.1.4 July 2004

For the July 2004 sampling event, winter flounder was again the most abundant EFH species, accounting for 35.4% of the catch. Windowpane was the second most abundant EFH species, accounting for 10.2% of the catch. These were followed by scup, accounting for 6.1% of the catch and summer flounder, accounting for 2.0% of the catch (Table 7).

Analysis of length data for the Borrow Area A July 2004 sampling event revealed that nine scup were measured with the smallest at 186 mm, largest at 327 mm, and an average size of 257.44 mm. Three summer flounder were measured with the smallest at 290 mm, largest at 485 mm, and an average size of 403.33 mm. Fifteen (15) windowpane were measured with the smallest at 61 mm, largest at 220 mm, and an average size of 152.47 mm. Fifty-two (52) winter flounder were measured with the smallest at 41 mm, largest at 274 mm, and an average of 105.13 mm (Table 9).

4.2.2 Borrow Area B

For the four combined sampling events, eight EFH-designated species, including Atlantic herring, black sea bass, bluefish, red hake, scup, summer flounder, windowpane, and winter flounder, were collected in Borrow Area B. Similar to Borrow Area A, winter flounder was the only EFH-designated species collected during all four sampling events (Table 9). Scup was the most abundant EFH-designated species collected in Borrow Area B, accounting for 80.6% of the total catch. The next most abundant EFH-designated species was winter flounder, accounting for 4.6% of the total catch. Other EFH-designated species of significant value were red hake, accounting for 0.9% of the total catch and windowpane, accounting for 0.7% of the total catch (Table 8).

4.2.2.1 September 2003

Similar to Borrow Area A, the September 2003 and July 2004 sampling events captured the most EFH-designated species (four species). Scup was the most abundant EFH species, accounting for 95.8% of the catch. Winter flounder was the next most abundant, accounting for 0.1% of the catch. Only one individual was collected for both black sea bass and bluefish, accounting for less than 0.1% of the catch (Table 8).

Length statistics for the Borrow Area B September 2003 sampling event showed 62 scup measured with the smallest at 45 mm, largest at 370 mm, and an average size of 65.3 mm. Two winter flounder were measured with the smallest at 95 mm and the largest at 240 mm. Only one each of black sea bass, 428 mm and bluefish, 212 mm were collected during this sampling event (Table 9).

4.2.2.2 February 2004

Three EFH-designated species were collected during the February 2004 sampling event. Atlantic herring was the most abundant, accounting for 13.8% of the catch. Winter flounder was the next most abundant, accounting for 12.1% of the catch. Only one black sea bass was collected, accounting for 1.7% of the catch (Table 8).

Length statistics for the February 2004 sampling event showed eight Atlantic herring measured with the smallest at 195 mm, largest at 265 mm, and an average size of 225.38 mm. Seven winter flounder were measured with the smallest at 52 mm, largest at 300 mm, and an average size of 103.00 mm. Only one black sea bass, 110 mm was collected during this sampling event (Table 9).

4.2.2.3 May 2004

For the May 2004 sampling event in Borrow Area B, winter flounder was the most abundant EFH species, accounting for 33.7% of the catch. Red hake was the second most abundant EFH species, accounting for 9.4% of the catch. Windowpane was the third EFH species, accounting for 5.1% of the catch (Table 8).

Analysis of length data for the May 2004 sampling event revealed that 33 red hake were measured with the smallest at 70 mm, largest at 151 mm, and an average size of 99.21 mm. Eighteen (18) windowpane were measured with the smallest at 64 mm, largest at 300 mm, and an average size of 166.33 mm. One hundred eighteen (118) winter flounder were measured with the smallest at 54 mm, largest 360 mm, and an average size of 99.76 mm (Table 9).

4.2.2.4 July 2004

For the July 2004 sampling event, winter flounder was the most abundant species captured, accounting for 22.9% of the catch. Scup was the second most abundant EFH species, accounting for 5.7% of the catch. Windowpane was the third most abundant EFH species, accounting for

3.8% of the catch. Only one summer flounder was collected, accounting for less than 0.5% of the catch (Table 8).

Analysis of length data for the July 2004 sampling event revealed 12 scup were measured with the smallest at 186 mm, largest at 285 mm, and an average size of 242.25 mm. Eight windowpane were measured with the smallest at 184 mm, largest at 287 mm, and an average size of 222.38 mm. Forty-eight (48) winter flounder were measured with the smallest at 34 mm, largest at 184 mm, and an average size of 71.67 mm. Only one summer flounder, at 281 mm was collected during this sampling event (Table 9).

4.3 BIOMASS

Biomass in the borrow areas from all four surveys was dominated by a relatively small number of species, including: horseshoe crab, spider crab, scup, winter flounder, summer flounder, windowpane, tautog, and clearnose skate [*Raja eglanteria* (Figure 15 and Table 10)]. Six species accounted for more than 80 percent of the total biomass. The capture of large schools of bay anchovy in September 2003 and July 2004 represented more than 71 kg, or 22% of the total biomass captured during the sampling events. With anchovy biomass included, anchovy represents the second most dominant species in terms of total biomass for the entire study, with the most dominant species represented by horseshoe crab, which accounted for 23.6% of total biomass. Spider crab was the third most dominant species in terms of biomass (20.4%), followed by scup (7.0%), winter flounder (4.9%), and summer flounder (4.4%). It should be noted that horseshoe and spider crabs accounted for the highest biomass although they only represented only 0.8% and 9.5% of species abundance (Table 6); a finding that can be attributed to their heavy exoskeletons.

Three EFH-designated species: scup and winter and summer flounder, comprised a significant proportion of the total biomass. They were the three most dominant finfish species collected in terms of biomass. Scup represented 9.0% of total biomass, w inter flounder accounted for 6.3% of total biomass, while summer flounder accounted for 5.7% (Table 10).

4.3.1 September 2003 Sampling Event

Six species accounted for 86.8% of the biomass during the September 2003 sampling event (Table 10 and Figure 16A). With bay anchovy data included in the analysis for September, this species represents 68.1% of the total biomass, followed by scup, which comprised 16.6% of the total biomass. With anchovy excluded, scup was the most dominant species captured in terms of biomass (as well as abundance), accounting for 52.1% of the total weight, black sea bass was the second most dominant species accounting for 11.5% of the weight, and long-finned squid was the third most dominant species accounting for 8.5% of the weight. Three EFH-designated species (scup, black sea bass, and winter flounder) were among the top 6 species in terms of biomass dominance during September's sampling event.

4.3.2 February 2004 Sampling Event

Six species accounted for 99.2% of the biomass during the February 2004 sampling event (Table 10 and Figure 16B). Asteriid sea star was the dominant species captured in terms of biomass (but not the dominant species in terms of abundance) during the February 2004 sampling event, accounting for 44.1% of the total biomass. Grubby was second most dominant species, accounting for 14.6% of the total weight. Spider crab and Atlantic herring were closely matched as the third and fourth dominant species, accounting for 14.0% and 13.9% of the biomass, respectively. Two EFH-designated species were among the top 6 species in terms of biomass dominance during February's sampling event: Atlantic herring (13.9%) and winter flounder (11.3%).

4.3.3 May 2004 Sampling Event

Six species accounted for 88.5% of the biomass during the May 2004 sampling event (Table 10 and Figure 16C). Spider crab was the dominant species, accounting for 38.8% of the weight, while horseshoe crab was the second most dominant species, accounting for 23.0% of the sample weight. Winter and summer flounder were equivalent, each representing 8% of the total biomass. Three EFH-designated species were among the top 6 species in terms of biomass dominance during May's sampling event: winter and summer flounder (each 8%), and windowpane (4.4%).

4.3.4 July 2004 Sampling Event

Finally, total biomass collected in July 2004 was dominated by six species, which accounted for 91.8% of biomass. Horseshoe crab was the dominant species, accounting for 57.1% of the total weight, followed by spider crab (12.5%) and scup [9.6% (Table 10 and Figure 16D)]. Three EFH-designated species were among the top 6 species in terms of biomass dominance during July's sampling event: scup (9.6%), windowpane (4.2%), and summer flounder (3.7%).

Anchovy were less dominant in the July 2004 sampling event, and with this species included horseshoe crab still represents the most dominant species (50.1%) in terms of biomass. However anchovy replaces spider crab as the second most dominant species (12.3%), with spider crab being the third most dominant (11%) biomass species.

5.0 BENTHIC SAMPLING RESULTS

The list of benthic invertebrate species represented in Tables 11 and 12 only include those species for which over 100 individuals were collected. Elimination of other benthic invertebrate species produced results that allowed the focus to be placed on the species that represented a majority of the benthic community sampled and made it easier to compare species composition data between borrow areas. The following results summarize species richness, abundance, and biomass data. They are presented by sampling event and borrow area.

5.1 SEPTEMBER 2003

For the September 2003 benthic sampling survey, a total of 86 taxa, consisting of a minimum of 26,690 individuals were collected in both borrow areas. Results of the benthic sampling events are provided in Appendix B. The total number of individuals collected in Borrow Area A was approximately twice as much as those collected in Borrow Area B (Table 11). Species diversity was much higher in Borrow Area A (83 taxa) than in Borrow Area B (51 taxa). Results of the September 2003 survey showed that Nematoda, Annelida, and Oligochaeta were present in great abundance at both borrow areas, but were only able to be identified to the Lowest Possible Identification Level (LPIL). Abundant polychaete worms collected at both borrow areas included *Ampharete spp.* (LPIL), *Ampharete lindstroemi*, *Cossura longocirrata*, *Cirratulidae spp.* (LPIL), *Nephtys spp.* (LPIL), *Scalibregma inflatum*, and *Polydora cornuta*. Additionally, molluscs and arthropods were found in both borrow areas but in most cases less than 100 individuals were present for each taxon identified (Table 11).

Biomass in both borrow areas was dominated by bivalves. This was as expected because bivalves (e.g., clams and mussels) possess a hard outer shell that contributes to higher biomass relative to other benthic invertebrate species (Table 13). Dominant taxa included the molluscan orders Pelecypoda and Gastropoda, as well as polychaetes. For the September 2003 benthic survey, the total biomass weight of the benthic invertebrates collected in Borrow Area B was nearly twice the weight of the benthic invertebrate species collected in Borrow Area A. Additionally, Sipuncula, Ostracoda, and Pisces were only collected in Borrow Area A (Table 13).

A minimum of 17,384 individuals across 83 taxa were collected in Borrow Area A (Appendix B). Nematoda (LPIL) was the dominant taxon, accounting for 49.9% of the catch (Table 11). Polychaetes of the family Cirratulidae (LPIL) and Oligochaeta (LPIL) were the next two most dominant taxa, each representing 13.3% of the taxa collected. Two additional polychaete worms, *Polydora cornuta* and *Cossura longocirrata*, accounted for 5.3% and 2.4% of the catch, respectively, and all other taxa individually represented less than 1.9% of the total catch for Borrow Area A.

Bivalves, polychaetes, and gastropods represented 98.9% of the total benthic invertebrate biomass collected in Borrow Area A (Figure 17). The molluscan class Pelecypoda had the highest biomass with a catch weight of 261.736 g (81.2%). Polychaetes recorded the second highest biomass with a total catch weight of 34.406 g (10.7%). This was followed by

Gastropoda (LPIL) with a catch weight of 22.687 g (7.0%). Figure 17 illustrates the biomass distribution in Borrow Area A by taxonomic class.

A minimum 9,306 individuals across 51 taxa were collected in Borrow Area B (Appendix B). As found in Borrow Area A, Nematoda (LPIL) was the dominant taxon, accounting for 70.5% of the catch (Table 11). Oligochaeta (LPIL) and Cirratulidae (LPIL) of the Polychaeta family were the next two most dominant taxa representing 9.4% and 8.5% of the taxa collected. Additionally, the amphipod *Ampelisca abdita* accounted for 2.5% of the catch. All other taxa individually represented less than 1.9% of the total catch for Borrow Area B.

Similar to the biomass distribution found in Borrow Area A, bivalves, gastropods, and polychaetes represented 99.8% of the total benthic invertebrate biomass collected in Borrow Area B. The molluscan class Bivalvia had the highest biomass with a catch weight of 441.358 g (80.4%). Gastropoda (LPIL) recorded the second highest biomass with a total catch weight of 93.806 g (17.1%). This was followed by Polychaetes with a catch weight of 12.899 g (2.3%). Figure 20 and Table 13 illustrates biomass distribution in Borrow Area B by taxonomic class.

5.2 MAY 2004

For the May 2004 benthic sampling survey, a total of 88 taxa, consisting of at least 26,897 individuals, were collected in both borrow areas. Results of the benthic grab analysis are presented in Appendix B. The total number of individuals collected in Borrow Area A nearly doubled the total number of individuals collected in Borrow Area B (Table 12). As in September 2003, species diversity was much higher in Borrow Area A (85 taxa) than in Borrow Area B (67 taxa); however, the number of benthic grabs conducted in Borrow Area A greatly outweighed the number of benthic grabs conducted in Borrow Area B (35 vs. 15) — a fact that likely contributed to the overall difference. Similar to the September 2003 survey, results of the May 2004 survey showed that a large number of nematode and oligochaete worms were collected at both borrow areas, but could only be identified to the LPIL. Abundant polychaete worms collected at both borrow areas included *Ampharete finmarchica*, *A. acutifrons*, *Streblospio benedicti*, *Nephtys picta*, *Capitella capitata*, *Spionids* spp. (LPIL), *Tharyx acutus*, *Glycera* spp. (LPIL), and *Polydora ligni*. Although gastropods and bivalves were collected in both borrow areas, none of either taxa collected in Borrow Area B numbered over 100 individuals. Abundant arthropods collected in both borrow areas included the copepod, *Temora longicornis*, and the amphipod, *Ampelisca abdita* (Table 12).

Similar to the September 2003 effort, biomass in both borrow areas was dominated by bivalves (Table 13). Dominant species included the molluscan orders Pelecypoda and Gastropoda, as well as polychaete annelids. For the May 2004 benthic survey, the total biomass of the benthic invertebrates collected in Borrow Area A was nearly twice the weight of the benthic invertebrate species collected in Borrow Area B. Only the presence or absence of bryozoan colonies was noted and no weight measurements were taken. Additionally, ostracods were identified to the LPIL but no weight measurements were obtained.

A minimum of 17,606 individuals across 85 taxa were collected in Borrow Area A (Appendix B). Nematoda (LPIL) was the dominant taxon, accounting for 50.9% of the catch (Table 12).

Oligochaeta (LPIL) was the next most abundant taxon representing 7.7% of the taxa collected. Other abundant species included *Temora longicornis* (4.4%), *Ampharete finmarchica* (4.1%), *Streblospio benedicti* (3.6%), and *Ampelisca abdita* (3.3%). All of the remaining taxa individually represented less than 3.0% of the total catch for Borrow Area A.

Pelecypods, polychaetes, and gastropods represented 93.1% of the total benthic invertebrate biomass collected in Borrow Area A (Figure 18). The molluscan class Pelecypoda had the highest biomass with a catch weight of 1,026.994 g (55.2%). Polychaetes recorded the second highest biomass with a total catch weight of 441.168 g (23.7%). This was followed by Gastropoda (LPIL) with a catch weight of 261.765 g (14.1%). Additionally, arthropodan amphipods and decapods represented 6.9% of the total biomass when combined together. Figure 18 illustrates the biomass distribution in Borrow Area A by taxonomic class.

A minimum of 9,291 individuals across 67 taxa were collected in Borrow Area B (Appendix B). As seen previously, Nematoda (LPIL) was the dominant taxon, accounting for 62.5% of the catch (Table 12). Oligochaeta (LPIL) was the next most abundant taxon representing 6.2% of the taxa collected. Other abundant taxa included the polychaetes *Streblospio benedicti* and *Capitella capitata* (each with 5.5%), and *Ampharete finmarchica* (3.8%). All of the remaining taxa individually represented less than 2.5% of the total catch for Borrow Area B.

Bivalves, polychaetes, and gastropods represented 97.7% of the total benthic invertebrate biomass collected in Borrow Area B (Figure 18). The molluscan class Pelecypoda had the highest biomass with a catch weight of 672.349 g (65.7%). Polychaetes recorded the second highest biomass with a total catch weight of 271.619 g (26.6%). This was followed by Gastropoda (LPIL) with a catch weight of 55.303 g (5.4%). Amphipods and decapods were present at Borrow Area B but their combined biomass represented less than one-third (2.2%) of what was found in Borrow Area A. Figure 18 and Table 13 illustrate and summarize biomass distribution in Borrow Area B by taxonomic class.

5.3 GRAIN SIZE ANALYSIS

Grain size samples were collected from both borrow areas in September 2003 and May 2004. Samples were taken at 34 sites from Borrow Area A, and from 15 sites in Borrow Area B. The percentage of dry weight was measured to assess the relative amounts of different grain sizes in each sample (see Appendix C). Medium grain size sands were the dominant sediment size collected in both Borrow Areas A and B (comprising 45% in each borrow area). Fine sand was the second most abundant grain size, particularly in Borrow Area B. No pebble-sized (or larger) sediments were collected, and only small amounts (less than 9 g) of silts or clays were collected from either site (see Figure 19). Some amounts of gravels and coarse sand, as well as silts or clays, were found in every sample.

Overall, Borrow Area A had more coarse material than Borrow Area B, but less fine sands (Figures 19). Generally, only small differences were observed between samples collected in September 2003 and May 2004 (see Figures 20 and 21). In May, there was a higher average amount of medium sands, but samples collected in September of the previous year had more fine gravel and silt or clay than the May samples. Borrow Area A also had more coarse gravel in September than in May.

5.4 SEDIMENT CHEMICAL ANALYSIS

Chemical analysis of the sediments in the borrow areas were collected during September 22-23, 2003. Results of the sediment chemical analysis are provided in Appendix D.

5.4.1 Borrow Area A

A total of 12 subsamples were collected for analysis of chemical constituents from the 35 available benthic grabs collected at Borrow Area A. The only chemical found to be above the New York State Technical and Administrative Guidance Memorandum cleanup objective criteria is the semivolatile compound Chrysene. Chrysene is a polycyclic aromatic hydrocarbon (PAH) that is typically found in cigarette smoke, coal tar pitch volatiles, coke oven emissions and diesel exhaust. The high reading occurred in two out of the 12 possible grabs.

5.4.2 Borrow Area B

From the 15 available benthic grabs collected at Borrow Area B, a total of six subsamples were collected for analysis of chemical constituents. As with Borrow Area A, the only chemical found to be above the New York State Technical and Administrative Guidance Memorandum cleanup objective criteria is the semivolatile compound Chrysene. The higher reading occurred in four out of the six possible grabs in Borrow Area B.

6.0 WATER QUALITY MEASUREMENTS

Water quality measurements were taken during fish sampling events in September 2003 and in February, May, and July of 2004 (Tables 17, 18, 20, and 21). In addition, water quality was measured during benthic sampling events in September 2003 and May 2004 (Tables 16 and 19). Measurements were taken at three depths: at the bottom, middle, and surface of the water column. The results reflect seasonal changes in temperature, including a lag time for water temperatures to adjust to seasonal air temperatures, and inverse changes in dissolved oxygen levels, as expected. Mean temperatures climbed from a low of minus 0.33°C recorded in February to a high of 23.02°C in September. Conversely, the lowest mean level of dissolved oxygen was recorded in September (7.10 mg/l), while the highest mean level (12.54 mg/l) was recorded in May. Borrow Area B generally had higher mean temperatures and higher levels of dissolved oxygen than Borrow Area A. Mean salinity levels ranged from a minimum of 13.38 ppt in February to a maximum of 24.42 ppt in September. There did not appear to be any clear pattern in the difference in salinity between the two sites. Mean pH was lowest in September and July (7.57) and highest (8.22) in February.

7.0 STATISTICAL ANALYSIS

7.1 FISH RESULTS

The differences for the three fish variables were investigated between borrow areas A and B for each sample period. The results of these t-tests are summarized in Table 22. For the most part, no differences between the borrow areas for these variables were detected. In January 2004, Borrow Area A had a significantly higher EFH species richness than Borrow Area B. However, the reverse was observed in May 2004 when EFH species richness in Borrow Area B was significantly higher than Borrow Area A. It should be noted that due to the low sample sizes and high variability with some of the trawl data, the power to detect a difference would be considered to be low.

7.2 BENTHIC RESULTS

The difference between benthic invertebrate species richness was investigated between Borrow Areas A and B for each year and the 2003/2004 combined data. The results of these t-tests are summarized in Table 23. No differences between benthic invertebrate species richness was detected in 2003, 2004, or for the combined 2003/2004 data set ($P = > 0.64$).

7.3 GRAIN SIZE RESULTS

T-tests performed on the combined 2003 and 2004 grain size data indicated that the percent compositions between Borrow Areas A and B was significantly different for fine gravel ($P < 0.001$), coarse sand ($P = 0.002$), and fine sand ($P < 0.001$). Fine gravel and coarse sand were found to be significantly less predominant in Borrow Area B than in Borrow Area A (Figure 19). Fine sand was found to be significantly more predominant in Borrow Area B than Borrow Area A [$P = 0.001$ (Figure 10)]. Overall, Borrow Area A appears to have a substrate comprised of more course materials than Borrow Area B.

8.0 DISCUSSION

The results presented in this report characterize the finfish and benthic invertebrate community present in the two proposed sand borrow areas (i.e., A and B) located offshore of Asharoken, New York, as observed in September 2003, and February, May, and July 2004. This characterization of physical and biological resources provides a baseline for future finfish and benthic macroinvertebrate monitoring efforts in the borrow areas during and after sand removal for beach nourishment purposes. The results of this survey were based on seasonal low-frequency sampling of each borrow area and reveal a discrete temporal picture of finfish and benthic community assemblages, species size distributions, abundance of EFH-designated finfish species, and biomass estimates and distributions. Additionally, this report characterizes the sediment profiles and the water quality characteristics of both borrow areas.

The sampling event with the highest diversity of fish and benthic species captured (25) was May 2004. This was closely followed by the September 2003 sampling event with 23 fish and benthic invertebrate species, the July 2004 sampling event with 22 fish and benthic invertebrate species, and February 2004 sampling event with 10 fish and benthic invertebrate species (Figure 10). Out of the 43 fish and benthic invertebrate species captured, only five species were captured during all sampling events (Table 6). From the five duplicate species, winter flounder and cunner were the fish species, while the other three duplicated species consist of asteriid sea star, rock crab, and spider crab. Five duplicate species were also captured during three out of the four sampling events. This group consists of 3 fish species (grubby, scup, and tautog) and two invertebrate species (horseshoe crab and long-finned squid).

Overall, fish and invertebrate species captured during February were lowest in terms of abundance and diversity. The occurrence is typical as many of the fish and invertebrate species collected during the spring and fall events migrate into deeper water to avoid frigid winter water temperatures. Grubby was the dominant fish species collected during the February 2004 sampling event. This was not unexpected as the grubby is a coldwater sculpin with an upper temperature limit of approximately 20.5°C and capable of surviving in water temperatures below 0°C (Bigelow and Schroeder 1953).

Notable fish species captured during the September sampling event included bay anchovy, scup, and weakfish. These species were captured in great abundance, and the size of the individuals captured (Appendix A) showed that these young-of-the-year (YOY) species were presumably utilizing the nearshore waters in Long Island Sound as nursery grounds. Fish and benthic invertebrate species of importance captured during the May 2004 sampling event include American lobster, grubby, red and silver hake, and Atlantic tomcod (*Microgadus tomcod)*. These species are known to migrate into shallow waters during winter and spring seasons and migrate back into the deeper waters as conditions become less ideal (i.e., increase in water temperature). This was evident as the recorded water temperatures of the July 2004 sampling event were substantially higher compared to the May 2004 sampling event, and was confirmed by the lack of referenced species captured during the July 2004 sampling event.

The species with the highest biomass were horseshoe and spider crabs (Table 10 and Figure 15). Together, these two species accounted for 56.6% of the total biomass. Scup was the dominant finfish species captured, accounting for 9.0% of the total biomass. This was followed by winter flounder at 6.3% of the total biomass and summer flounder at 5.7% of the total biomass to round out the top three finfish species. Approximately 3,250 scup were captured compared to 523 winter flounder and 13 summer flounder (Table 6).

For both borrow areas, a total of eight different EFH-designated species were captured during all sampling events combined, with winter flounder being the only species captured during each event (Table 6). The September 2003 sampling event caught the most number of EFH-designated species with five different species. This was followed by May and July 2004, with four different species, and then February 2004, with three different species. Summer flounder were captured in Borrow Area A during two sampling events and in Borrow Area B only during the July 2004 sampling event (Table 9). Both Atlantic herring and bluefish are predominantly mid-water species; therefore the low number of individuals collected was not unexpected. Black sea bass are known to be associated with structures, and since the sampling areas are sand it is not surprising to catch a low number of individuals of this species.

Nematodes and oligochaetes were identified to the LPIL. These benthic invertebrates were abundant and accounted for the dominant and second most dominant species collected in both borrow areas during the September 2003 and May 2004 sampling events. Results of both September 2003 and May 2004 benthic grabs showed that gastropods and pelecypods were fairly abundant (over 100 individuals) at Borrow Area A, while very few were caught in Borrow Area B. For the May 2004 sampling event, other common benthic invertebrates collected in both borrow areas include the polychaete worms, copepods, and amphipods (Tables 11 and 12).

Results of the September 2003 and May 2004 grain size analyses showed that medium grain sized sands was the dominant type of sediment at both borrow areas, followed by fine grain size sands (Tables 14 and 15). No pebble size sediment were collected at either borrow areas. Coarse gravel size sediment was collected from only one grab location in Borrow Area B, while being present in 12 out of 35 grab sites in Borrow Area A. Silt and clay were present in all grab sites; however, the silt/clay component never comprised more than 12% of dry weight and was generally less than 5% of the total sample weight.

Water quality parameters at both borrow areas throughout the sampling events were as expected (Tables 16 to 21). Results of the water quality parameters collected showed a drop in water temperature from September 2003 to February 2004, and an increase in temperature from February to July 2004. Oxygen availability is directly correlated to water temperature where an increase in water temperature will cause a decrease in available oxygen. Lower water temperatures in February correlated to higher levels of dissolved oxygen compared with other sampling events. This was evident during the May and July 2004 surveys, as well. As water temperature in July increased, the amount of available DO decreased when compared to the May 2004 sampling event.

9.0 SUMMARY

Data collected for this investigation characterized existing fish and benthic communities that use two potential sand borrow area locations in nearshore waters off of Asharoken Beach. Water quality, grain size, and chemical constituents of the sand found within the borrow locations were also analyzed. These borrow areas are referred to as Borrow Area A and Borrow Area B (Figure 1). The approximate area of Borrow Area A is 8,270,150 square feet or 0.224 square nautical miles (0.29 square miles). The approximate area of Borrow Area B is 4,375,000 square feet or 0.1185 square nautical miles (0.1569 square miles).

Finfish

Thirteen (13) pre-determined transects were selected for the borrow area and seven predetermined transects were selected for the Borrow Area B. Trawls were conducted during September 2003, and February, May, July 2004 sampling. Benthic sampling was conducted during September 2003 and May 2004. Grain size analysis was conducted via sub-samples from the benthic grabs. Water quality measurements were taken during both trawls and grabs.

Sixty-eight (68) otter-trawls (tows) were conducted in water depths of 29–47 feet and for durations of 8–10 minutes during the September 2003, February 2004, May 2004, and July 2004 sampling events. As a result, a total of 33 finfish species and 10 macroinvertebrate species (including squid) were collected in both Borrow Area A and Borrow Area B. Large, seasonal (September), schools of bay anchovy precluded this species from inclusion in total abundance enumeration. The most abundant species of economic importance were scup, which was the dominant species; accounting for over half or 60.7% of the overall catch (this excludes bay anchovy, which if counted, would be 90.0% of the total abundance). The second most abundant species was winter flounder (9.8%), weakfish (4.2%), long-finned squid (2.3%), and Atlantic butterfish (2.0%). Cunner (*Tautogolabrus adspersus*) and winter flounder were the only two species of finfish collected during each of the four seasonal sampling events.

For all of the sampling events combined, a total of eight EFH-designated species were collected in both borrow areas (i.e., Atlantic herring, black sea bass, bluefish, red hake, scup, summer flounder, windowpane, and winter flounder). Scup, winter and summer flounder were the three most abundant EFH species and made up a significant portion of the total biomass.

Differences in trawl results (abundance and diversity) were evident between Borrow Areas A and B. A comparison of the top five species from Borrow Areas A and B shows that winter flounder and spider crab were among the most abundant species in both borrow areas. Scup was clearly the dominant species in Borrow Area B, representing approximately 80% of the species abundance; however, it was only the fourth most common species (11%) in Borrow Area A. Weakfish was among the most common species in Borrow Area A, but not in Borrow Area B. However, without a data set capable of higher resolution including greater frequency of trawls and longer seasonal duration, correlating differences in captured species (abundance and diversity) to potential differences in location and/or habitat between the two borrow areas can only be speculative. Most finfish populations, juveniles through adults, are highly mobile and patchy in nature, and, the effectiveness of fishing the net was almost certainly different between the two sites because of "hangs" associated with area A. Generally speaking (under the limitations of the study's sampling program) comparison of the two sites showed no statistical differences among the fishery (capture) variables tested.

Benthos

Benthic sampling was conducted during the September 2003 and May 2004. Benthic grabs were collected using a Smith-McIntyre grab (0.1 square meters) at each pre-determined sample station. Thirty-five pre-determined grab stations were selected for Borrow Area A and 15 pre-determined grab stations were selected for Borrow Area B. A combined total of 88 taxa were represented. Marine worms showed the greatest abundance at about 71% of the organisms present. Bivalves, gastropods and polychaetes represented about 98% of the biomass. Abundance, diversity and biomass were much greater in Borrow Area A than at Borrow Area B. This may be related to a larger percentage of course sediment types found in Borrow Area A, but is probably also be an artifact of the different sample sizes collected at each borrow site. (A had about twice as many grabs as B) Comparison of species richness between the two borrow areas showed no statistical differences. Grain size at both sites was dominated by medium and fine sands. Area A displayed a higher percentage of course materials that area B. Area B had a greater percentage of fine sands than A.

Chemical Analysis.

In Borrow Area A, two of 12 sediment samples were flagged for high levels of PAHs in Borrow Area B, four of 6 samples showed similar levels of the same compound (chrysene). These compounds and their levels are probably related to internal combustion engine exhaust by-products.

Water Quality

Seasonal water quality measurements were typical for the region. No anomalous trends were observed.

Discussion of Results

Based on the results of all the monitoring Site A may have greater diversity and abundance of benthic organisms thus making it a more "valuable" habitat to both benthic organisms and the fish that forage on them. Site A also showed a propensity to hang up the net possibly suggesting problems for dredging too. Site B had a slightly greater percentage of medium and find sands. As a sand source Site B appears to offer the least impact to marine species as well as the borrow area with fewer obstructions, making dredging there more efficient and safer. Since some monitoring results showed that structured areas of Site B may include favorable habitat for lobster and possibly juvenile scup, areas impacted by dredging can be enhanced to provide more habitat for these species. Since some monitoring results showed that structured areas of site B may include favorable habitat for lobster and possibly juvenile scup, it is recommended that if this area was used for beach fill that those areas impacted by dredging be enhanced to provide more habitat for species such as lobster and scup.

10.0 REFERENCES

Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. United States Department of Interior, Fish and Wildlife Service. Fishery Bulletin 74, Volume 53. 577 pp.

United States Army Corps of Engineers (USACE). 2000. Raritan Bay Sandy Hook Bay Offshore Borrow Area Investigation. Draft 2000 Finfish/Epibenthic Invertebrate Summary Report. USACE, New York District. 62 pp.

United States Army Corps of Engineers (USACE). 2002. Hurricane and Storm Damage Reduction at Asharoken, Suffolk County, New York. USACE, New York District. 13 pp + appendix.

Table 1. Asharoken Borrow Area A and B Bottom Trawl Coordinates, September 24–26, 2003.

Tow #	Date	Start			End			Duration
		Time	Latitude	Longitude	Time	Latitude	Longitude	
Area A								
Tow #1	24-Sep	1316	40° 57.590	73° 22.681	1327	40° 57.530	73° 22.354	11 minutes
Tow #2	24-Sep	1343	40° 57.414	73° 22.679	1353	40° 57.380	73° 23.007	10 minutes
Tow #3	24-Sep	1407	40° 57.313	73° 22.655	1417	40° 57.279	73° 22.982	10 minutes
Tow #4	24-Sep	1435	40° 57.257	73° 22.584	1445	40° 57.291	73° 22.256	10 minutes
Tow #5	24-Sep	1500	40° 57.227	73° 22.469	1510	40° 57.194	73° 22.796	10 minutes
Tow #6	25-Sep	1025	40° 57.182	73° 22.508	1035	40° 57.215	73° 22.180	10 minutes
Tow #7	25-Sep	1055	40° 57.117	73° 22.742	1105	40° 57.150	73° 22.414	10 minutes
Tow #8[1]	25-Sep	- -	40° 57.103	73° 22.470	- -	40° 57.136	73° 22.143	- -
Tow #9	26-Sep	0916	40° 57.042	73° 22.682	0926	40° 57.073	73° 22.360	10 minutes
Tow #10	26-Sep	0941	40° 56.962	73° 22.633	0949	40° 56.995	73° 22.306	8 minutes
Tow #11	26-Sep	1004	40° 56.875	73° 22.460	1012	40° 56.909	73° 22.133	8 minutes
Tow #12	26-Sep	1052	40° 56.837	73° 22.361	1102	40° 56.806	73° 22.128	10 minutes
Tow #13	26-Sep	1114	40° 56.663	73° 22.507	1124	40° 56.696	73° 22.180	10 minutes
Ref Tow #1	24-Sep	1527	40° 57.878	73° 23.352	1535	40° 58.061	73° 23.573	8 Minutes
Area B								
Tow #1	24-Sep	1023	40° 56.422	73° 16.777	1031	40° 56.437	73° 16.447	8 minutes
Tow #2	24-Sep	1051	40° 56.379	73° 16.807	1059	40° 56.394	73° 16.477	8 minutes
Tow #3	24-Sep	1116	40° 56.345	73° 16.646	1125	40° 56.360	73° 16.316	9 minutes
Tow #4	24-Sep	1134	40° 56.297	73° 16.796	1144	40° 56.312	73° 16.466	10 minutes
Tow #5	24-Sep	1203	40° 56.260	73° 16.697	1213	40° 56.275	73° 16.369	10 minutes
Tow #6	26-Sep	1216	40° 56.213	73° 16.820	1226	40° 56.228	73° 16.490	10 minutes
Tow #7	26-Sep	1245	40° 56.177	73° 16.719	1255	40° 56.192	73° 16.390	10 minutes

Key:
[1] = Net was deployed, but got hung up and tore off (lost net and door).

Table 2. Asharoken Borrow Area A and B Bottom Trawl Coordinates, February 18–19, 2004.

		Start			End			
Tow #	**Date**	**Time**	**Latitude**	**Longitude**	**Time**	**Latitude**	**Longitude**	**Duration**
Area A								
Tow #1	18-Feb	1005	40° 57.500	73° 22.682	1015	40° 57.538	73° 22.339	10 minutes
Tow #2	18-Feb	1030	40° 57.379	73° 23.002	1040	40° 57.416	73° 22.685	10 minutes
Tow #3	18-Feb	1058	40° 57.283	73° 22.982	1108	40° 57.314	73° 22.648	10 minutes
Tow #4	18-Feb	1120	40° 57.251	73° 22.583	1130	40° 57.286	73° 22.259	10 minutes
Tow #5	18-Feb	1145	40° 57.207	73° 22.807	1155	40° 57.238	73° 22.490	10 minutes[1]
Tow #6	18-Feb	1233	40° 57.183	73° 22.498	1243	40° 57.216	73° 22.188	10 minutes
Tow #7	19-Feb	1110	40° 57.111	73° 22.696	1120	40° 57.150	73° 22.417	10 minutes
Tow #8	19-Feb	1208	40° 57.099	73° 22.487	1218	40° 57.084	73° 22.143	10 minutes[2]
Tow #9	19-Feb	1228	40° 57.066	73° 22.370	1238	40° 57.040	73° 22.712	10 minutes
Tow #10	19-Feb	1309	40° 57.019	73° 22.289	1313	40° 56.982	73° 22.494	4 minutes[3]
Tow #11	19-Feb	1335	40° 56.924	73° 22.298	1345	40° 56.992	73° 22.970	10 minutes[4]
Tow #12	19-Feb	1403	40° 56.825	73° 22.347	1411	40° 57.036	73° 22.096	10 minutes[5]
Tow #13	19-Feb	1505	40° 57.111	73° 22.696	1515	40° 57.416	73° 22.685	10 minutes[6]
Area B								
Tow #1	18-Feb	1316	40° 56.420	73° 16.777	1326	40° 56.448	73° 16.432	10 minutes
Tow #2	18-Feb	1342	40° 56.394	73° 16.481	1352	40° 56.390	73° 16.805	10 minutes
Tow #3	18-Feb	1405	40° 56.351	73° 16.656	1415	40° 56.361	73° 16.335	10 minutes
Tow #4	18-Feb	1425	40° 56.312	73° 16.466	1435	40° 56.297	73° 16.803	10 minutes
Tow #5	19-Feb	0919	40° 56.265	73° 16.721	0929	40° 56.260	73° 16.342	10 minutes
Tow #6	19-Feb	0940	40° 56.236	73° 16.489	0950	40° 56.206	73° 16.789	10 minutes
Tow #7	19-Feb	1006	40° 56.228	73° 16.104	1016	40° 56.191	73° 16.379	10 minutes

Key:
[1] = Net was torn and needed to be repaired before deploying.
[2] = Very rocky area. Tore up the net in both attempts. Moved 8B (end position) to avoid hang up.
[3] = Very rocky area and hung up the net twice. Moved 10A and 10B locations to avoid hang up.
[4] = Rocky area and net got hung up.
[5] = Very rocky area and hung up net twice. Moved 12A and 12B locations to avoid hang up.
[6] = Very rocky area and hung up net three times. Moved transect from 7A and 2B to avoid hang up.

Table 3. Asharoken Borrow Area A and B Bottom Trawl Coordinates, May 11–12 and July 7–8, 2004.

		Start			End			
Tow #	**Date**	**Time**	**Latitude**	**Longitude**	**Time**	**Latitude**	**Longitude**	**Duration**
Area A								
Tow #1	11-May, 7-Jul	1000, 1038	40° 57.354	73° 22.496	1010, 1048	40° 57.560	73° 22.712	10, 10[3] minutes
Tow #2	11-May, 7-Jul	1122, 1115	40° 57.033	73° 23.670	1132, 1125	40° 57.241	73° 22.920	10[1], 10[3] minutes
Tow #3	11-May, 7-Jul	1203, 1135	40° 57.130	73° 22.635	1210, 1144	40° 57.329	73° 22.790	7[2], 9[6] minutes
Tow #4	11-May, 7-Jul	1225, 1242	40° 57.253	73° 22.582	1235, 1252	40° 57.465	73° 22.860	10, 10 minutes
Tow #5	11-May, 7-Jul	1250, 1303	40° 57.529	73° 22.793	1300, 1313	40° 57.291	73° 22.537	10, 10 minutes
Tow #6	11-May, 7-Jul	1316, 1324	40° 57.463	73° 22.737	1326, 1334	40° 57.317	73° 22.482	10, 10 minutes
Tow #7	11-May, 7-Jul	1345, 1344	40° 57.387	73° 22.712	1355, 1354	40° 57.337	73° 22.417	10, 10 minutes
Tow #8	12-May, 8-Jul	1227, 1143	40° 57.055	73° 22.437	1237, 1150	40° 57.897	73° 22.268	10[3], 7[4] minutes
Tow #9	12-May, 8-Jul	1251, 1337	40° 57.127	73° 22.346	1300, 1345	40° 57.011	73° 22.254	9[4], 8[7] minutes
Tow #10	12-May	1345	40° 57.555	73° 22.004	1355	40° 56.794	73° 22.110	10[3] minutes
Tow #11	12-May	1405	40° 56.155	73° 22.918	- -	- -	- -	- - minutes[5]
Area B								
Tow #1	12-May, 7-Jul	0918, 1440	40° 56.448	73° 16.432	0928, 1450	40° 56.421	73° 16.763	10, 10 minutes
Tow #2	12-May, 7-Jul	0955, 1517	40° 56.394	73° 16.481	1005, 1527	40° 56.392	73° 16.815	10, 10 minutes
Tow #3	12-May, 7-Jul	1025, 1550	40° 56.359	73° 16.335	1035, 1600	40° 56.350	73° 16.650	10, 10 minutes
Tow #4	12-May, 8-Jul	1107, 0923	40° 56.297	73° 16.465	1117, 0933	40° 56.284	73° 16.773	10, 10 minutes
Tow #5	11-May, 8-Jul	1500, 0947	40° 56.276	73° 16.370	1510, 0957	40° 56.259	73° 16.732	10, 10 minutes
Tow #6	11-May, 8-Jul	1520, 1016	40° 56.213	73° 16.823	1530, 1026	40° 56.230	73° 16.491	10, 10 minutes
Tow #7	11-May, 8-Jul	1544, 1041	40° 56.196	73° 16.388	1554, 1051	40° 56.174	73° 16.718	10, 10 minutes

Key:
[1] = Net was hung and torn. Net was replaced and transect was re-towed.
[2] = Rocky area. Net was hung, but contained a decent haul.
[3] = Rocky area. Net was hung and transect re-towed.
[4] = Rocky area. Net was hung and ripped, but contained decent haul. Needed to repair net before next trawl.
[5] = Rocky area. Net was hung and ripped in half. Second ripped net of the May sampling event.
[6] = Rocky area. Net was hung, ripped at the chain and could not be repaired. Needed to replace net before next trawl.
[7] = Tow was conducted, but net contained nothing (potentially not sitting on the bottom). Blew the hydraulics during retrieval and could not complete tow.

Table 4. Asharoken Benthic Sampling Coordinates, September 2003 and May 2004 Sampling Events.

Grab #	Latitude	Longitude	Depth (feet)
September 2003			
Area A			
Grab #1	40º 57.601	73º 22.566	44
Grab #2	40º 57.489	73º 22.441	42
Grab #3	40º 57.423	73º 22.621	37
Grab #4	40º 57.242	73º 22.384	34
Grab #5	40º 57.304	73º 22.260	33
Grab #6	40º 57.243	73º 22.199	29
Grab #7	40º 57.120	73º 22.208	35
Grab #8	40º 57.061	73º 22.137	38
Grab #9	40º 57.068	73º 22.268	35
Grab #10	40º 56.941	73º 22.199	38
Grab #11	40º 56.945	73º 22.265	36
Grab #12	40º 56.947	73º 22.381	33
Grab #13	40º 56.881	73º 22.206	37
Grab #14	40º 56.885	73º 22.325	35
Grab #15	40º 56.881	73º 22.381	34
Grab #16	40º 56.822	73º 22.263	39
Grab #17	40º 56.824	73º 22.388	37
Grab #18	40º 56.766	73º 22.263	38
Grab #19	40º 56.762	73º 22.383	39
Grab #20	40º 57.000	73º 22.506	39
Grab #21	40º 57.000	73º 22.623	38
Grab #22	40º 57.003	73º 22.628	36
Grab #23	40º 57.063	73º 22.509	39
Grab #24	40º 57.120	73º 22.687	37
Grab #25	40º 57.124	73º 22.563	40
Grab #26	40º 57.187	73º 22.628	39
Grab #27	40º 57.184	73º 22.741	35
Grab #28	40º 57.246	73º 22.562	42
Grab #29	40º 57.244	73º 22.627	36
Grab #30	40º 57.244	73º 22.749	40
Grab #31	40º 57.249	73º 22.803	36
Grab #32	40º 57.361	73º 22.804	39
Grab #33	40º 57.368	73º 22.808	36
Grab #34	40º 57.428	73º 22.868	37
Grab #35	40º 57.421	73º 22.927	35
Area B			
Grab #1	40º 56.468	73º 16.688	46
Grab #2	40º 56.402	73º 16.622	43

Table 4. Asharoken Benthic Sampling Coordinates, September 2003 and May 2004 Sampling Events (continued).

Grab #	Latitude	Longitude	Depth (feet)
September 2003			
Area B (continued)			
Grab #3	40º 56.344	73º 16.668	42
Grab #4	40º 56.344	73º 16.441	42
Grab #5	40º 56.286	73º 16.387	41
Grab #6	40º 56.342	73º 16.743	39
Grab #7	40º 56.341	73º 16.681	39
Grab #8	40º 56.281	73º 16.562	32
Grab #9	40º 56.289	73º 16.499	34
Grab #10	40º 56.224	73º 16.381	39
Grab #11	40º 56.286	73º 16.800	34
Grab #12	40º 56.280	73º 16.679	34
Grab #13	40º 56.221	73º 16.622	35
Grab #14	40º 56.221	73º 16.559	36
Grab #15	40º 56.164	73º 16.443	36
May 2004			
Area A			
Grab #1	40º 57.583	73º 22.550	47
Grab #2	40º 57.483	73º 22.450	47
Grab #3	40º 57.433	73º 22.633	37
Grab #4	40º 57.217	73º 22.367	35
Grab #5	40º 57.267	73º 22.267	47
Grab #6	40º 57.217	73º 22.217	26
Grab #7	40º 57.133	73º 22.183	40
Grab #8	40º 57.067	73º 22.150	34
Grab #9	40º 57.033	73º 22.233	37
Grab #10	40º 56.950	73º 22.200	38
Grab #11	40º 56.950	73º 22.283	37
Grab #12	40º 56.950	73º 22.367	34
Grab #13	40º 56.883	73º 22.233	38
Grab #14	40º 56.883	73º 22.300	37
Grab #15	40º 56.883	73º 22.383	33
Grab #16	40º 56.800	73º 22.250	33
Grab #17	40º 56.800	73º 22.350	33
Grab #18	40º 56.733	73º 22.267	30
Grab #19	40º 56.733	73º 22.350	33
Grab #20	40º 56.983	73º 22.517	34
Grab #21	40º 57.000	73º 22.617	31
Grab #22	40º 57.067	73º 22.517	36
Grab #23	40º 57.083	73º 22.600	33

Table 4. Asharoken Benthic Sampling Coordinates, September 2003 and May 2004 Sampling Events (continued).

Grab #	Latitude	Longitude	Depth (feet)
May 2004			
Area A (continued)			
Grab #24	40º 57.100	73º 22.683	34
Grab #25	40º 57.150	73º 22.550	37
Grab #26	40º 57.167	73º 22.633	35
Grab #27	40º 57.183	73º 22.733	34
Grab #28	40º 57.233	73º 22.550	39
Grab #29	40º 57.233	73º 22.633	37
Grab #30	40º 57.250	73º 22.733	37
Grab #31	40º 57.267	73º 22.817	34
Grab #32	40º 57.350	73º 22.783	37
Grab #33	40º 57.367	73º 22.867	34
Grab #34	40º 57.433	73º 22.850	37
Grab #35	40º 57.433	73º 22.933	35
Area B			
Grab #1	40º 56.433	73º 16.717	44
Grab #2	40º 56.400	73º 16.617	43
Grab #3	40º 56.367	73º 16.533	43
Grab #4	40º 56.333	73º 16.450	43
Grab #5	40º 56.300	73º 16.367	43
Grab #6	40º 56.367	73º 16.750	42
Grab #7	40º 56.333	73º 16.667	41
Grab #8	40º 56.300	73º 16.583	40
Grab #9	40º 56.267	73º 16.500	40
Grab #10	40º 56.233	73º 16.400	42
Grab #11	40º 56.300	73º 16.800	38
Grab #12	40º 56.267	73º 16.717	38
Grab #13	40º 56.233	73º 16.617	39
Grab #14	40º 56.200	73º 16.533	40
Grab #15	40º 56.150	73º 16.450	39

Table 5. Species Collected from All Asharoken Bottom Trawl Surveys.

Family	Scientific Name	Common Name
September 2003		
Finfish		
Atherinidae (silversides)	*Menidia menidia*	Atlantic Silverside
Batrachoididae (toadfishes)	*Opsanus tau*	Oyster Toadfish
Carangidae (pompanos and jacks)	*Selene vomer*	Lookdown
Clupeidae (herring)	*Clupea harengus*	Atlantic Herring
	Brevoortia tyrannus	Menhaden
	Alosa pseudoharengus	Alewife
	Alosa aestivalis	Blueback Herring
Engraulidae (anchovies)	*Anchoa mitchilli*	Bay Anchovy
Labridae (wrasses)	*Tautogolabrus adspersus*	Cunner
Pleuronectidae (righteye flounders)	*Pseudopleuronectes americanus*	Winter Flounder
Pomatomidae (bluefishes)	*Pomatomus saltatrix*	Bluefish
Sciaenidae (drums)	*Cynoscion regalis*	Weakfish
Serranidae (sea basses)	*Centropristis striata*	Black Sea Bass
Sparidae (porgies)	*Stenotomus chrysops*	Scup
Stromateidae (butterfishes)	*Peprilus triacanthus*	Atlantic Butterfish
Tetradontidae (puffers)	*Sphoeroides maculatus*	Northern Puffer
Triglidae (searobins)	*Prionotus carolinus*	Northern Searobin
Invertebrates		
Asteriidae (sea stars)	*Asterias forbesi*	Asteriid Sea Star
Cancridae (rock crabs)	*Cancer irroratus*	Rock Crab
Limulidae (horseshoe crabs)	*Limulus polyphemus*	Atlantic Horseshoe Crab
Loliginidae (squids)	*Loligo pealei*	Long-finned Squid
Majidae (spider crabs)	*Libinia emarginata*	Common Spider Crab
Melongenidae (whelks)	*Busycon canaliculatum*	Channeled Whelk
February 2004		
Finfish		
Clupeidae (herring)	*Clupea harengus*	Atlantic Herring
Cottidae (sculpins)	*Myoxocephalus aenaeus*	Grubby
Labridae (wrasses)	*Tautoga onitis*	Tautog
	Tautogolabrus adspersus	Cunner
Pholidae (blenny-like fishes)	*Pholis gunnellus*	Rock Gunnel
Pleuronectidae (righteye flounders)	*Pseudopleuronectes americanus*	Winter Flounder
Invertebrates		
Asteriidae (sea stars)	*Asterias forbesi*	Asteriid Sea Star
Cancridae (rock crabs)	*Cancer irroratus*	Rock Crab
Majidae (spider crabs)	*Libinia emarginata*	Common Spider Crab

Table 5. Species Collected from All Asharoken Bottom Trawl Surveys (continued).

Family	Scientific Name	Common Name
May 2004		
Finfish		
Blenniidae (blennies)	*Hypsoblennius hentz*	Feather Blenny
Bothidae (lefteye flounders)	*Etropus microstomus*	Smallmouth Flounder
	Paralichthys dentatus	Summer Flounder
	Scophthalmus aquosus	Windowpane
Clupeidae (herring)	*Alosa pseudoharengus*	Alewife
	Etrumeus teres	Round Herring
Cottidae (sculpins)	*Myoxocephalus aenaeus*	Grubby
Gadidae (codfishes)	*Urophycis chuss*	Red Hake
	Merluccius bilinearis	Silver Hake
	Microgadus tomcod	Atlantic Tomcod
Labridae (wrasses)	*Tautoga onitis*	Tautog
	Tautogolabrus adspersus	Cunner
Pholidae (gunnels)	*Pholis fasciata*	Banded Gunnel
	Pholis gunnellus	Rock Gunnel
Pleuronectidae (righteye flounders)	*Pseudopleuronectes americanus*	Winter Flounder
Rajidae (skates)	*Raja eglanteria*	Clearnose Skate
Soleidate (soles)	*Trinectes maculatus*	Hogchoker
Sparidae (porgies)	*Stenotomus chrysops*	Scup
Invertebrates		
Anthidae (mud crabs)	*Menippe mercenaria*	Stone Crab
Asteriidae (sea stars)	*Asterias forbesi*	Asteriid Sea Star
Cancridae (rock crabs)	*Cancer irroratus*	Rock Crab
Limulidae (horseshoe crabs)	*Limulus polyphemus*	Atlantic Horseshoe Crab
Loliginidae (squids)	*Loligo pealei*	Long-finned Squid
Majidae (spider crabs)	*Libinia emarginata*	Common Spider Crab
Nephropsidae (lobsters)	*Homarus americanus*	American Lobster
July 2004		
Finfish		
Bothidae (lefteye flounders)	*Etropus microstomus*	Smallmouth Flounder
	Paralichthys dentatus	Summer Flounder
	Scophthalmus aquosus	Windowpane
Clupeidae (herring)	*Alosa aestivalis*	Blueback Herring
Cottidae (sculpins)	*Myoxocephalus aenaeus*	Grubby
Engraulidae (anchovies)	*Anchoa mitchilli*	Bay Anchovy
Gadidae (codfishes)	*Urophycis regia*	Spotted Hake
Labridae (wrasses)	*Tautoga onitis*	Tautog
	Tautogolabrus adspersus	Cunner
Pleuronectidae (righteye flounders)	*Pseudopleuronectes americanus*	Winter Flounder

Table 5. Species Collected from All Asharoken Borrow Area A and B Bottom Trawl Surveys (continued).

Family	Scientific Name	Common Name
July 2004		
Finfish		
Rajidae (skates)	*Raja eglanteria*	Clearnose Skate
Soleidate (soles)	*Trinectes maculatus*	Hogchoker
Sparidae (porgies)	*Stenotomus chrysops*	Scup
Stromateidae (butterfishes)	*Peprilus triacanthus*	Atlantic Butterfish
Triglidae (searobins)	*Prionotus evolans*	Striped Searobin
Invertebrates		
Asteriidae (sea stars)	*Asterias forbesi*	Asteriid Sea Star
Cancridae (rock crabs)	*Cancer irroratus*	Rock Crab
Limulidae (horseshoe crabs)	*Limulus polyphemus*	Horseshoe Crab
Loliginidae (squids)	*Loligo pealei*	Long-finned Squid
Majidae (spider crabs)	*Libinia emarginata*	Common Spider Crab
Portunidae (true crabs)	*Ovalipes ocellatus*	Lady Crab
Squillidae (mantis shrimp)	*Squilla empusa*	Mantis Shrimp

Table 6. Species Composition and Abundance at All Asharoken Borrow Areas.

	Total Catch					Percent of Total Catch Excluding Bay Anchovy					Percent of Total Catch Including Bay Anchovy				
Taxa	**9/03**	**2/04**	**5/04**	**7/04**	**Total**	**9/03**	**2/04**	**5/04**	**7/04**	**Total**	**9/03**	**2/04**	**5/04**	**7/04**	**Total**
Alewife (*Alosa pseudoharengus*)	1	- -	1	- -	2	<0.1	- -	0.1	- -	<0.1	<0.1	- -	0.1	- -	<0.1
American lobster (*Homarus americanus*)	- -	- -	2	- -	2	- -	- -	0.2	- -	<0.1	- -	- -	0.2	- -	<0.1
Asteriid Sea Star (*Asterias forbesi*)	2	15	16	6	39	0.1	9.7	1.4	1.7	0.7	<0.1	9.7	1.4	0.2	0.1
Atlantic Butterfish (*Peprilus triacanthus*)	93	- -	- -	16	109	2.5	- -	- -	4.5	2.0	0.2	- -	- -	0.6	0.2
Atlantic Herring (*Clupea harengus*)	1	8	- -	- -	9	<0.1	5.2	- -	- -	0.2	<0.1	5.2	- -	- -	<0.1
Atlantic Menhaden (*Brevoortia tyrannus*)	1	- -	- -	- -	1	<0.1	- -	- -	- -	<0.1	<0.1	- -	- -	- -	<0.1
Atlantic Silverside (*Menidia menidia*)	1	- -	- -	- -	1	<0.1	- -	- -	- -	<0.1	<0.1	- -	- -	- -	<0.1
Atlantic Tomcod (*Microgadus tomcod*)	- -	- -	5	- -	5	- -	- -	0.4	- -	0.1	- -	- -	0.4	- -	<0.1
Banded Gunnel (*Pholis fasciata*)	- -	- -	1	- -	1	- -	- -	0.1	- -	<0.1	- -	- -	0.1	- -	<0.1
Bay Anchovy (*Anchoa mitchilli*)	**45606**	**- -**	**- -**	**2443**	**48049**	*** ***	**- -**	**- -**	*** ***	*** ***	**92.5**	**- -**	**- -**	**87.3**	**90.0**
Black Sea Bass (*Centropristis striata*)	2	1	- -	- -	3	0.1	0.6	- -	- -	0.1	<0.1	0.6	- -	- -	<0.1
Blueback Herring (*Alosa aestivalis*)	1	- -	- -	60	61	<0.1	- -	- -	16.8	1.1	<0.1	- -	- -	2.1	0.1
Bluefish (*Pomatomus saltatrix*)	16	- -	- -	- -	16	0.4	- -	- -	- -	0.3	<0.1	- -	- -	- -	<0.1
Channeled Whelk (*Busycon canaliculatum*)	2	- -	- -	- -	2	0.1	- -	- -	- -	<0.1	<0.1	- -	- -	- -	<0.1
Clearnose Skate (*Raja eglanteria*)	- -	- -	18	1	19	- -	- -	1.5	0.3	0.4	- -	- -	1.5	<0.1	<0.1
Cunner (*Tautogolabrus adspersus*)	2	24	10	16	52	0.1	15.5	0.9	4.5	1.0	<0.1	15.5	0.9	0.6	0.1
Feather Blenny (*Hypsoblennius hentz*	- -	- -	1	- -	1	- -	- -	0.1	- -	<0.1	- -	- -	0.1	- -	<0.1
Grubby (*Myoxocephalus aenaeus*)	- -	82	13	1	96	- -	52.9	1.1	0.3	1.8	- -	52.9	1.1	<0.1	0.2
Hogchoker (*Trinectes maculatus*)	- -	- -	1	1	2	- -	- -	0.1	0.3	<0.1	- -	- -	0.1	<0.1	<0.1
Horseshoe Crab (*Limulus polyphemus*)	1	- -	22	22	45	<0.1	- -	1.9	6.2	0.8	<0.1	- -	1.9	0.8	0.1
Lady Crab (*Ovalipes ocellatus*)	- -	- -	- -	5	5	- -	- -	- -	1.4	0.1	- -	- -	- -	0.2	<0.1
Long-finned Squid (*Loligo pealei*)	83	- -	31	9	123	2.3	- -	2.7	2.5	2.3	0.2	- -	2.7	0.3	0.2
Lookdown (*Selene vomer*)	1	- -	- -	- -	1	<0.1	- -	- -	- -	<0.1	<0.1	- -	- -	- -	<0.1
Mantis Shrimp (*Squilla empusa*)	- -	- -	- -	3	3	- -	- -	- -	0.8	0.1	- -	- -	- -	0.1	<0.1
Northern Puffer (*Sphoeroides maculatus*)	1	- -	- -	- -	1	<0.1	- -	- -	- -	<0.1	<0.1	- -	- -	- -	<0.1
Northern Searobin (*Prionotus carolinus*)	1	- -	- -	- -	1	<0.1	- -	- -	- -	<0.1	<0.1	- -	- -	- -	<0.1
Oyster Toadfish (*Opsanus tau*)	1	- -	- -	- -	1	<0.1	- -	- -	- -	<0.1	<0.1	- -	- -	- -	<0.1
Red Hake (*Urophycis chuss*)	- -	- -	86	- -	86	- -	- -	7.4	- -	1.6	- -	- -	7.4	- -	0.2

Table 6. Species Composition and Abundance at All Asharoken Borrow Areas (continued).

	Total Catch					Percent of Total Catch Excluding Bay Anchovy					Percent of Total Catch Including Bay Anchovy				
Taxa	**9/03**	**2/04**	**5/04**	**7/04**	**Total**	**9/03**	**2/04**	**5/04**	**7/04**	**Total**	**9/03**	**2/04**	**5/04**	**7/04**	**Total**
Rock Crab (*Cancer irroratus*)	3	1	18	8	30	0.1	0.6	1.5	2.2	0.6	<0.1	0.6	1.5	0.3	0.1
Rock Gunnel (*Pholis gunnellus*)	- -	2	3	- -	5	- -	1.3	0.3	- -	0.1	- -	1.3	0.3	- -	<0.1
Round Herring (*Etrumeus teres*)	- -	- -	1	- -	1	- -	- -	0.1	- -	<0.1	- -	- -	0.1	- -	<0.1
Scup (*Stenotomus chrysops*)	3,228	- -	1	21	3,250	87.8	- -	0.1	5.9	60.7	6.5	- -	0.1	0.8	6.1
Silver Hake (*Merluccius bilinearis*)	- -	- -	4	- -	4	- -	- -	0.3	- -	0.1	- -	- -	0.3	- -	<0.1
Smallmouth Flounder (*Etropus microstomus*)	- -	- -	10	1	11	- -	- -	0.9	0.3	0.2	- -	- -	0.9	<0.1	<0.1
Spider Crab (*Libinia dubia*)	1	4	457	49	511	<0.1	2.6	39.2	13.7	9.5	<0.1	2.6	39.2	1.8	1.0
Spotted Hake (*Urophycis regia*)	- -	- -	- -	8	8	- -	- -	- -	2.2	0.2	- -	- -	- -	0.3	<0.1
Stone Crab (*Menippe mercenaria*)	- -	- -	2	- -	2	- -	- -	0.2	- -	<0.1	- -	- -	0.2	- -	<0.1
Striped Searobin (*Prionotus evolans*)	- -	- -	- -	1	1	- -	- -	- -	0.3	<0.1	- -	- -	- -	<0.1	<0.1
Summer Flounder (*Paralichthys dentatus*)	- -	- -	9	4	13	- -	- -	0.8	1.1	0.2	- -	- -	0.8	0.1	<0.1
Tautog (*Tautoga onitis*)	- -	1	5	2	8	- -	0.6	0.4	0.6	0.2	- -	0.6	0.4	0.1	<0.1
Weakfish (*Cynoscion regalis*)	226	- -	- -	- -	226	6.1	- -	- -	- -	4.2	0.5	- -	- -	- -	0.4
Windowpane (*Scophthalmus aquosis*)	- -	- -	53	23	76	- -	- -	4.5	6.4	1.4	- -	- -	4.5	0.8	0.1
Winter Flounder (*Pseudopleuronectes americanus*)	9	17	397	100	523	0.2	11.0	34.0	28.0	9.8	<0.1	11.0	34.0	3.6	1.0
Total Number of Organisms Collected	**49,283**	**155**	**1,167**	**2,800**	**53,405**										
Total Number Excluding Bay Anchovy	**3,677**	**155**	**1,167**	**357**	**5,356**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Total Number of Taxa Collected	**23**	**10**	**25**	**22**	**43**										

Notes:

- September 2003 event – 20 tows total, includes 1 reference tow and does not include lost net tow.
- February 2004 event – 16 tows with one tow being 8 minutes instead of 10 minutes.
- May 2004 event – 17 tows total (10 in Borrow Area A and 7 in Borrow Area B).
- July 2004 event – 15 tows total (8 in Borrow Area A and 7 in Borrow Area B).
- Shaded cells indicate essential fish habitat (EFH) designated species.

Table 7. Species Composition and Abundance at Asharoken Borrow Area A.

	Total Catch					Percent of Total Catch Excluding Bay Anchovy					Percent of Total Catch Including Bay Anchovy				
Taxa	**9/03**	**2/04**	**5/04**	**7/04**	**Total**	**9/03**	**2/04**	**5/04**	**7/04**	**Total**	**9/03**	**2/04**	**5/04**	**7/04**	**Total**
Alewife (*Alosa pseudoharengus*)	1	- -	1	- -	2	0.2	- -	0.1	- -	0.1	<0.1	- -	0.12	- -	<0.1
Asteriid Sea Star (*Asterias forbesi*)	2	5	6	2	15	0.4	5.3	0.7	1.4	1.0	<0.1	5.26	0.73	1.32	0.10
Atlantic Butterfish (*Peprilus triacanthus*)	27	- -	- -	4	31	5.6	- -	- -	2.7	2.0	0.19	- -	- -	2.65	0.20
Atlantic Herring (*Clupea harengus*)	1	- -	- -	- -	1	0.2	- -	- -	- -	0.1	0.01	- -	- -	- -	<0.1
Atlantic Menhaden (*Brevoortia tyrannus*)	1	- -	- -	- -	1	0.2	- -	- -	- -	0.1	<0.1	- -	- -	- -	<0.1
Banded Gunnel (*Pholis fasciata*)	- -	- -	1	- -	1	- -	- -	0.1	- -	0.1	- -	- -	0.12	- -	<0.1
Bay Anchovy (*Anchoa mitchilli*)	**13812**	- -	- -	**4**	**13816**	* *	- -	- -	* *	* *	**96.63**	- -	- -	**2.65**	**89.97**
Black Sea Bass (*Centropristis striata*)	1	- -	- -	- -	1	0.2	- -	- -	- -	0.1	<0.1	- -	- -	- -	<0.1
Bluefish (*Pomatomus saltatrix*)	6	- -	- -	- -	6	1.2	- -	- -	- -	0.4	<0.1	- -	- -	- -	<0.1
Channeled Whelk (*Busycon canaliculatum*)	1	- -	- -	- -	1	0.2	- -	- -	- -	0.1	<0.1	- -	- -	- -	<0.1
Clearnose Skate (*Raja eglanteria*)	- -	- -	13	- -	13	- -	- -	1.6	- -	0.8	- -	- -	1.59	- -	0.08
Cunner (*Tautogolabrus adspersus*)	2	21	8	3	34	0.4	22.1	1	2.0	2.2	<0.1	22.11	0.98	1.99	0.22
Feather Blenny (*Hypsoblennius hentz*)	- -	- -	1	- -	1	- -	- -	0.1	- -	0.1	- -	- -	0.12	- -	<0.1
Grubby (*Myoxocephalus aenaeus*)	- -	52	9	1	62	- -	54.7	1.1	0.7	4.0	- -	54.74	1.10	0.66	0.40
Hogchoker (*Trinectes maculatus*)	- -	- -	1	- -	1	- -	- -	0.1	- -	0.1	- -	- -	0.12	- -	<0.1
Horseshoe Crab (*Limulus polyphemus*)	1	- -	11	15	27	0.2	- -	1.3	10.2	1.8	<0.1	- -	1.35	9.93	0.18
Lady Crab (*Ovalipes ocellatus*)	- -	- -	- -	4	4	- -	- -	- -	2.7	0.3	- -	- -	- -	2.65	<0.1
Long-finned Squid (*Loligo pealei*)	44	- -	25	5	74	9.1	- -	3.1	3.4	4.8	0.31	- -	3.06	3.31	0.48
Lookdown (*Selene vomer*)	1	- -	- -	- -	1	0.2	- -	- -	- -	0.1	<0.1	- -	- -	- -	<0.1
Northern Searobin (*Prionotus carolinus*)	1	- -	- -	- -	1	0.2	- -	- -	- -	0.1	<0.1	- -	- -	- -	<0.1
Red Hake (*Urophycis chuss*)	- -	- -	53	- -	53	- -	- -	6.5	- -	3.4	- -	- -	6.49	- -	0.35
Rock Crab (*Cancer irroratus*)	- -	1	12	6	19	- -	1.1	1.5	4.1	1.2	- -	1.05	1.47	3.97	0.12
Rock Gunnel (*Pholis gunnellus*)	- -	2	2	- -	4	- -	2.1	0.2	- -	0.3	- -	2.11	0.24	- -	<0.1
Round Herring (*Etrumeus teres*)	- -	- -	1	- -	1	- -	- -	0.1	- -	0.1	- -	- -	0.12	- -	<0.1
Scup (*Stenotomus chrysops*)	166	- -	1	9	176	34.5	- -	0.1	6.1	11.4	1.16	- -	0.12	5.96	1.15
Silver Hake (*Merluccius bilinearis*)	- -	- -	4	- -	4	- -	- -	0.5	- -	0.3	- -	- -	0.49	- -	<0.1
Smallmouth Flounder (*Etropus microstomus*)	- -	- -	5	1	6	- -	- -	0.6	0.7	0.4	- -	- -	0.61	0.66	<0.1
Spider Crab (*Libinia dubia*)	- -	3	334	16	353	- -	3.2	40.9	10.9	22.9	- -	3.16	40.88	10.60	2.30

Table 7. Species Composition and Abundance at Asharoken Borrow Area A (continued).

Taxa	Total Catch					Percent of Total Catch Excluding Bay Anchovy					Percent of Total Catch Including Bay Anchovy				
	9/03	2/04	5/04	7/04	Total	9/03	2/04	5/04	7/04	Total	9/03	2/04	5/04	7/04	Total
Spotted Hake (*Urophycis regia*)	- -	- -	- -	8	8	- -	- -	- -	5.4	0.5	- -	- -	- -	5.30	0.05
Striped Searobin (*Prionotus evolans*)	- -	- -	- -	1	1	- -	- -	- -	0.7	0.1	- -	- -	- -	0.66	<0.1
Summer Flounder (*Paralichthys dentatus*)	- -	- -	9	3	12	- -	0	1.1	2.0	0.8	- -	- -	1.10	1.99	0.08
Tautog (*Tautoga onitis*)	- -	1	3	2	6	- -	1.1	0.4	1.4	0.4	- -	1.05	0.37	1.32	<0.1
Tomcod (*Microgadus tomcod*)	- -	- -	3	- -	3	- -	- -	0.4	- -	0.2	- -	- -	0.37	- -	<0.1
Weakfish (*Cynoscion regalis*)	219	- -	- -	- -	219	45.5	- -	- -	- -	14.2	1.53	- -	- -	- -	1.43
Windowpane (*Scophthalmus aquosis*)	- -	- -	35	15	50	- -	- -	4.3	10.2	3.2	- -	- -	4.28	9.93	0.33
Winter Flounder (*Pseudopleuronectes americanus*)	7	10	279	52	348	1.5	10.5	34.1	35.4	22.6	0.05	10.53	34.15	34.44	2.27
Total Biomass of Organisms Collected	**14,293**	**95**	**817**	**151**	**15,356**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Total Biomass Excluding Bay Anchovy	**481**	**95**	**817**	**147**	**1,540**										
Total Number of Taxa Collected	**17**	**8**	**23**	**18**	**36**										

Notes:

- September 2003 event – 13 tows total, includes 1 reference tow (does not include lost net tow).
- February 2004 event – 9 tows with one tow being 8 minutes instead of 10 minutes.
- May 2004 event – 10 tows total.
- July 2004 event – 8 tows total.
- Shaded cells indicate essential fish habitat (EFH) designated species.

Table 8. Species Composition and Abundance at Asharoken Borrow Area B.

	Total Catch					Percent of Total Catch Excluding Bay Anchovy					Percent of Total Catch Including Bay Anchovy				
Taxa	**9/03**	**2/04**	**5/04**	**7/04**	**Total**	**9/03**	**2/04**	**5/04**	**7/04**	**Total**	**9/03**	**2/04**	**5/04**	**7/04**	**Total**
American Lobster (*Homarus americanus*)	- -	- -	2	- -	2	- -	- -	0.6	- -	0.1	- -	- -	0.57	- -	<0.1
Asteriid Sea Star (*Asterias forbesi*)	- -	10	10	4	24	- -	17.2	2.9	1.9	0.6	- -	17.24	2.86	0.15	0.06
Atlantic Butterfish (*Peprilus triacanthus*)	75	- -	- -	12	87	2.4	- -	- -	5.7	2.3	0.21	- -	- -	0.45	0.23
Atlantic Herring (*Clupea harengus*)	- -	8	- -	0	8	- -	13.8	- -	- -	0.2	- -	13.79	- -	- -	<0.1
Atlantic Silverside (*Menidia menidia*)	1	- -	- -	0	1	<0.1	0	- -	- -	<0.1	<0.1	- -	- -	- -	<0.1
Bay Anchovy (*Anchoa mitchilli*)	**31794**	- -	- -	**2439**	**34233**	* *	0	- -	* *	* *	**90.87**	- -	- -	**92.07**	**89.98**
Black Sea Bass (*Centropristis striata*)	1	1	- -	0	2	<0.1	1.7	- -	- -	0.1	<0.1	1.72	- -	- -	<0.1
Blueback Herring (*Alosa aestivalis*)	1	- -	- -	60	61	<0.1	- -	- -	28.6	1.6	<0.1	- -	- -	2.27	0.16
Bluefish (*Pomatomus saltatrix*)	1	- -	- -	0	1	<0.1	- -	- -	- -	<0.1	<0.1	- -	- -	- -	<0.1
Channeled Whelk (*Busycon canaliculatum*)	1	- -	0	0	1	<0.1	- -	- -	- -	<0.1	<0.1	- -	- -	- -	<0.1
Clearnose Skate (*Raja eglanteria*)	- -	- -	5	1	6	- -	- -	1.4	0.5	0.2	- -	- -	1.43	<0.1	<0.1
Cunner (*Tautogolabrus adspersus*)	- -	3	2	13	18	- -	5.2	0.6	6.2	0.5	- -	5.17	0.57	0.49	0.05
Grubby (*Myoxocephalus aenaeus*)	- -	28	4	0	32	- -	48.3	1.1	- -	0.8	- -	48.28	1.14	- -	0.08
Hogchoker (*Trinectes maculatus*)	- -	- -	0	1	1	- -	- -	- -	0.5	<0.1	- -	- -	- -	<0.1	<0.1
Horseshoe Crab (*Limulus polyphemus*)	- -	- -	11	7	18	- -	- -	3.1	3.3	0.5	- -	- -	3.14	0.26	0.05
Lady Crab (*Ovalipes ocellatus*)	- -	- -	0	1	1	- -	- -	- -	0.5	0.0	- -	- -	- -	<0.1	<0.1
Long-finned Squid (*Loligo pealei*)	39	- -	6	4	49	1.2	- -	1.7	1.9	1.3	0.11	- -	1.71	0.15	0.13
Mantis Shrimp (*Squilla empusa*)	- -	- -	- -	3	3	- -	- -	- -	1.4	0.1	- -	- -	- -	0.11	<0.1
Northern Puffer (*Sphoeroides maculatus*)	1	- -	- -	- -	1	<0.1	- -	- -	- -	<0.1	<0.1	- -	- -	- -	<0.1
Oyster Toadfish (*Opsanus tau*)	1	- -	- -	- -	1	<0.1	- -	- -	- -	<0.1	<0.1	- -	- -	- -	<0.1
Red Hake (*Urophycis chuss*)	- -	- -	33	- -	33	- -	- -	9.4	- -	0.9	- -	- -	9.43	- -	0.09
Rock Crab (*Cancer irroratus*)	3	- -	6	2	11	0.1	- -	1.7	1.0	0.3	<0.1	- -	1.71	0.08	<0.1
Rock Gunnel (*Pholis gunnellus*)	- -	- -	1	0	1	- -	- -	0.3	- -	<0.1	- -	- -	0.29	- -	<0.1
Scup (*Stenotomus chrysops*)	3062	- -	0	12	3074	95.8	- -	- -	5.7	80.6	8.75	- -	- -	0.45	8.08
Smallmouth Flounder (*Etropus microstomus*)	- -	- -	5	0	5	- -	- -	1.4	- -	0.1	- -	- -	1.43	- -	<0.1
Spider Crab (*Libinia dubia*)	1	1	123	33	158	<0.1	1.7	35.1	15.7	4.1	<0.1	1.72	35.14	1.25	0.42
Stone Crab (*Menippe mercenaria*)	- -	- -	2	0	2	- -	- -	0.6	- -	0.1	- -	- -	0.57	- -	<0.1
Summer Flounder (*Paralichthys dentatus*)	- -	- -	0	1	1	- -	- -	- -	0.5	<0.1	- -	- -	- -	<0.1	<0.1

Table 8. Species Composition and Abundance at Asharoken Borrow Area B (continued).

Taxa	Total Catch					Percent of Total Catch Excluding Bay Anchovy					Percent of Total Catch Including Bay Anchovy				
	9/03	2/04	5/04	7/04	Total	9/03	2/04	5/04	7/04	Total	9/03	2/04	5/04	7/04	Total
Tautog (*Tautoga onitis*)	- -	- -	2	0	2	- -	- -	0.6	- -	0.1	- -	- -	0.57	- -	<0.1
Tomcod (*Microgadus tomcod*)	- -	- -	2	- -	2	- -	- -	0.6	- -	0.1	- -	- -	0.57	- -	<0.1
Weakfish (*Cynoscion regalis*)	7	- -	- -	- -	7	0.2	- -	- -	- -	0.2	<0.1	- -	- -	- -	<0.1
Windowpane (*Scophthalmus aquosus*)	- -	- -	18	8	26	- -	- -	5.1	3.8	0.7	- -	- -	5.14	0.30	0.07
Winter Flounder (*Pseudopleuronectes americanus*)	2	7	118	48	175	0.1	12.1	33.7	22.9	4.6	<0.1	12.07	33.71	1.81	0.46
Total Biomass of Organisms Collected	**34,990**	**58**	**350**	**2,649**	**38,047**										
Total Biomass Excluding Bay Anchovy	**3,196**	**58**	**350**	**210**	**3,814**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Total Number of Taxa Collected	**15**	**7**	**17**	**17**	**33**										

Notes:

- September 2003 event – 8 tows total.
- February 2004 event – 8 tows total.
- May 2004 event – 7 tows total
- July 2004 event – 7 tows total
- Shaded cells indicate essential fish habitat (EFH) designated species.

Table 9. Length Statistics for EFH Species for Asharoken Borrow Area.

Common Name	Scientific Name	Date	N	Min	Max	Mean	SD
Borrow Area A							
Atlantic Herring	*Clupea harengus*	Sept/03	1	105	- -	- -	- -
Black Sea Bass	*Centropristis striata*	Sept/03	1	412	- -	- -	- -
Bluefish	*Pomatomus saltatrix*	Sept/03	6	135	249	209.33	41.54
Red Hake	*Urophycis chuss*	May/04	53	30	321	100.19	36.70
Scup	*Stenotomus chrysops*	Sept/03	103	49	325	83.01	60.72
		May/04	1	322	- -	- -	- -
		July/04	9	186	327	257.44	48.98
Summer Flounder	*Paralichthys dentatus*	May/04	9	267	600	464.44	118.73
		July/04	3	290	485	403.33	101.28
Windowpane	*Scophthalmus aquosus*	May/04	35	60	295	174.80	78.66
		July/04	15	61	220	152.47	48.97
Winter Flounder	*Pseudopleuronectes americanus*	Sept/03	7	157	270	192.57	42.03
		Feb/04	10	47	125	77.10	27.85
		May/04	279	45	321	107.70	49.24
		July/04	52	41	274	105.13	46.91
Borrow Area B							
Atlantic Herring	*Clupea harengus*	Feb/04	8	195	265	225.38	21.69
Black Sea Bass	*Centropristis striata*	Sept/03	1	428	- -	- -	- -
		Feb/04	1	110	- -	- -	- -
Bluefish	*Pomatomus saltatrix*	Sept/03	1	212	- -	- -	- -
Red Hake	*Urophycis chuss*	May/04	33	70	151	99.21	14.09
Scup	*Stenotomus chrysops*	Sept/03	62	45	370	65.29	43.43
		July/04	12	186	285	242.25	30.34
Summer Flounder	*Paralichthys dentatus*	July/04	1	281	- -	- -	- -
Windowpane	*Scophthalmus aquosus*	May/04	18	64	300	166.33	80.67
		July/04	8	184	287	99.76	37.20
Winter Flounder	*Pseudopleuronectes americanus*	Sept/03	2	95	240	167.50	102.53
		Feb/04	7	52	300	103.00	87.66
		May/04	118	54	360	99.76	37.20
		July/04	48	34	184	71.67	35.59

Key:
N = Number measured.
Min = Minimum length (millimeter).
Max = Maximum length (millimeter).
Mean = Average length (millimeter).
SD = Standard deviation.

Table 10. Species Biomass of All Asharoken Borrow Areas.

Taxa	Biomass (g)					Percent of Total Biomass Excluding Bay Anchovy					Percent of Total Biomass Including Bay Anchovy				
	9/03	2/04	5/04	7/04	Total	9/03	2/04	5/04	7/04	Total	9/03	2/04	5/04	7/04	Total
Alewife (*Alosa pseudoharengus*)	1	0	5	0	6	<0.1	0	<0.1	0	<0.1	<0.1	0	<0.1	0	<0.1
American Lobster (*Homarus americanus*)	0	0	1000	0	1000	0	0	0.7	0	0.4	0	0	0.7	0	0.3
Asteriid Sea Star (*Asterias forbesi*)	750	1950	2140	470	5310	2.6	44.1	1.5	0.6	2.1	0.8	44.1	1.5	0.6	1.7
Atlantic Butterfish (*Peprilus triacanthus*)	1899	0	0	630	2529	6.6	0.0	0	0.9	1.0	2.1	0	0	0.8	0.8
Atlantic Herring (*Clupea harengus*)	7	615	0	0	622	<0.1	13.9	0	0	0.2	<0.1	13.9	0	0	0.2
Atlantic Menhaden (*Brevoortia tyrannus*)	500	0	0	0	500	1.7	0	0	0	0.2	0.6	0	0	0	0.2
Atlantic Silverside (*Menidia menidia*)	10	0	0	0	10	<0.1	0	0	0	<0.1	<0.1	0	0	0	<0.1
Atlantic Tomcod (*Microgadus tomcod*)	0	0	70	0	70	0	0	<0.1	0	<0.1	0	0	<0.1	0	<0.1
Banded Gunnel (*Pholis fasciata*)	0	0	7	0	7	0	0	<0.1	0	<0.1	0	0	<0.1	0	<0.1
Bay Anchovy (*Anchoa mitchilli*)	**61060**	**0**	**0**	**10172**	**71232**	*** ***	**0**	**0**	*** ***	*** ***	**68.1**	**0**	**0**	**12.3**	**22.2**
Black Sea Bass (*Centropristis striata*)	3300	15	0	0	3315	11.5	0.3	0	0	1.3	3.7	0.3	0	0	1.0
Blueback Herring (*Alosa aestivalis*)	15	0	0	445	460	0.1	0	0	0.6	0.2	<0.1	0	0	0.5	0.1
Bluefish (*Pomatomus saltatrix*)	770	0	0	0	770	2.7	0	0	0	0.3	0.9	0	0	0	0.2
Channel Whelk (*Busycon canaliculatum*)	325	0	0	0	325	1.1	0	0	0	0.1	0.4	0	0	0	0.1
Clearnose Skate (*Raja eglanteria*)	0	0	8800	500	9300	0	0	6.1	0.7	3.7	0	0	6.1	0.6	2.9
Cunner (*Tautogolabrus adspersus*)	180	56	86	172	494	0.6	1.3	0.1	0.2	0.2	0.2	1.3	0.1	0.2	0.2
Feather Blenny (*Hypsoblennius hentzi*)	0	0	20	0	20	0	0	<0.1	0	<0.1	0	0	<0.1	0	<0.1
Grubby (*Myoxocephalus aenaeus*)	0	644	122	3	769	0	14.6	0.1	<0.1	0.3	0	14.6	0.1	<0.1	0.2
Hogchoker (*Trinectes maculatus*)	0	0	115	110	225	0	0	0.1	0.2	0.1	0	0	0.1	0.1	0.1
Horseshoe Crab (*Limulus polyphemus*)	1000	0	33000	41600	75600	3.5	0	23.0	57.1	30.3	1.1	0	23.0	50.1	23.6
Lady Crab (*Ovalipes ocellatus*)	0	0	0	107	107	0	0	0	0.1	<0.1	0	0	0	0.1	<0.1
Long-finned Squid (*Loligo pealei*)	2420	0	5090	252	7762	8.5	0	3.5	0.3	3.1	2.7	0	3.5	0.3	2.4
Lookdown (*Selene vomer*)	5	0	0	0	5	<0.1	0	0	0	<0.1	<0.1	0	0	0	<0.1
Mantis Shrimp (*Squilla empusa*)	0	0	0	170	170	0	0	0	0.2	0.1	0	0	0	0.2	0.1
Northern Puffer (*Sphoeroides maculatus*)	16	0	0	0	16	0.1	0	0	0	<0.1	<0.1	0	0	0	<0.1
Northern Searobin (*Prionotus carolinus*)	20	0	0	0	20	0.1	0	0	0	<0.1	<0.1	0	0	0	<0.1
Oyster Toadfish (*Opsanus tau*)	45	0	0	0	45	0.2	0	0	0	<0.1	0.1	0	0	0	<0.1
Red Hake (*Urophycis chuss*)	0	0	845	0	845	0	0	0.6	0	0.3	0	0	0.6	0	0.3

Table 10. Species Biomass of All Asharoken Borrow Areas (continued).

Taxa	Biomass (g)					Percent of Total Biomass					Percent of Total Biomass Including Bay Anchovy				
	9/03	2/04	5/04	7/04	Total	9/03	2/04	5/04	7/04	Total	9/03	2/04	5/04	7/04	Total
Rock Crab (*Cancer irroratus*)	20	9	249	14	292	0.1	0.2	0.2	<0.1	0.1	<0.1	0.2	0.2	<0.1	0.1
Rock Gunnel (*Pholis gunnellus*)	0	7	10	0	17	0	0.2	<0.1	0	<0.1	0	0.2	<0.1	0	<0.1
Round Herring (*Etrumeus sadina*)	0	0	3	0	3	0	0	<0.1	0	<0.1	0	0	0	0	<0.1
Scup (*Stenotomus chrysops*)	14899	0	500	6980	22379	52.1	0	0.3	9.6	9.0	16.6	0	0.3	8.4	7.0
Silver Hake (*Merluccius bilinearis*)	0	0	50	0	50	0	0	<0.1	0	<0.1	0	0	<0.1	0	<0.1
Smallmouth Flounder (*Etropus microstomus*)	0	0	92	8	100	0	0	0.1	<0.1	<0.1	0	0	0.1	<0.1	<0.1
Spider Crab (*Libinia dubia*)	70	620	55790	9100	65580	0.2	14.0	38.8	12.5	26.3	0.1	14.0	38.8	11.0	20.4
Spotted Hake (*Urophycis regius*)	0	0	0	365	365	0	0	0	0.5	0.1	0	0	0	0.4	0.1
Stone Crab (*Menippe mercenaria*)	0	0	3	0	3	0	0	<0.1	0	<0.1	0	0	<0.1	0	<0.1
Striped Searobin (*Prionotus evolans*)	0	0	0	500	500	0	0	0	0.7	0.2	0	0	0	0.6	0.2
Summer Flounder (*Paralichthys dentatus*)	0	0	11420	2725	14145	0	0	7.9	3.7	5.7	0	0	7.9	3.3	4.4
Tautog (*Tautoga onitis*)	0	5	6055	3400	9460	0	0.1	4.2	4.7	3.8	0	0.1	4.2	4.1	2.9
Weakfish (*Cynoscion regalis*)	1240	0	0	0	1240	4.3	0	0	0	0.5	1.4	0	0	0	0.4
Windowpane (*Scophthalmus aquosis*)	0	0	6275	3075	9350	0	0	4.4	4.2	3.7	0	0	4.4	3.7	2.9
Winter Flounder (*Pseudopleuronectes americanus*)	1100	501	11905	2228	15734	3.8	11.3	8.3	3.1	6.3	1.2	11.3	8.3	2.7	4.9
Total Biomass of Organisms Collected	**89652**	**4422**	**143652**	**83026**	**320752**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Total Biomass Excluding Bay Anchovy	**28592**	**4422**	**143652**	**72854**	**249520**										

Notes:

- September 2003 event - 20 tows total.
- February 2004 event – 16 tows total.
- May 2004 event – 17 tows total.
- July 2004 event – 15 tows total.
- Shaded cells indicate essential fish habitat (EFH) designated species.

** Bay anchovy were excluded from the first set of "Percent of Total Biomass" columns, but are included in the second set of "Percent of Total Biomass" calculations in the table above.

Table 11. Benthic Invertebrates Collected at Asharoken Borrow Areas A and B, September 2003.

Taxa	Borrow Area A		Borrow Area B	
	Total Catch	Percent Composition	Total Catch	Percent Composition
Nematoda (LPIL)	7,995	49.9	5,863	70.5
Annelida: Oligochaeta (LPIL)	2,133	13.3	781	9.4
Annelida: Polychaeta				
Ampharete (LPIL)	187	1.2	134	1.6
Ampharete lindstroemi	158	1.0	132	1.6
Cossura longocirrata	388	2.4	102	1.2
Cirratulidae (LPIL)	2,131	13.3	710	8.5
Tharyx (LPIL)	243	1.5	- -	- -
Nephtys (LPIL)	149	0.9	124	1.5
Nephtys incisa	134	0.8	- -	- -
Aricidae (LPIL)	117	0.7	- -	- -
Cistenides (=*Pectinaria*) *hyperborea*	298	1.9	- -	- -
Scalibregma inflatum	101	0.6	109	1.3
Polydora cornuta	854	5.3	155	1.9
Streblospio benedicti	176	1.1	- -	- -
Mollusca: Gastropoda				
Crepidula fornicata	112	0.7	- -	- -
Turbonilla (LPIL)	116	0.7	- -	- -
Mollusca: Pelecypoda (LPIL)	194	1.2	- -	- -
Tellina agilis	144	0.9	- -	- -
Thracia (LPIL)	197	1.2	- -	- -
Nucula proxima	212	1.3	- -	- -
Ampelisca abdita	- -	- -	212	2.5
Total	**16,039**	**100.0%**	**8,322**	**100.0%**

Key:

- LPIL – Lowest Possible Identification Level.

Notes:

- Total species of all samples only include samples where over 100 individuals were collected.
- 35 benthic grabs conducted in Borrow Area A and 15 benthic grabs conducted in Borrow Area B.

Table 12. Benthic Invertebrates Collected at Asharoken Borrow Areas A and B, May 2004.

Taxa	Borrow Area A		Borrow Area B	
	Total Catch	Percent Composition	Total Catch	Percent Composition
Nematoda (LPIL)	8,250	50.9	5,100	62.5
Annelida: Oligochaeta (LPIL)	1,241	7.7	505	6.2
Annelida: Polychaeta				
Ampharete finmarchica	659	4.1	312	3.8
Streblospio benedicti	582	3.6	448	5.5
Clymenella torquata	441	2.7	- -	- -
Nephtys picta	341	2.1	106	1.3
Ampharete acutifrons	327	2.0	156	1.9
Cirriformia (Cirratulus) grandis	313	1.9	- -	- -
Drilonereis longa	247	1.5	- -	- -
Spionids spp. (LPIL)	231	1.4	135	1.7
Capitella capitata	228	1.4	452	5.5
Glycera dibranchiata	205	1.3	- -	- -
Polydora spp. (LPIL)	204	1.3	- -	- -
Tharyx acutus	196	1.2	170	2.1
Polydora ligni	148	0.9	198	2.4
Leitoscoloplos (Scoloplos) fragilis	138	0.9	- -	- -
Nephtys bucea	133	0.8	- -	- -
Asychis elongata	132	0.8	- -	- -
Eteone lactea	123	0.8	- -	- -
polytroch larvae	111	0.7	- -	- -
Glycera spp. (LPIL)	111	0.7	104	1.3
Scolecolepides viridis	- -	- -	117	1.4
Mollusca: Gastropoda				
Crepidula fornicata	156	1.0	- -	- -
Mollusca: Pelecypoda				
Nucula proxima	156	1.0	- -	- -
Pitar morrhuanus	130	0.8	- -	- -
Arthropoda: Copepoda				
Temora longicornis	706	4.4	164	2.0
Arthropoda: Amphipoda				
Ampelisca abdita	539	3.3	187	2.3
Leptocheirus pinguis	157	1.0	- -	- -
Total	**16,205**	**100.0**	**8,154**	**100.0**

Notes:
- LPIL – Lowest Possible Identification Level.
- Total species of all samples only include samples where over 100 individuals were collected.
- 35 benthic grabs conducted in Borrow Area A and 15 benthic grabs conducted in Borrow Area B.

Table 13. Benthic Invertebrate Biomass at Asharoken Borrow Areas A and B, September 2003 and May 2004.

Taxa	Area A		Area B	
	Total Weight (gram)	Percent of Total	Total Weight (gram)	Percent of Total
September 2003				
Nematoda	0.035	< 0.1	0.015	< 0.1
Annelida: Oligochaeta	0.034	< 0.1	0.016	< 0.1
Annelida: Polychaeta	34.406	10.7	12.899	2.3
Mollusca: Gastropoda	22.687	7.0	93.806	17.1
Mollusca: Pelecypoda	261.736	81.2	441.358	80.4
Sipuncula	0.406	0.1	- -	- -
Arthropoda: Ostracoda	0.005	< 0.1	- -	- -
Arthropoda: Amphipoda	0.551	0.2	0.126	< 0.1
Arthropoda: Mysida: Mysidae	0.013	< 0.1	0.01	< 0.1
Arthropoda: Decapoda: Anomura	0.028	< 0.1	0.646	0.1
Arthropoda: Decapoda: Brachyura	2.509	0.8	0.182	< 0.1
Pisces	0.078	< 0.1	- -	- -
Total	**322.488**	**100.0**	**549.058**	**100.0**
May 2004				
Bryozoa	- -	- -	- -	- -
Nematoda	< 0.001	< 0.1	0.001	< 0.1
Annelida: Oligochaeta	0.029	< 0.1	1.024	0.1
Annelida: Polychaeta	441.168	23.7	271.619	26.6
Mollusca: Gastropoda	261.765	14.1	55.303	5.4
Mollusca: Pelecypoda	1026.994	55.2	672.349	65.7
Arthropoda: Ostracoda	- -	- -	- -	- -
Arthropoda: Amphipoda	61.862	3.3	9.485	0.9
Arthropoda: Copepoda	0.029	< 0.1	0.002	< 0.1
Arthropoda: Decapoda	67.253	3.6	12.894	1.3
Total	**1,859.101**	**100.0**	**1,022.677**	**100.0**

Notes:

- 35 benthic grabs conducted in Borrow Area A and 15 benthic grabs conducted in Borrow Area B.
- Only presence/absence determinations were made for bryozoan or ostracod species and no weight measurements were obtained.

Table 14. Grain Size Analysis for Asharoken Borrow Area A (% of Dry Weight), September 2003 and May 2004.

Sample Number	Sieve Size						
	Pebble	Gravel		Sand			Silt or Clay
		Coarse	Fine	Coarse	Medium	Fine	
September 2003							
A1	- -	- -	- -	18.50	26.70	49.05	5.75
A2	- -	- -	13.60	13.15	16.70	48.20	8.30
A3	- -	- -	2.30	3.40	58.95	33.75	1.60
A4	- -	7.60	29.35	10.10	33.10	19.40	0.45
A5	- -	- -	1.90	2.30	32.00	59.40	4.40
A6	- -	41.65	13.85	7.15	19.00	14.25	4.10
A7	- -	- -	4.55	9.55	43.15	41.10	1.65
A8	- -	- -	4.45	3.90	42.05	38.35	11.25
A9	- -	21.57	17.28	8.00	34.20	16.80	2.15
A10	- -	- -	10.30	6.35	49.90	27.50	5.95
A11	- -	- -	13.35	9.15	51.85	23.55	2.10
A12	- -	- -	7.80	6.50	71.40	13.90	0.40
A13	- -	22.05	8.05	5.60	45.05	15.95	3.30
A14	- -	6.00	37.80	11.35	28.85	14.95	1.05
A15	- -	13.85	16.75	10.05	46.35	11.80	1.20
A16	- -	- -	15.60	8.80	52.80	18.00	4.80
A17	- -	6.90	20.90	15.10	38.55	16.20	2.35
A18	- -	- -	28.95	8.50	45.20	11.00	6.35
A19	- -	- -	13.65	8.10	41.15	32.65	4.45
A20	- -	10.90	19.30	7.00	40.65	21.40	0.75
A21	- -	7.15	17.55	7.90	47.10	18.20	2.10
A22	- -	- -	17.10	6.05	44.05	30.55	2.25
A23	- -	46.35	13.60	6.28	28.07	4.68	1.02
A24	- -	- -	28.40	11.65	46.80	12.60	0.55
A25	- -	0.15	37.38	12.20	30.63	8.78	10.86
A26	- -	- -	30.00	18.25	44.80	6.10	0.85
A27	- -	- -	9.40	6.35	40.50	42.85	0.90
A28	- -	16.60	19.90	6.40	35.05	19.20	2.85
A28	- -	- -	35.35	13.25	44.45	6.75	0.20
A30	- -	- -	5.50	4.95	43.75	44.35	1.45
A31	- -	- -	11.95	6.65	43.05	32.65	5.70
A32	- -	- -	36.10	10.35	40.35	11.65	1.55
A33	- -	- -	14.30	11.85	53.05	19.70	1.10
A34	- -	- -	13.45	7.20	40.65	37.50	1.20
A35	- -	- -	10.50	10.70	56.75	21.00	1.05
May 2004							
A1	- -	- -	7.39	8.19	43.74	38.03	2.65
A2	- -	- -	13.27	18.80	31.04	33.31	3.57
A3	- -	- -	14.50	7.35	38.94	38.21	1.00
A4	- -	- -	9.38	11.32	41.99	36.12	1.19
A5	- -	- -	0.08	0.76	67.55	31.30	0.31

Table 14. Grain Size Analysis of Asharoken Borrow Area A (% of Dry Weight), September 2003 and May 2004 (continued).

Sample Number	Sieve Size						
	Pebble	Gravel		Sand			Silt or Clay
		Coarse	Fine	Coarse	Medium	Fine	
May 2004							
A6	- -	- -	5.73	3.65	49.68	40.66	0.27
A7	- -	- -	19.03	13.75	49.16	15.96	2.10
A8	- -	- -	5.53	12.02	55.68	24.62	2.15
A9	- -	11.23	31.39	6.95	31.45	18.22	0.75
A10	- -	- -	11.52	7.07	59.24	19.95	2.21
A11	- -	5.35	31.24	6.89	35.99	19.72	0.81
A12	- -	1.99	13.42	10.57	54.84	18.66	0.52
A13	- -	- -	13.78	13.74	54.85	16.29	1.34
A14	- -	1.98	19.77	9.32	40.12	27.85	0.97
A15	- -	3.52	18.23	16.05	52.65	8.30	1.25
A16	- -	- -	30.59	9.54	45.44	13.52	0.91
A17	- -	- -	15.86	8.59	54.73	19.78	1.04
A18	- -	2.06	1.83	38.12	47.54	9.48	0.97
A19	- -	- -	5.61	9.56	50.35	31.97	2.50
A20	- -	- -	5.45	4.15	51.87	38.03	0.50
A21	- -	- -	17.12	8.78	53.62	19.98	0.49
A22	- -	- -	11.80	7.83	58.99	20.66	0.72
A23	- -	2.33	27.90	9.75	48.45	11.04	0.52
A24	- -	7.61	26.87	9.67	40.14	15.29	0.42
A25	- -	3.25	31.58	15.59	44.14	4.95	0.48
A26	- -	2.79	18.21	10.09	54.71	13.55	0.65
A27	- -	- -	20.16	7.22	31.65	40.60	0.37
A28	- -	- -	3.37	4.07	39.39	51.06	2.11
A29	- -	8.36	10.24	11.29	50.42	18.80	0.89
A30	- -	- -	8.23	8.73	62.32	20.06	0.65
A31	- -	- -	14.94	8.06	54.04	21.51	1.45
A32	- -	2.18	11.34	7.09	59.91	18.91	0.58
A33	- -	- -	11.56	5.92	44.48	37.34	0.70
A34	- -	- -	2.77	4.40	60.54	31.72	0.58
A35	- -	- -	22.73	14.81	50.23	11.41	0.82

Table 15. Grain Size Analysis of Asharoken Borrow Area B (% of Dry Weight), September 2003 and May 2004.

Sample Number	Sieve Size						
	Pebble	Gravel		Sand			Silt or Clay
		Coarse	Fine	Coarse	Medium	Fine	
September 2003							
B1	- -	- -	0.40	0.95	44.30	46.00	8.35
B2	- -	- -	0.95	7.45	37.10	53.20	1.30
B3	- -	- -	7.35	9.30	35.25	43.75	4.35
B4	- -	- -	0.70	3.95	28.05	62.90	4.40
B5	- -	- -	5.60	8.45	36.15	45.25	4.55
B6	- -	- -	0.45	2.00	19.65	76.50	1.40
B7	- -	- -	5.00	5.00	36.20	48.80	5.00
B8	- -	- -	2.35	6.85	44.05	44.35	2.40
B9	- -	- -	1.90	9.40	57.30	30.50	0.90
B10	- -	- -	3.20	8.65	53.90	33.25	1.00
B11	- -	- -	5.70	2.85	46.45	44.50	0.50
B12	- -	- -	9.50	7.35	52.85	29.35	0.95
B13	- -	- -	34.35	10.20	36.90	15.55	3.00
B14	- -	- -	10.90	9.75	55.75	22.40	1.20
B15	- -	- -	7.20	6.80	46.65	38.05	1.30
May 2004							
B1	- -	- -	1.63	5.60	53.80	37.42	1.55
B2	- -	3.51	2.17	6.31	41.49	45.90	0.61
B3	- -	- -	2.49	5.69	48.59	41.69	1.55
B4	- -	- -	2.39	5.83	36.35	53.42	2.00
B5	- -	- -	2.24	5.84	44.86	45.86	1.20
B6	- -	- -	1.76	5.69	29.05	62.46	1.03
B7	- -	- -	0.84	5.08	43.54	50.23	0.30
B8	- -	- -	3.88	7.44	44.60	43.20	0.87
B9	- -	- -	1.79	7.01	55.61	35.24	0.34
B10	- -	- -	4.27	10.41	55.62	29.15	0.55
B11	- -	- -	0.07	3.21	62.53	33.88	0.31
B12	- -	- -	2.75	6.29	53.15	37.53	0.27
B13	- -	- -	1.78	5.13	58.79	33.97	0.33
B14	- -	- -	3.48	6.05	55.20	34.54	0.74
B15	- -	- -	1.48	3.59	51.30	43.27	0.37

Table 16. Asharoken Benthic Sampling Water Quality Observations, September 2003.

Station	Date MMDDYY	Time HH:MM	Depth Meters	Temp degC	pH units	SpCond mS/cm	Sal ppt	DO mg/l	Redox mV	Turb NTU
Benthic Sampling September 2003										
A1 (b)	092203	13:06	46.24	21.99	7.74	38.25	24.32	7.47	157.70	
A1 (m)	092203	13:07	24.69	22.03	7.71	38.32	24.37	7.29	168.20	
A1 (s)	092203	13:08	3.34	22.06	7.73	38.38	24.41	7.20	173.20	1.50*
A7 (b)	092203	13:58	39.38	21.81	7.71	37.70	23.93	5.45	209.40	
A7 (m)	092203		22.61	21.91	7.73	38.27	24.33	6.23	145.90	
A7 (s)	092203	14:00	2.92	21.92	7.74	38.31	24.36	7.30	150.70	1.50*
A15 (b)	092203	15:08	36.98	21.81	7.74	38.09	24.21	7.53	187.00	
A15 (m)	092203		23.38	21.82	7.74	38.28	24.34	7.39	188.20	
A15 (s)	092203	15:11	2.91	21.98	7.82	38.51	24.50	7.69	191.50	2.00*
A16 (b)	092303	8:54	37.63	21.60	7.59	38.29	24.35	7.13	251.40	
A16 (m)	092303		14.97	21.62	7.63	38.29	24.35	7.19	246.30	
A16 (s)	092303	8:56	2.92	21.61	7.64	38.29	24.35	7.19	244.50	1.50*
A35 (b)	092303	11:52	38.93	21.47	7.60	38.18	24.27	7.21	286.10	
A35 (m)	092303		19.98	21.48	7.64	38.16	24.26	7.21	279.90	
A35 (s)	092303	11:53	2.34	21.52	7.65	38.17	24.26	7.28	278.10	2.00*
Min				**21.47**	**7.59**	**37.70**	**23.93**	**5.45**	**145.90**	**1.50**
Max				**22.06**	**7.82**	**38.51**	**24.50**	**7.69**	**286.10**	**2.00**
Mean				**21.78**	**7.69**	**38.23**	**24.31**	**7.10**	**210.54**	**1.70**
SD				**0.21**	**0.06**	**0.18**	**0.13**	**0.60**	**49.53**	**0.27**
B1 (b)	092203	9:57	48.89	21.71	7.68	38.28	24.34	7.40	142.80	
B1 (m)	092203		20.49	21.81	7.75	38.39	24.42	7.56	140.70	
B1 (s)	092203		3.41	21.88	7.87	38.45	24.46	7.81	146.70	2.00*
B6 (b)	092203	10:54	45.32	21.97	7.74	38.35	24.39	7.23	197.30	
B6 (m)	092203		20.20	22.01	7.76	38.39	24.42	7.18	197.30	
B6 (s)	092203	10:56	3.52	21.99	7.80	38.44	24.45	7.41	202.50	1.75*
B12 (b)	092203	11:50	38.69	21.94	7.81	38.37	24.41	7.91	192.80	
B12 (m)	092203	11:51	16.36	31.93	7.82	38.40	24.43	7.88	200.20	
B12 (s)	092203	11:52	2.84	21.96	7.85	38.47	24.48	8.16	204.00	1.50*
Min				**21.71**	**7.68**	**38.28**	**24.34**	**7.18**	**140.70**	**1.50**
Max				**31.93**	**7.87**	**38.47**	**24.48**	**8.16**	**204.00**	**2.00**
Mean				**23.02**	**7.79**	**38.39**	**24.42**	**7.62**	**180.48**	**1.75**
SD				**3.34**	**0.06**	**0.06**	**0.04**	**0.34**	**28.04**	**0.25**

Key:

Depth = meters
Specific Conductivity = milliSiemens per centimeter
Dissolved Oxygen = milligram per liter
Turbidity = Nephelometric turbidity unit
Max = maximum
SD = Standard deviation
Temp = Degree Celsius
Salinity = parts per thousand
Redox = millivolt
Min = minimum
Mean = Average
* = reading taken from Secchi disc

Table 17. Asharoken Fish Sampling Water Quality Observations, September 2003.

Station	Date MMDDYY	Time HH:MM	Depth Meters	Temp degC	pH units	SpCond mS/cm	Sal ppt	DO mg/l	Redox mV	Turb NTU
Fish Sampling September 2003										
A1 (b)	092403	13:29	50.45	21.21	7.71	37.78	23.99	7.34	188.50	
A1 (m)	092403		24.61	21.26	7.70	37.93	24.09	6.53	175.00	
A1 (s)	092403		3.15	21.32	7.69	38.01	24.15	7.03	177.00	2.50*
A2 (b)	092403	15:19	29.51	21.23	7.75	38.07	24.19	8.33	152.40	
A2 (m)	092403		15.33	21.43	7.75	38.10	24.21	7.92	158.30	
A2 (s)	092403		1.39	21.47	7.75	38.17	24.26	7.68	162.20	2.50*
A6 (b)	092503	10:15	43.53	21.04	7.63	38.03	24.16	7.61	242.40	
A6 (m)	092503		21.84	21.07	7.63	37.99	24.14	7.64	243.60	
A6 (s)	092503		1.52	21.05	7.65	38.06	24.19	7.50	244.60	1.75*
A9 (b)	092603	9:26	36.44	20.95	7.57	38.06	24.19	8.23	170.00	
A9 (m)	092603		19.56	21.07	7.61	38.06	24.19	7.98	171.50	
A9 (s)	092603		2.31	21.06	7.64	38.06	24.19	7.85	172.80	1.75*
A13 (b)	092603	11:24	47.97	21.12	7.67	37.90	24.07	8.09	188.60	
A13 (m)	092603		22.10	21.24	7.69	38.07	24.19	7.60	191.90	
A13 (s)	092603		1.67	21.24	7.69	38.03	24.16	7.82	195.50	2.00*
Min				**20.95**	**7.57**	**37.78**	**23.99**	**6.53**	**152.40**	**1.75**
Max				**21.47**	**7.75**	**38.17**	**24.26**	**8.33**	**244.60**	**2.50**
Mean				**21.18**	**7.68**	**38.02**	**24.16**	**7.68**	**188.95**	**2.10**
SD				**0.15**	**0.05**	**0.09**	**0.07**	**0.46**	**30.76**	**0.38**
B1 (b)	092403	10:10	42.63	21.11	7.66	38.20	24.28	7.29	332.70	
B1 (s)	092403		1.18	20.96	7.68	38.24	24.31	7.60	330.10	2.00*
B6 (b)	092603	12:26	40.38	21.28	7.70	38.14	24.24	8.33	193.60	
B6 (m)	092603		15.20	21.31	7.70	38.18	24.27	8.10	197.30	
B6 (s)	092603		2.80	21.35	7.70	38.21	24.29	8.17	199.40	2.00*
B7 (b)	092603	12:55	45.68	21.23	7.69	38.17	24.26	9.08	195.50	
B7 (m)	092603		26.90	21.35	7.69	38.19	24.28	8.53	199.70	
B7 (s)	092603		1.77	21.39	7.70	38.27	24.33	8.95	202.70	2.00*
Min				**20.96**	**7.66**	**38.14**	**24.24**	**7.29**	**193.60**	**2.00**
Max				**21.39**	**7.70**	**38.27**	**24.33**	**9.08**	**332.70**	**2.00**
Mean				**21.25**	**7.69**	**38.20**	**24.28**	**8.26**	**231.38**	**2.00**
SD				**0.15**	**0.01**	**0.04**	**0.03**	**0.61**	**61.80**	**0.00**

Key:

Depth = meters
Specific Conductivity = milliSiemens per centimeter
Dissolved Oxygen = milligram per liter
Turbidity = Nephelometric turbidity unit
Max = maximum
SD = Standard deviation
Temp = Degree Celsius
Salinity = parts per thousand
Redox = millivolt
Min = minimum
Mean = Average
* = reading taken from Secchi disc

Table 18. Asharoken Fish Sampling Water Quality Observations, February 2004.

Station	Date MMDDYY	Time HH:MM	Depth Meters	Temp degC	pH units	SpCond mS/cm	Sal ppt	DO mg/l	Redox mV	Turb NTU
Fish Sampling February 2004										
A7 (b)	021904	11:00	42.15	-0.16	8.09	24.37	14.76	11.07	152.40	15.20
A7 (m)	021904		19.91	-0.16	8.18	24.41	14.78	10.82	150.70	12.10
A7 (s)	021904		2.25	-0.11	8.20	24.40	14.78	11.08	150.20	12.20
A13 (b)	021904	15:15	38.67	-0.13	8.21	24.16	14.62	7.48	241.60	15.20
A13 (m)	021904		20.87	-0.12	8.30	24.21	14.65	9.33	235.10	12.00
A13 (s)	021904		2.38	-0.10	8.31	24.26	14.68	8.34	231.40	11.70
Min				**-0.16**	**8.09**	**24.16**	**14.62**	**7.48**	**150.20**	**11.70**
Max				**-0.10**	**8.31**	**24.41**	**14.78**	**11.08**	**241.60**	**15.20**
Mean				**-0.13**	**8.22**	**24.30**	**14.71**	**9.69**	**193.57**	**13.07**
SD				**0.03**	**0.08**	**0.11**	**0.07**	**1.55**	**46.64**	**1.66**
B5 (b)	021904	9:09	37.91	-0.35	8.01	20.09	11.95	13.62	252.40	11.20
B5 (m)	021904		14.81	-0.33	8.07	20.49	12.21	11.95	248.00	11.90
B5 (s)	021904		2.86	-0.31	8.10	20.73	12.36	11.36	245.80	12.10
B7 (b)	021904	10:18	36.01	-0.34	8.13	24.12	14.59	10.70	174.80	10.10
B7 (m)	021904		20.02	-0.33	8.18	24.13	14.60	10.95	171.90	10.40
B7 (s)	021904		1.60	-0.30	8.20	24.12	14.59	11.64	169.90	10.60
Min				**-0.35**	**8.01**	**20.09**	**11.95**	**10.70**	**169.90**	**10.10**
Max				**-0.30**	**8.20**	**24.13**	**14.60**	**13.62**	**252.40**	**12.10**
Mean				**-0.33**	**8.12**	**22.28**	**13.38**	**11.70**	**210.47**	**11.05**
SD				**0.02**	**0.07**	**2.03**	**1.33**	**1.04**	**42.00**	**0.82**

Key:

Depth = meters
Specific Conductivity = milliSiemens per centimeter
Dissolved Oxygen = milligram per liter
Turbidity = Nephelometric turbidity unit
Max = maximum
SD = Standard deviation
Temp = Degree Celsius
Salinity = parts per thousand
Redox = millivolt
Min = minimum
Mean = Average

Note:

- Water quality was not collected on February 18, 2004 because of a faulty meter that could not be replaced until the following day.

Table 19. Asharoken Benthic Sampling Water Quality Observations, May 2004.

Station	Date MMDDYY	Time HHMMSS	Depth Meters	Temp degC	pH units	SpCond mS/cm	Sal ppt	DO mg/l	Redox mV	Turb NTU
A1 (b)	051304	9:38	14.33	11.20	8.16	29.68	18.34	12.41	131.00	3.10
A1 (m)	051304			11.37	8.20	30.11	18.63	11.95	123.20	2.40
A1 (s)	051304			11.99	8.21	30.26	18.74	12.01	120.00	2.30
A20 (b)	051304	11:48	10.36	10.27	8.20	29.23	18.03	12.51	156.00	3.00
A20 (m)	051304			10.87	8.23	29.91	18.50	11.85	155.60	2.30
A20 (s)	051304			12.23	8.23	30.57	18.95	11.76	155.30	2.20
A18 (b)	051304	13:05	9.14	10.98	8.20	29.16	17.98	12.53	197.10	3.90
A18 (m)	051304			11.47	8.25	30.12	18.64	11.15	192.00	2.40
A18 (s)	051304			12.05	8.25	30.98	19.23	11.55	189.70	2.00
Min				**10.27**	**8.16**	**29.16**	**17.98**	**11.15**	**120.00**	**2.00**
Max				**12.23**	**8.25**	**30.98**	**19.23**	**12.53**	**197.10**	**3.90**
Mean				**11.38**	**8.21**	**30.00**	**18.56**	**11.97**	**157.77**	**2.62**
SD				**0.64**	**0.03**	**0.59**	**0.40**	**0.46**	**29.77**	**0.60**
B11 (b)	051404	9:00	11.58	9.51	8.09	28.45	17.50	12.04	150.70	3.00
B11 (m)	051404			9.66	8.18	29.14	17.97	10.81	146.10	2.70
B11 (s)	051404			11.07	8.20	29.88	18.48	11.07	143.40	2.30
B2 (b)	051404	10:52	13.11	9.26	8.14	28.40	17.47	12.67	140.20	3.70
B2 (m)	051404			9.19	8.18	28.78	17.73	11.07	132.20	2.70
B2 (s)	051404			11.45	8.22	29.83	18.44	10.78	128.00	2.70
Min				**9.19**	**8.09**	**28.40**	**17.47**	**10.78**	**128.00**	**2.30**
Max				**11.45**	**8.22**	**29.88**	**18.48**	**12.67**	**150.70**	**3.70**
Mean				**10.02**	**8.17**	**29.08**	**17.93**	**11.41**	**140.10**	**2.85**
SD				**0.98**	**0.05**	**0.66**	**0.45**	**0.77**	**8.58**	**0.47**

Key:

Depth = meters
Specific Conductivity = milliSiemens per centimeter
Dissolved Oxygen = milligram per liter
Turbidity = Nephelometric turbidity unit
Max = maximum
SD = Standard deviation
Temp = Degree Celsius
Salinity = parts per thousand
Redox = millivolt
Min = minimum
Mean = Average

Table 20. Asharoken Fish Sampling Water Quality Observations, May 2004.

Station	Date MMDDYY	Time HHMMSS	Depth Meters	Temp degC	pH units	SpCond mS/cm	Sal ppt	DO mg/l	Redox mV	Turb NTU
A1 (b)	051104	9:55	11.89	9.09	8.07	28.54	17.56	11.51	151.30	52.90
A1 (m)	051104			9.40	8.12	28.77	17.72	11.20	144.70	4.90
A1 (s)	051104			10.05	8.15	29.18	18.00	11.29	140.90	3.50
A7 (b)	051104	13:59	12.19	9.01	8.11	28.50	17.54	12.78	120.50	1072.10
A7 (m)	051104			9.03	8.10	28.53	17.56	11.30	118.10	3.40
A7 (s)	051104			11.82	8.17	30.73	19.06	11.05	115.50	3.50
A8 (b)	051204	11:59	12.19	9.50	8.18	28.89	17.80	13.61	147.20	3.20
A8 (m)	051204			10.25	8.20	29.15	17.98	12.03	141.70	2.60
A8 (s)	051204			12.89	8.24	31.09	19.31	11.62	138.00	2.00
A11 (b)	051204	14:35	11.28	9.39	8.17	28.81	17.75	11.92	169.40	22.80
A11 (m)	051204			9.45	8.16	28.75	17.71	11.28	164.40	4.90
A11 (s)	051204			12.13	8.26	30.69	19.03	11.59	159.30	2.00
Min				**9.01**	**8.07**	**28.50**	**17.54**	**11.05**	**115.50**	**2.00**
Max				**12.89**	**8.26**	**31.09**	**19.31**	**13.61**	**169.40**	**1072.10**
Mean				**10.17**	**8.16**	**29.30**	**18.08**	**11.77**	**142.58**	**98.15**
SD				**1.35**	**0.06**	**0.95**	**0.65**	**0.75**	**17.64**	**307.07**
B5 (b)	051104	14:52	11.58	9.95	8.15	28.92	17.82	12.91	179.70	2.10
B5 (m)	051104			11.24	8.26	29.99	18.55	11.76	173.10	1.90
B5 (s)	051104			11.85	8.26	30.40	18.83	12.52	170.70	2.10
B7 (b)	051104	15:56	9.14	9.33	8.15	28.84	17.77	15.05	152.00	4.00
B7 (m)	051104			10.29	8.12	28.76	17.71	12.72	142.30	2.50
B7 (s)	051104			12.66	8.26	30.75	19.07	12.03	136.30	2.00
B1 (b)	051204	9:12	14.02	8.74	8.06	28.34	17.43	11.93	159.60	3.00
B1 (m)	051204			10.47	8.24	29.78	18.41	11.03	148.10	2.20
B1 (s)	051204			13.94	8.25	32.02	19.95	11.43	141.90	1.40
B4 (b)	051204	11:23	9.75	8.92	8.13	28.57	17.58	16.30	129.70	16.00
B4 (m)	051204			9.07	8.14	28.47	17.51	11.96	121.90	5.60
B4 (s)	051204			12.06	8.26	31.08	19.30	10.86	115.80	2.10
Min				**8.74**	**8.06**	**28.34**	**17.43**	**10.86**	**115.80**	**1.40**
Max				**13.94**	**8.26**	**32.02**	**19.95**	**16.30**	**179.70**	**16.00**
Mean				**10.71**	**8.19**	**29.66**	**18.33**	**12.54**	**147.59**	**3.74**
SD				**1.65**	**0.07**	**1.20**	**0.82**	**1.61**	**20.36**	**4.03**

Key:

Depth = meters
Specific Conductivity = milliSiemens per centimeter
Dissolved Oxygen = milligram per liter
Turbidity = Nephelometric turbidity unit
Max = maximum
SD = Standard deviation
Temp = Degree Celsius
Salinity = parts per thousand
Redox = millivolt
Min = minimum
Mean = Average

Table 21. Asharoken Fish Sampling Water Quality Observations, July 2004.

Station	Date MMDDYY	Time HHMMSS	Depth Meters	Temp degC	pH units	SpCond mS/cm	Sal ppt	DO mg/l	Redox mV	Turb NTU
A1 (b)	070704	10:11	5.12	17.75	7.77	34.35	21.57	9.51	338.40	1.20
A1 (m)	070704		2.19	18.42	7.86	35.01	22.03	8.82	337.10	0.70
A1 (s)	070704	10:13	0.46	19.19	7.91	35.74	22.55	10.33	337.10	0.50
A7 (b)	070704	13:57	12.86	17.15	7.07	35.06	22.07	8.17	312.00	11.10
A7 (m)	070704		6.58	17.26	7.03	35.06	22.07	7.39	345.80	2.40
A7 (s)	070704	13:59	0.83	19.90	7.32	36.81	23.30	7.45	358.20	0.70
A8 (b)	070804	11:29	7.06	16.87	7.68	34.54	21.70	9.06	249.60	2.30
A8 (m)	070804		4.30	17.01	7.64	34.53	21.70	8.01	253.00	2.20
A8 (s)	070804	11:29	0.77	19.25	7.81	35.43	22.33	7.36	259.60	0.80
Min				**16.87**	**7.03**	**34.35**	**21.57**	**7.36**	**249.60**	**0.50**
Max				**19.90**	**7.91**	**36.81**	**23.30**	**10.33**	**358.20**	**11.10**
Mean				**18.09**	**7.57**	**35.17**	**22.15**	**8.46**	**310.09**	**2.43**
SD				**1.13**	**0.34**	**0.76**	**0.53**	**1.05**	**43.76**	**3.34**
B1 (b)	070704	14:33	14.35	19.95	7.99	36.40	23.01	11.28	182.90	10.80
B1 (m)	070704		6.72	20.38	7.99	36.61	23.16	10.86	200.20	3.60
B1 (s)	070704	14:35	0.42	20.82	8.00	37.17	23.55	10.50	212.20	0.20
B3 (b)	070704	16:03	10.08	16.82	7.73	34.34	21.56	8.69	294.30	0.70
B3 (m)	070704		4.82	17.71	7.86	35.30	22.24	7.82	301.30	0.60
B3 (s)	070704	16:05	1.42	21.02	7.98	37.67	23.91	8.37	304.10	0.20
B4 (b)	070804	9:16	9.25	17.10	7.69	33.92	21.27	11.43	280.00	1.80
B4 (m)	070804		4.62	18.37	7.75	34.46	21.65	10.74	284.50	1.00
B4 (s)	070804	9:17	0.52	19.53	7.84	35.94	22.69	9.25	285.70	0.80
B7 (b)	070804	10:53	9.57	16.84	7.67	34.41	21.61	8.21	226.60	3.10
B7 (m)	070804		5.80	17.19	7.65	34.55	21.71	7.49	235.80	1.90
B7 (s)	070804	10:55	0.86	19.33	7.88	35.92	22.67	8.46	236.80	0.70
Min				**16.82**	**7.65**	**33.92**	**21.27**	**7.49**	**182.90**	**0.20**
Max				**21.02**	**8.00**	**37.67**	**23.91**	**11.43**	**304.10**	**10.80**
Mean				**18.76**	**7.84**	**35.56**	**22.42**	**9.43**	**253.70**	**2.12**
SD				**1.60**	**0.13**	**1.24**	**0.87**	**1.44**	**42.70**	**2.94**

Key:

Depth = meters
Specific Conductivity = milliSiemens per centimeter
Dissolved Oxygen = milligram per liter
Turbidity = Nephelometric turbidity unit
Max = maximum
SD = Standard deviation
Temp = Degree Celsius
Salinity = parts per thousand
Redox = millivolt
Min = minimum
Mean = Average

Table 22. Statistical Analysis for Fish Variable Comparisons at Asharoken.

September 2003	**Overall Species Richness**				
	Area	n	x	SD	P-Value
	A	12	4.75	2.14	0.58
	B	7	5.42	3.05	
	EFH Species Richness				
	Area	n	x	SD	P-Value
	A	12	1.00	0.85	1.00
	B	7	1.00	1.15	
	EFH Species Count				
	Area	n	x	SD	P-Value
	A	12	15	32.52	0.32
	B	7	2.28	3.59	
February 2004	**Overall Species Richness**				
	Area	n	x	SD	P-Value
	A	9	2.56	1.24	0.26
	B	7	3.43	1.72	
	EFH Species Richness				
	Area	n	x	SD	P-Value
	A	9	0.44	0.53	0.01
	B	7	1.43	0.79	
	EFH Species Count				
	Area	n	x	SD	P-Value
	A	9	1.11	1.54	0.33
	B	7	1.86	1.35	
May 2004	**Overall Species Richness**				
	Area	n	x	SD	P-Value
	A	10	9.80	1.75	0.16
	B	7	8.14	2.85	
	EFH Species Richness				
	Area	n	x	SD	P-Value
	A	10	3.50	0.53	0.02
	B	7	2.71	0.76	
	EFH Species Count				
	Area	n	x	SD	P-Value
	A	10	36.30	17.71	0.16
	B	7	24.29	15.37	
July 2004	**Overall Species Richness**				
	Area	n	x	SD	P-Value
	A	8	7.13	2.23	0.57
	B	7	8.00	3.56	
	EFH Species Richness				
	Area	n	x	SD	P-Value
	A	8	2.25	0.87	0.72
	B	7	2.43	0.99	
	EFH Species Count				
	Area	n	x	SD	P-Value
	A	8	9.88	5.61	0.99
	B	7	9.86	9.59	

Table 23. Statistical Analysis for Benthic Invertebrate Richness at Asharoken.

	2003				
Benthic Invertebrate Richness	Area	n	x	SD	P-Value
	A	35	17.14	4.45	0.65
	B	15	17.87	6.49	
	2004				
	Area	n	x	SD	P-Value
	A	35	20.54	5.74	0.75
	B	15	19.93	6.83	
	2003/2004				
	Area	n	x	SD	P-Value
	A	70	18.84	5.61	0.97
	B	30	18.90	9.59	

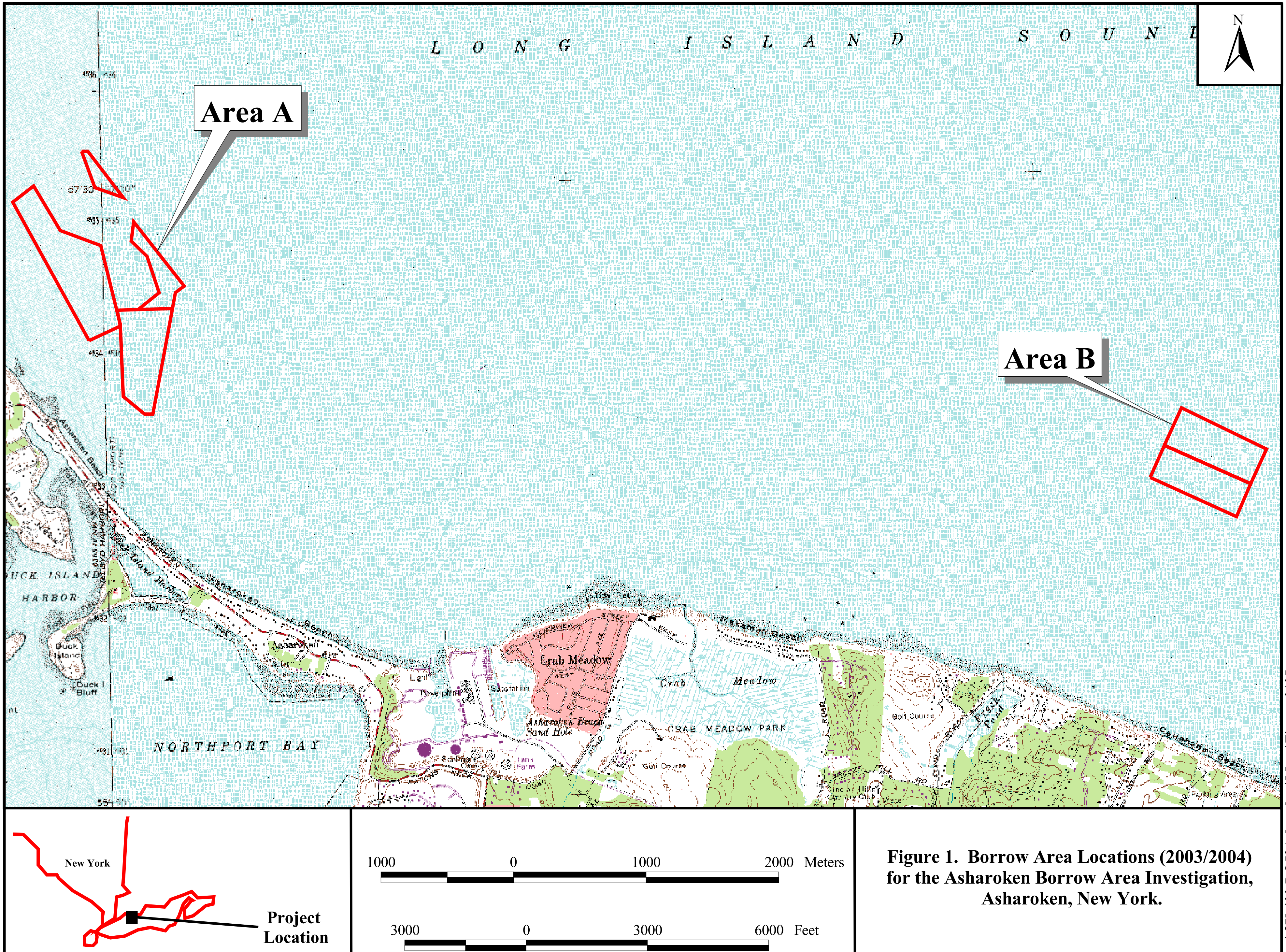

Figure 1. Borrow Area Locations (2003/2004) for the Asharoken Borrow Area Investigation, Asharoken, New York.

Source: USGS 7.5 Minute Topographic Quadrangles, Lloyd Harbor, 1967, and Northport, 1967, Photorevised 1979.

Prepared By: U. S. Army Corps of Engineers, New York District

Date: 09/05

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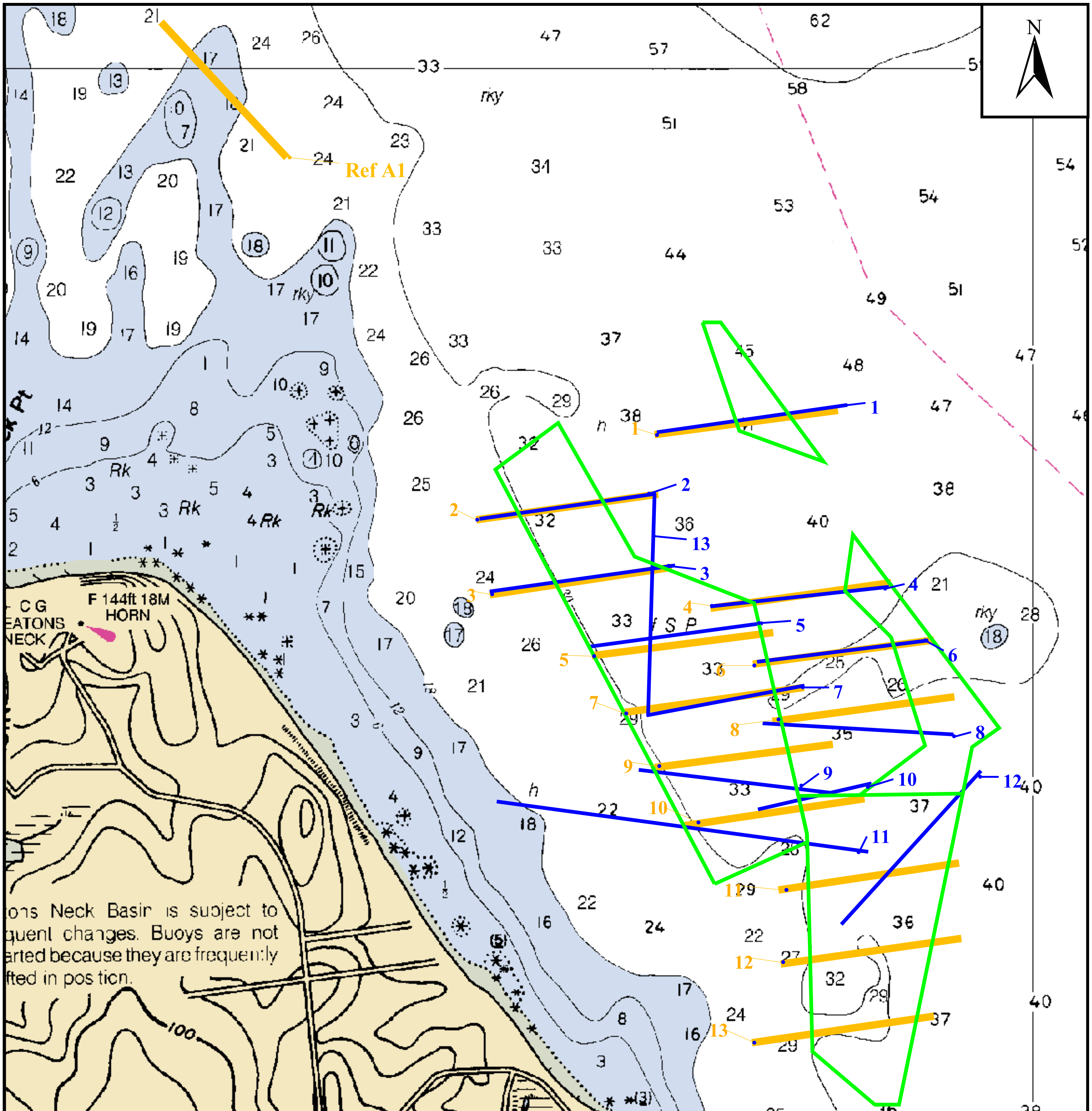

300 0 300 600 Meters

900 0 900 1800 Feet

LEGEND

Area A Boundary

Event 1 Trawl - September 2003

Event 2 Trawl - February 2004

Figure 2. Trawl Locations in Borrow Area A of the Asharoken Borrow Area Investigation (2003), Asharoken, New York.

Source: NOAA Charts 12364_20, 12364_21, and 12365_1, Maptech, Inc., 1998.

Prepared By: U. S. Army Corps of Engineers, New York District

Date: 09/05

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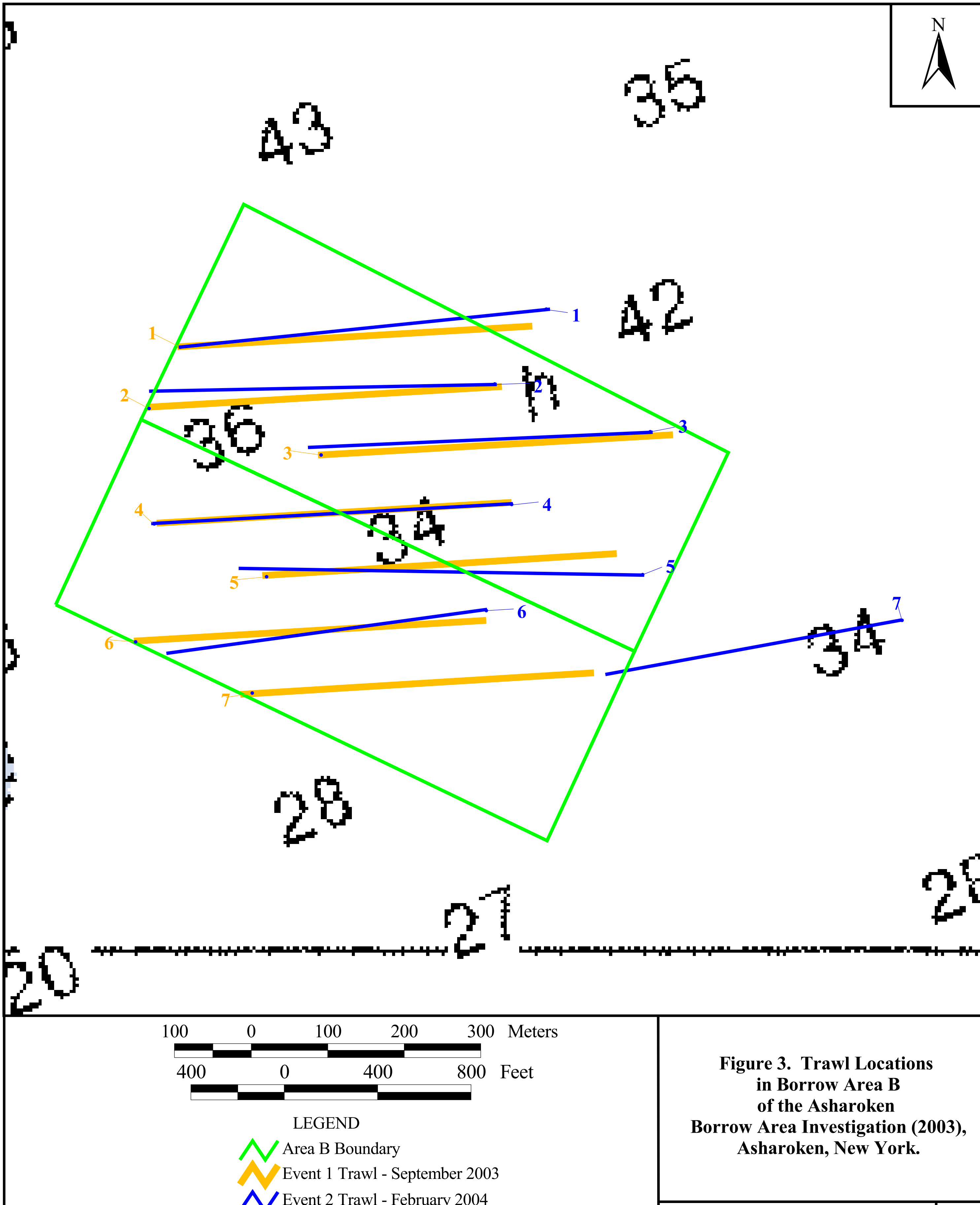

Figure 3. Trawl Locations in Borrow Area B of the Asharoken Borrow Area Investigation (2003), Asharoken, New York.

Source: NOAA Charts 12364_20, 12364_21, and 12365_1, Maptech, Inc., 1998.

Prepared By: U. S. Army Corps of Engineers, New York District

Date: 09/05

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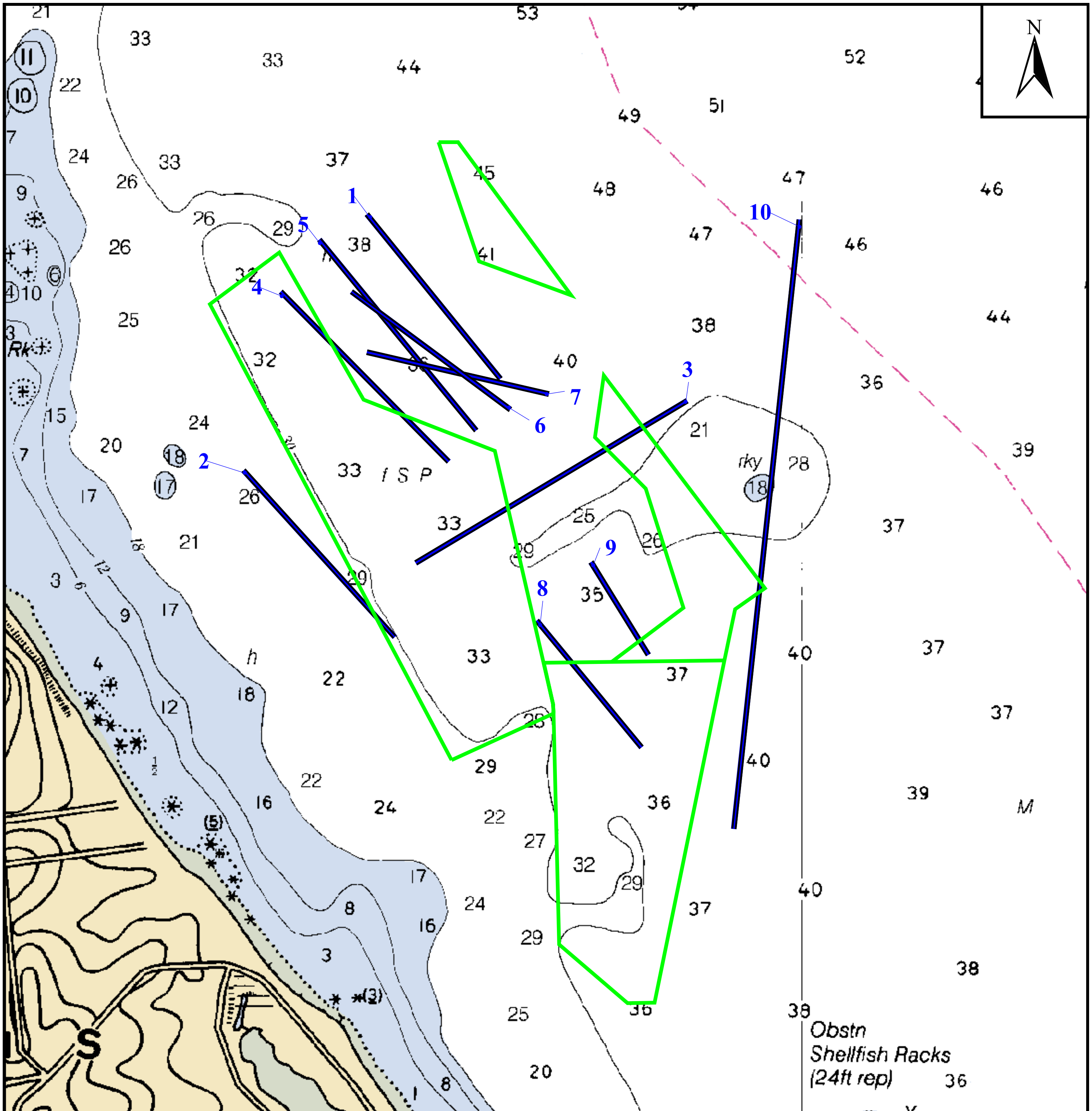

300 0 300 600 Meters

900 0 900 1800 Feet

LEGEND

Area A Boundary

Event 1 and 2 Trawl - May and July 2004

Figure 4. Trawl Locations in Borrow Area A of the Asharoken Borrow Area Investigation (2004), Asharoken, New York.

Prepared By: U. S. Army Corps of Engineers, New York District

Date: 09/05

Source: NOAA Charts 12364_20, 12364_21, and 12365_1, Maptech, Inc., 1998.

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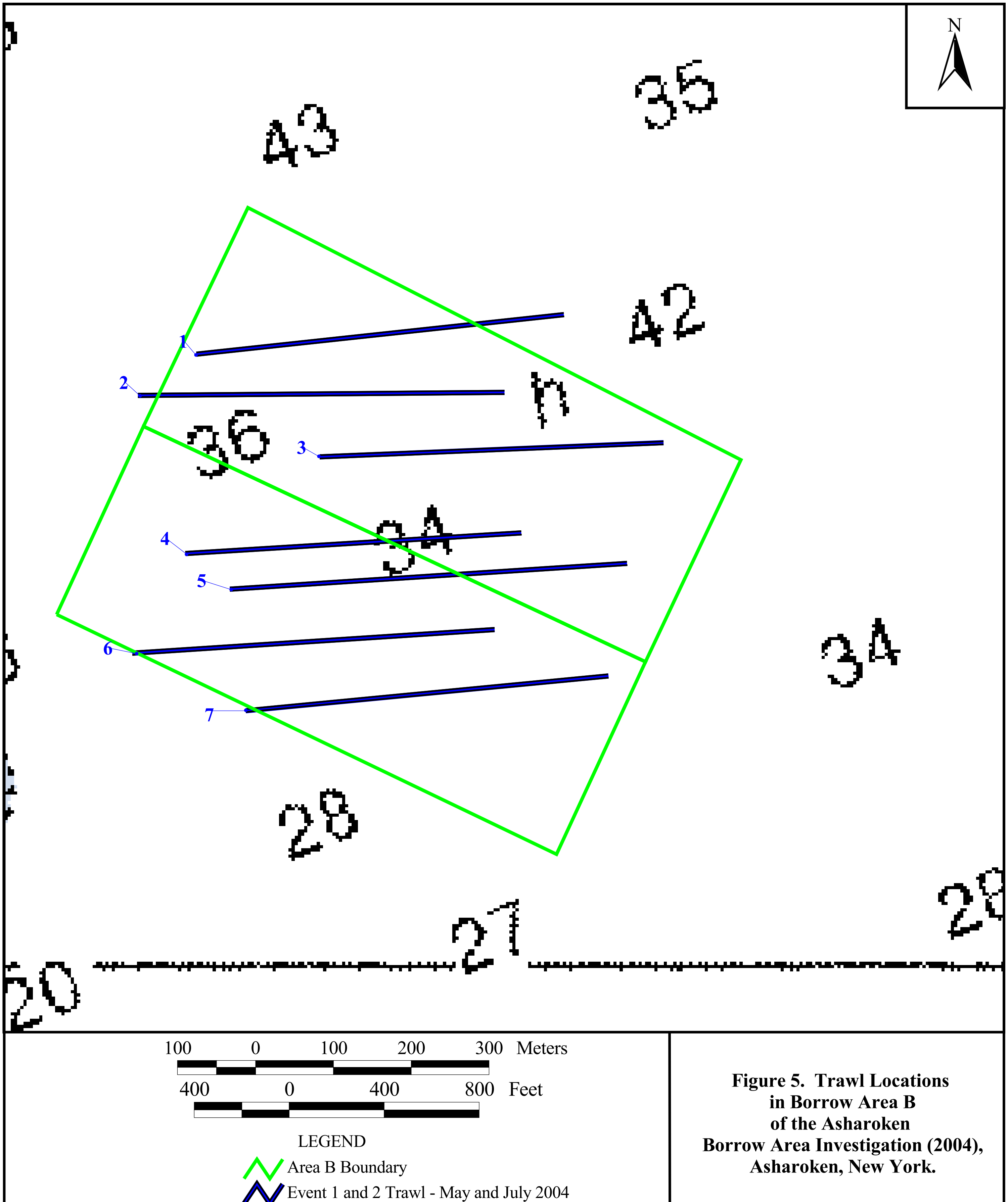

Figure 5. Trawl Locations in Borrow Area B of the Asharoken Borrow Area Investigation (2004), Asharoken, New York.

Prepared By: U. S. Army Corps of Engineers, New York District

Date: 09/05

Source: NOAA Charts 12364_20, 12364_21, and 12365_1, Maptech, Inc., 1998.

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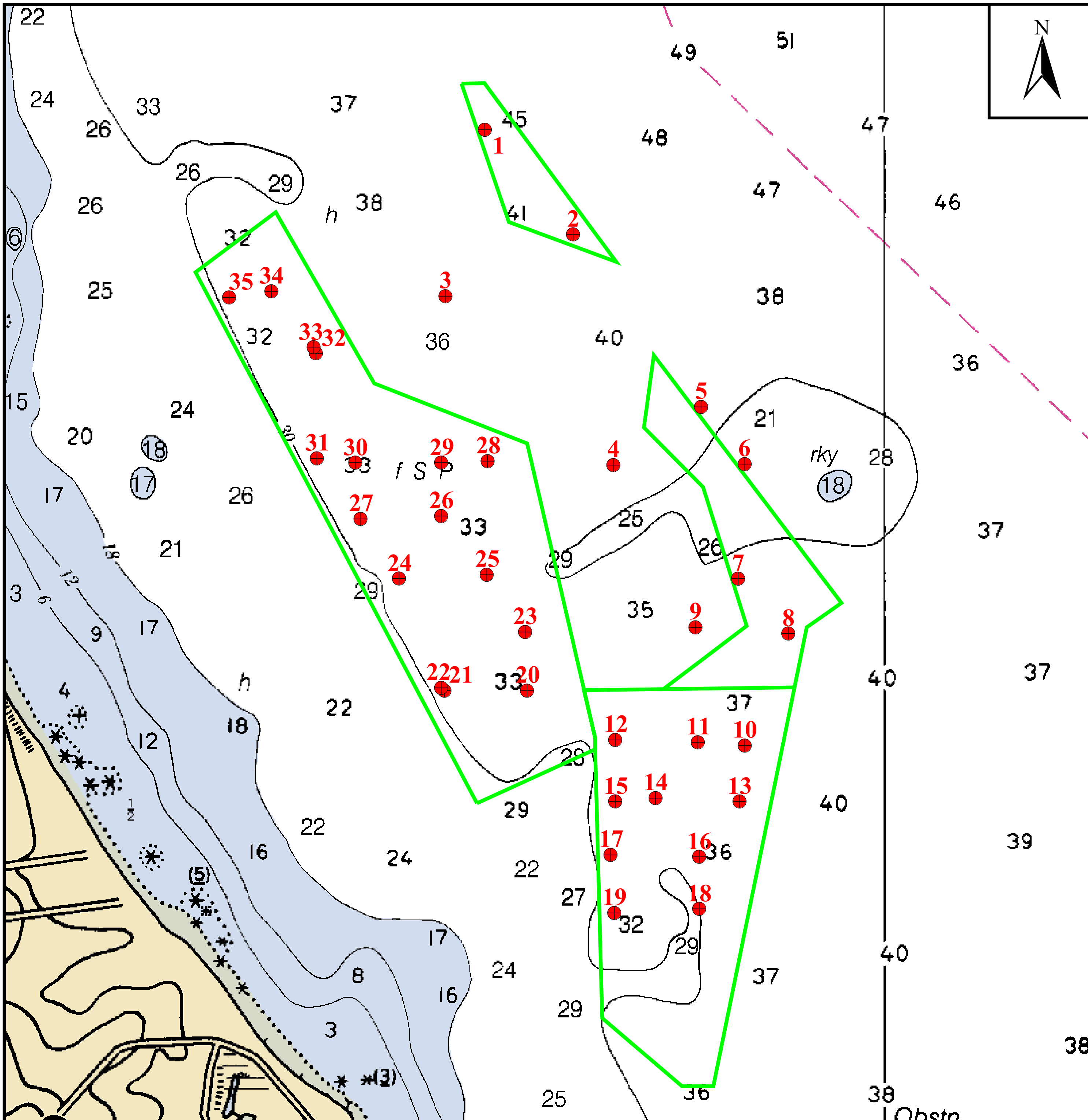

200 0 200 400 Meters

600 0 600 1200 Feet

LEGEND

Area A Boundary

Grab Locations - September 2003

Source: NOAA Charts 12364_20, 12364_21, and 12365_1, Maptech, Inc., 1998.

Figure 6. Benthic Grab Locations in Borrow Area A of the Asharoken Borrow Area Investigation (2003), Asharoken, New York.

Prepared By: U. S. Army Corps of Engineers, New York District

Date: 09/05

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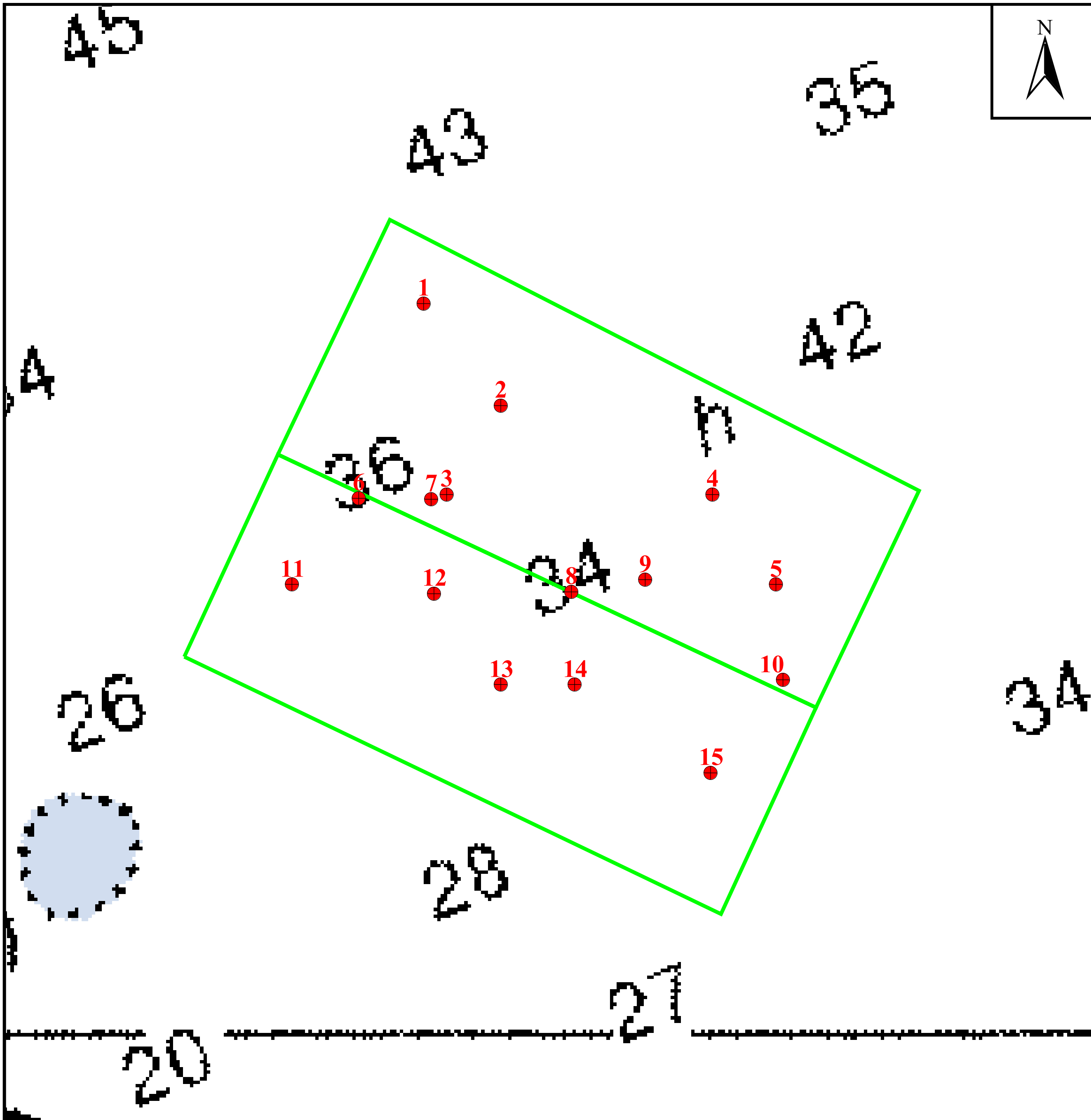

100 0 100 200 300 Meters

300 0 300 600 900 Feet

LEGEND

Area A Boundary

Grab Location - September 2003

Figure 7. Benthic Grab Locations in Borrow Area B of the Asharoken Borrow Area Investigation (2003), Asharoken, New York.

Source: NOAA Charts 12364_20, 12364_21, and 12365_1, Maptech, Inc., 1998.

Prepared By: U. S. Army Corps of Engineers, New York District

Date: 09/05

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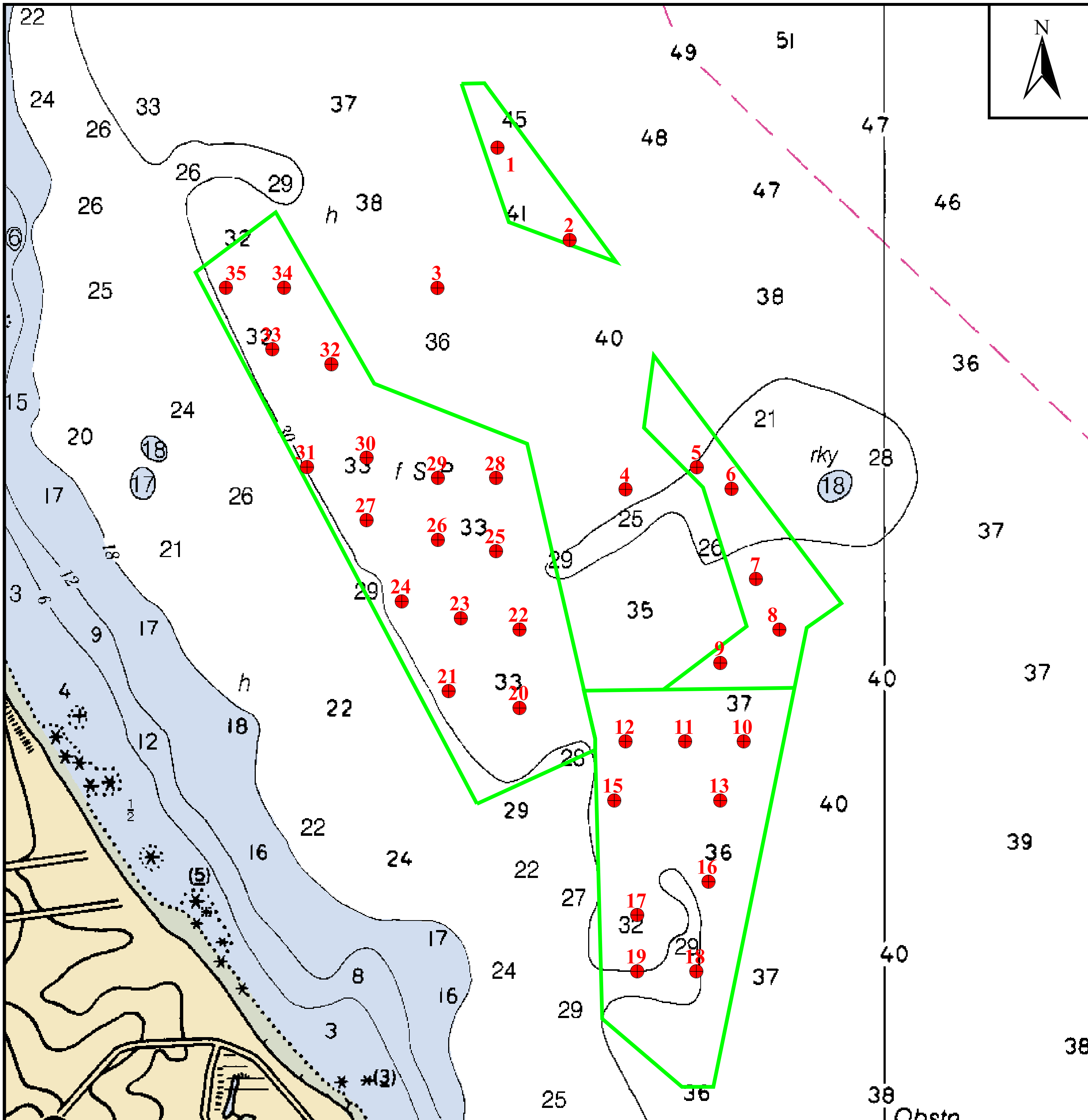

200 0 200 400 Meters

600 0 600 1200 Feet

LEGEND

Area A Boundary

Grab Locations - May 2004

Source: NOAA Charts 12364_20, 12364_21, and 12365_1, Maptech, Inc., 1998.

Figure 8. Benthic Grab Locations in Borrow Area A of the Asharoken Borrow Area Investigation (2004), Asharoken, New York.

Prepared By: **U. S. Army Corps of Engineers, New York District**

Date: 09/05

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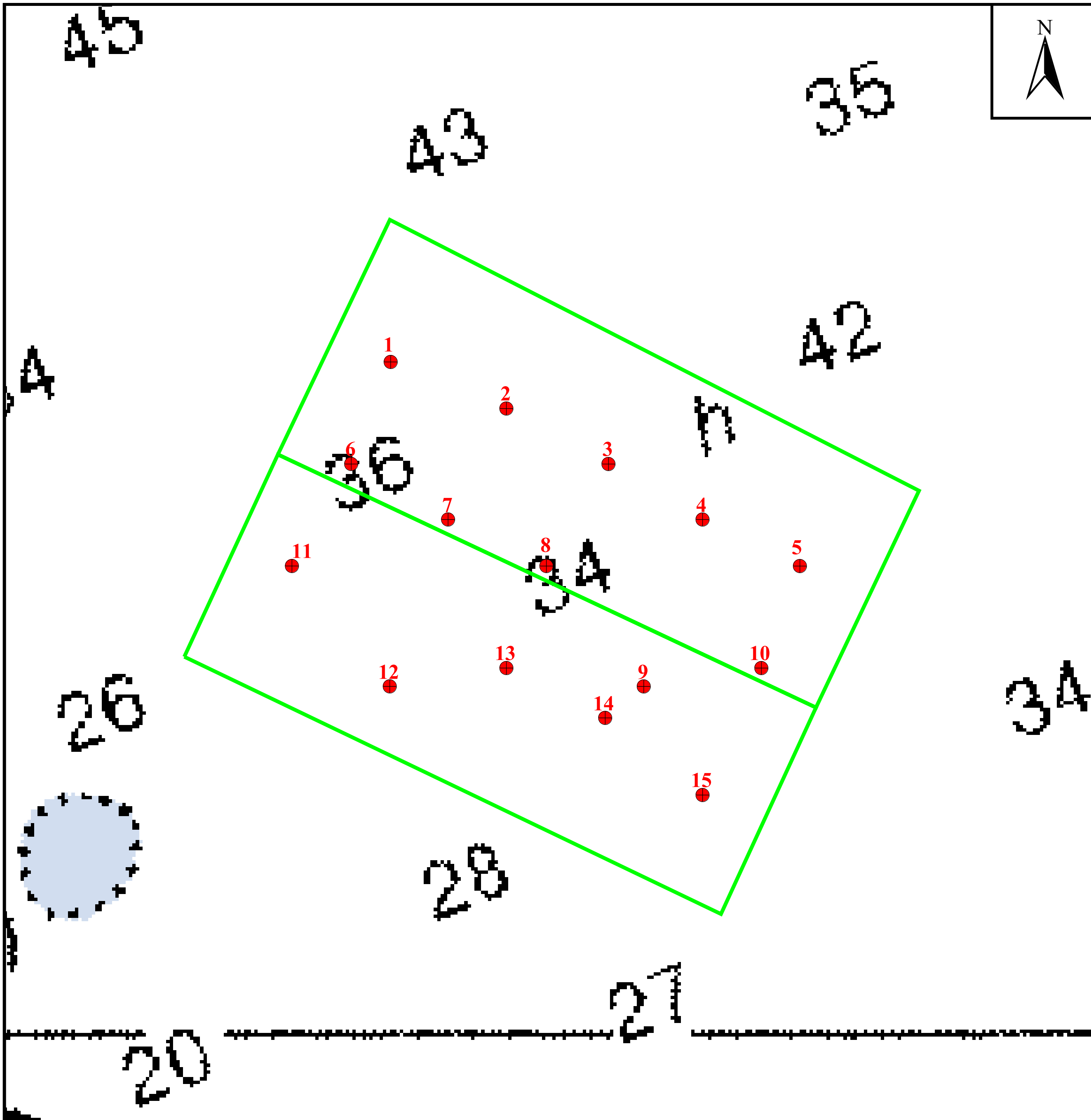

100 0 100 200 300 Meters

300 0 300 600 900 Feet

LEGEND

Area A Boundary

Grab Location - May 2004

Figure 9. Benthic Grab Locations in Borrow Area B of the Asharoken Borrow Area Investigation (2004), Asharoken, New York.

Source: NOAA Charts 12364_20, 12364_21, and 12365_1, Maptech, Inc., 1998.

Prepared By: U. S. Army Corps of Engineers, New York District

Date: 09/05

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Figure 10. Species Diversity at Both Asharoken Borrow Areas Combined by Month.

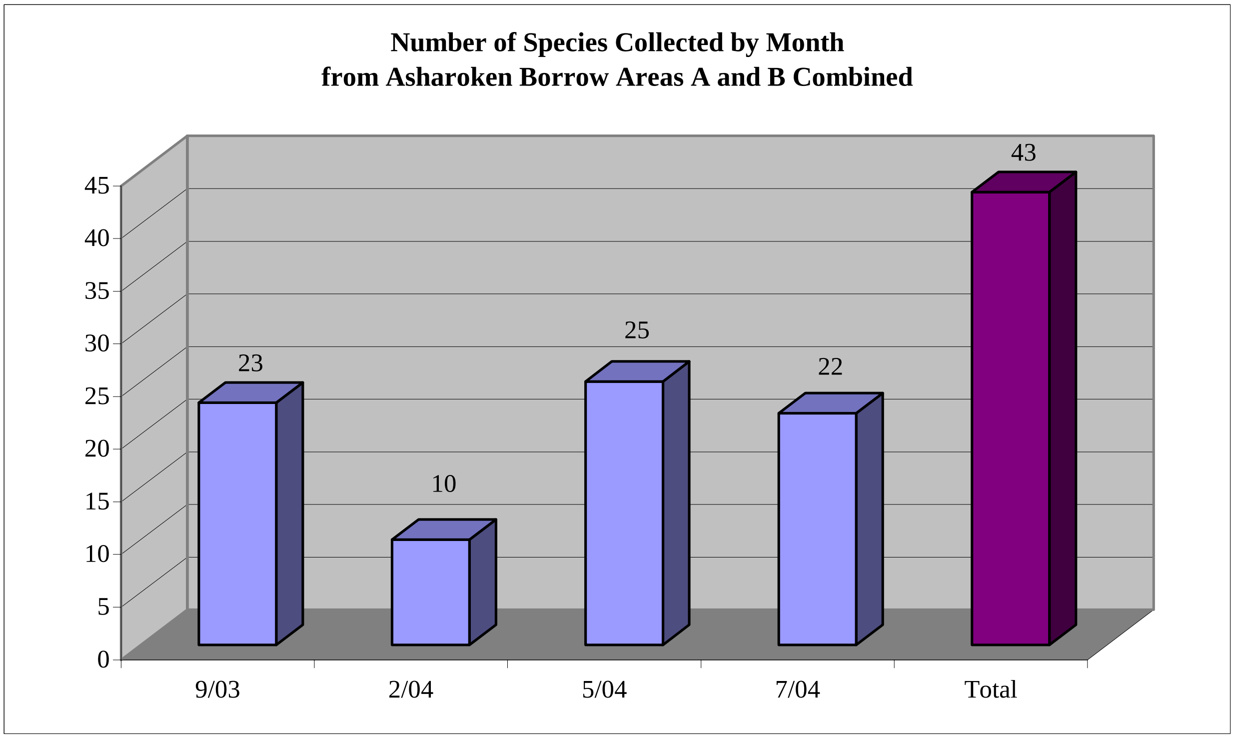


Figure 11. Comparison of Species Diversity Between Asharoken Borrow Areas A and B by Month.

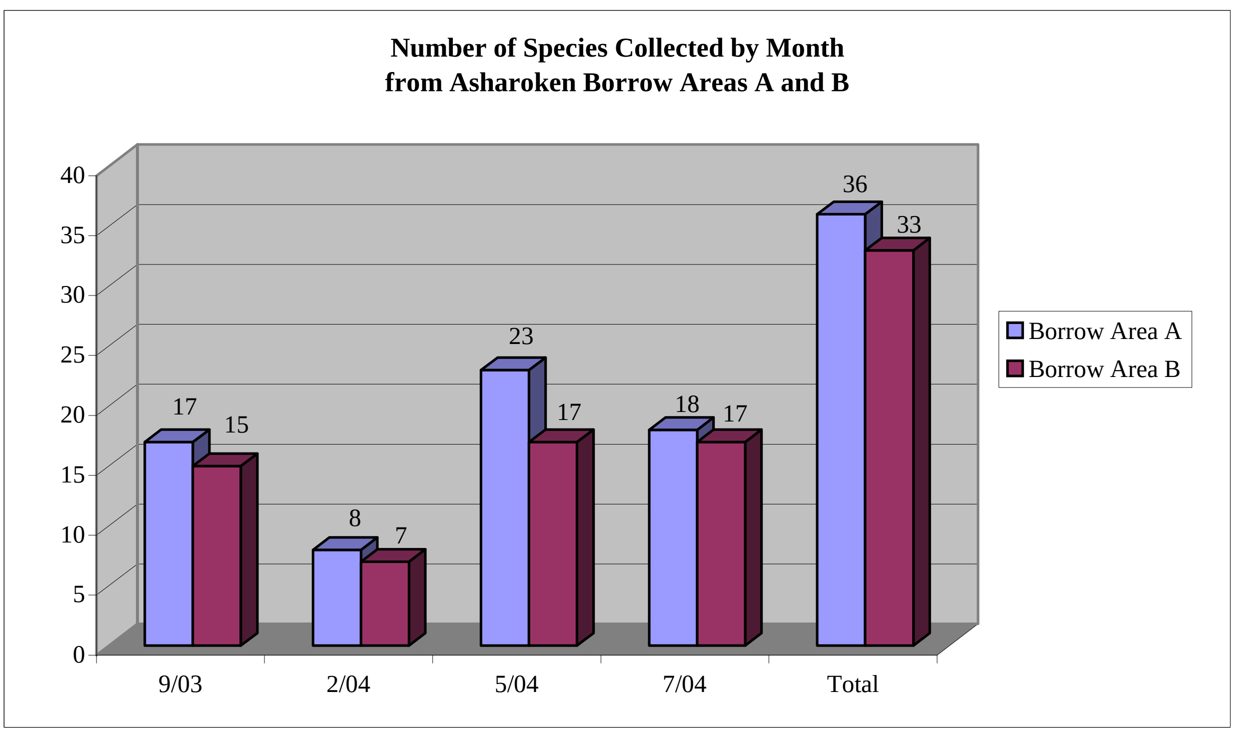
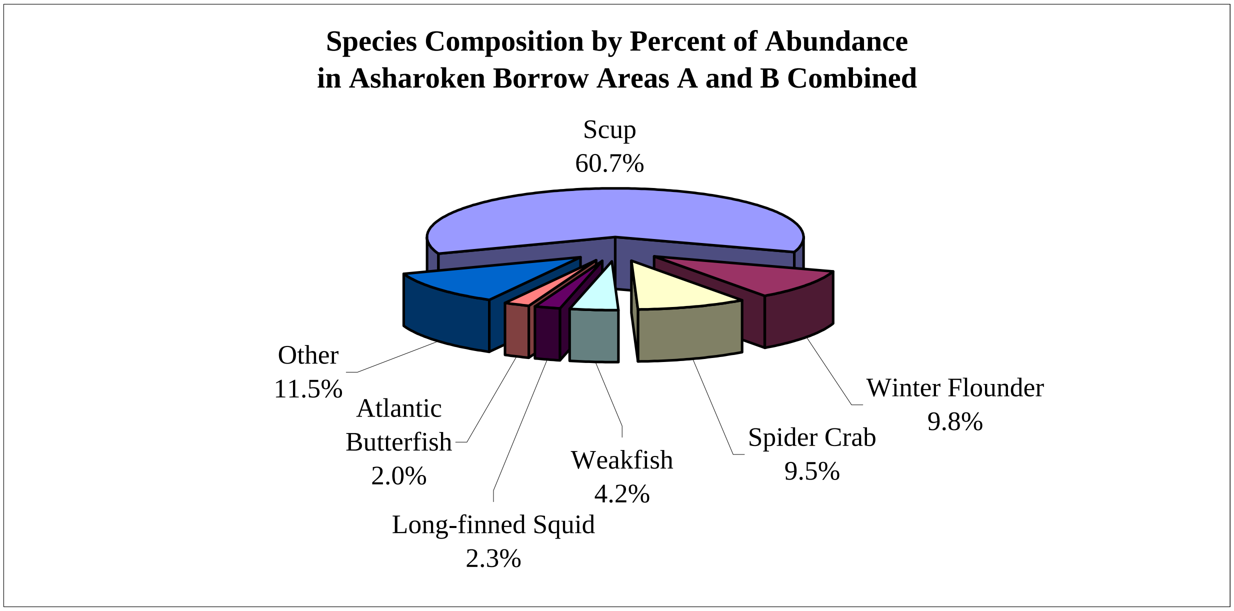


Figure 12. Species Composition by Percent of Abundance in Both Asharoken Borrow Areas Combined.



Note:

- Though not included in the analysis, bay anchovy accounted for 90.0% of the total number of individual organisms collected.

Figure 13. Species Composition by Percent of Abundance in Asharoken Borrow Area A.

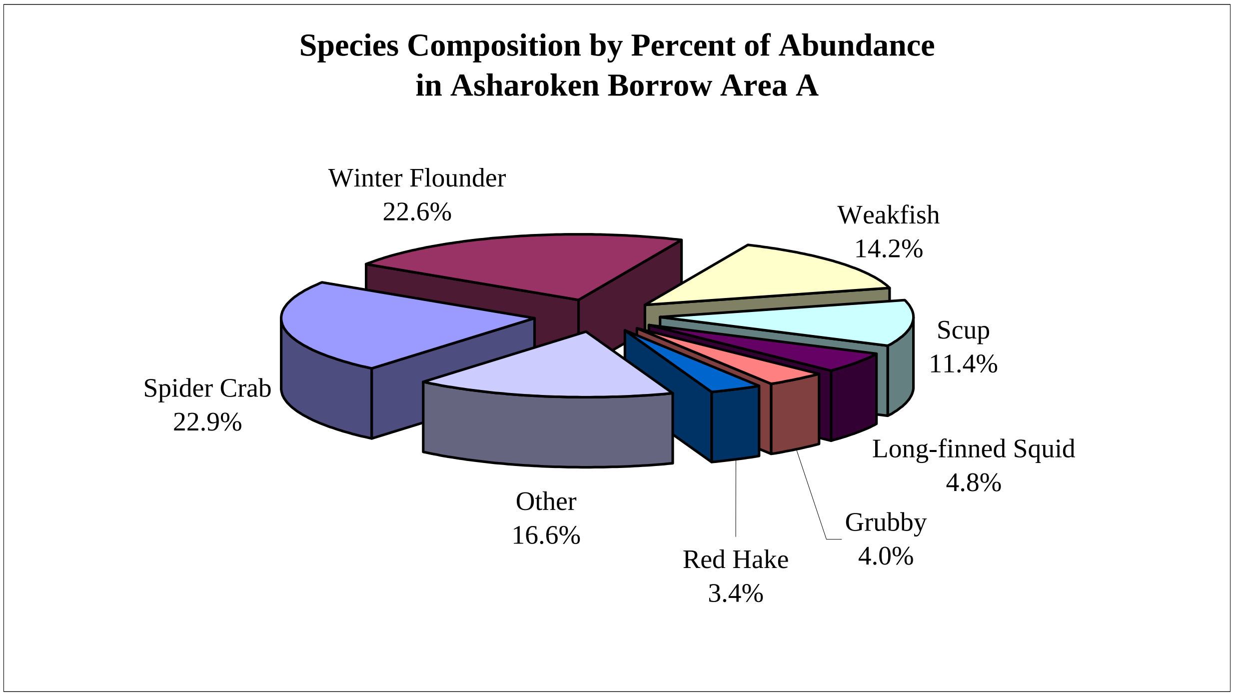


Figure 14. Species Composition by Percent of Abundance in Asharoken Borrow Area B.

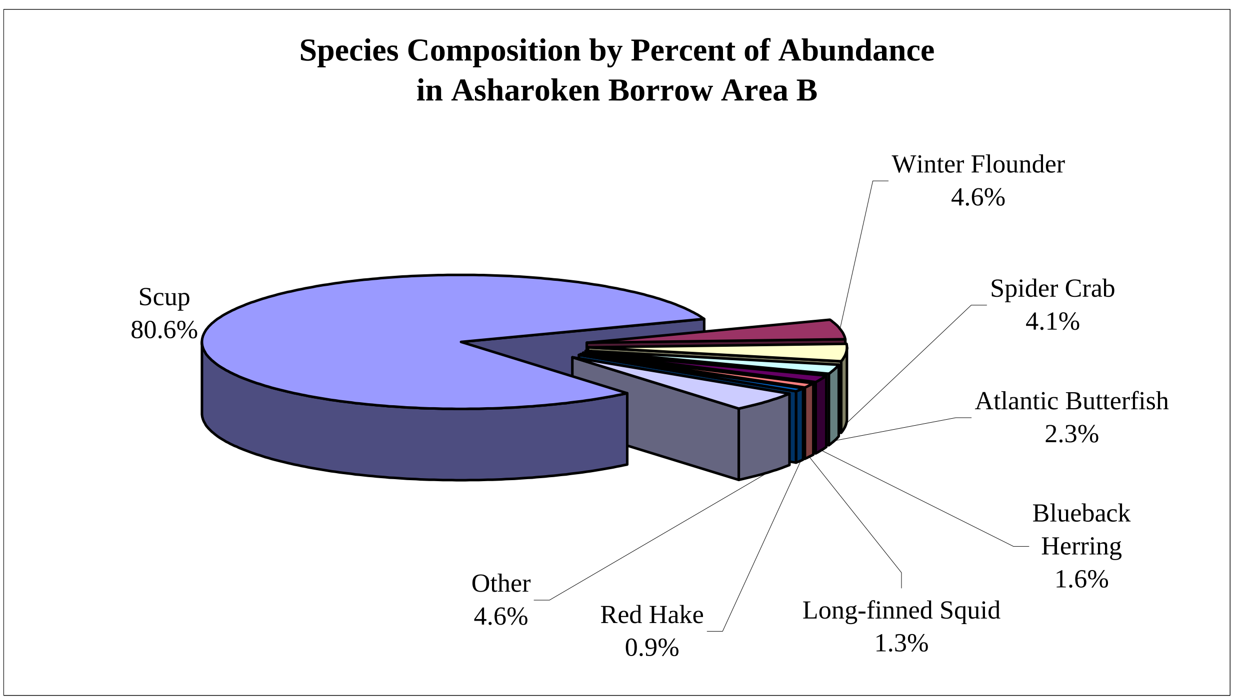


Figure 15. Percent of Total Biomass by Species During All Sampling Events.

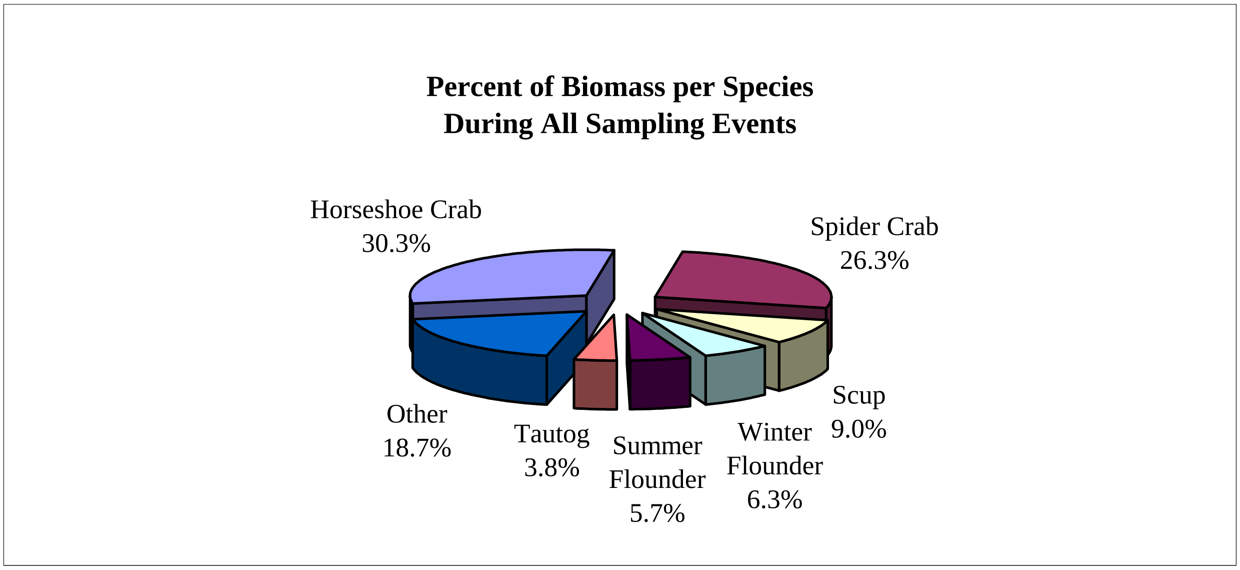


Figure 16A. Percent of Total Biomass by Species During the September 2003 Sampling Event.

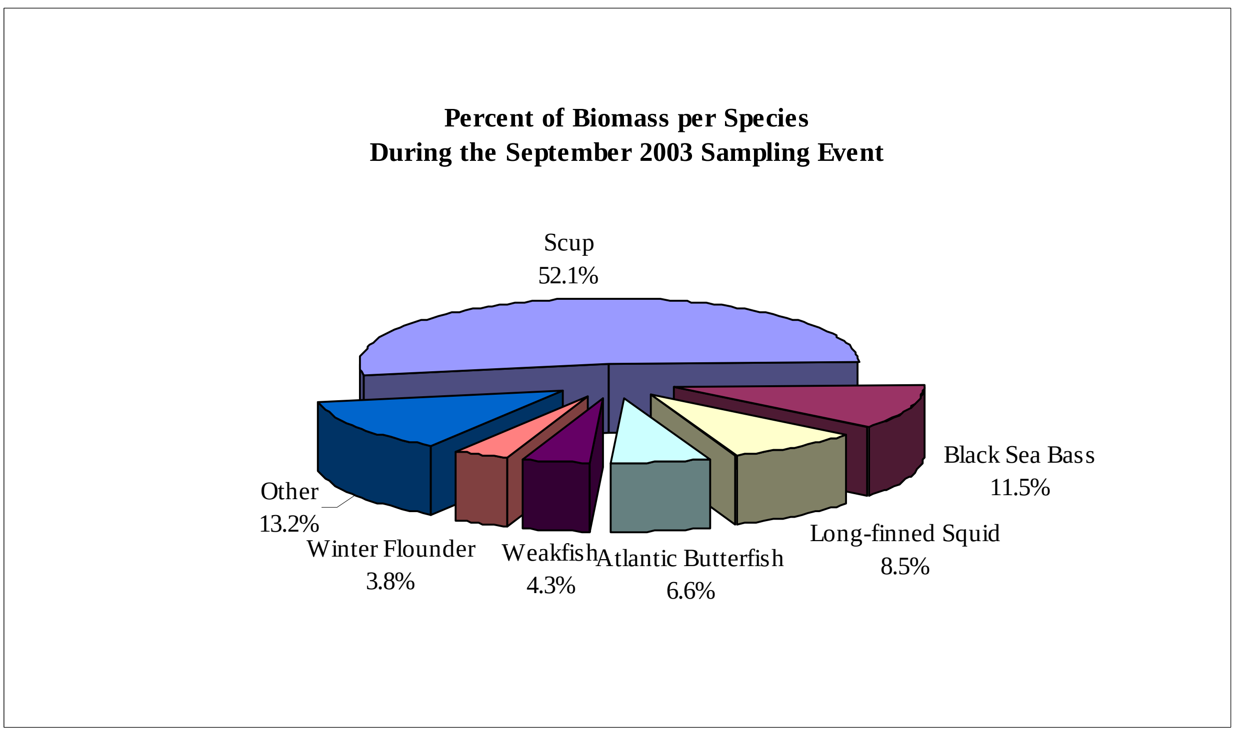


Figure 16B. Percent of Total Biomass by Species During the February 2004 Sampling Event.

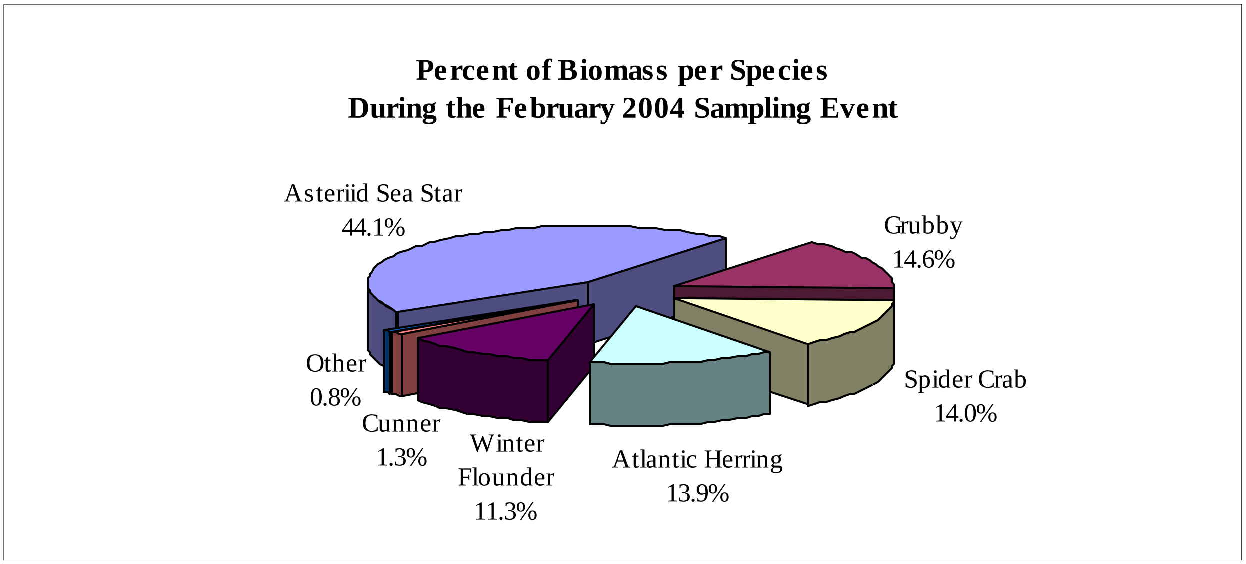


Figure 16C. Percent of Total Biomass by Species During the May 2004 Sampling Event..

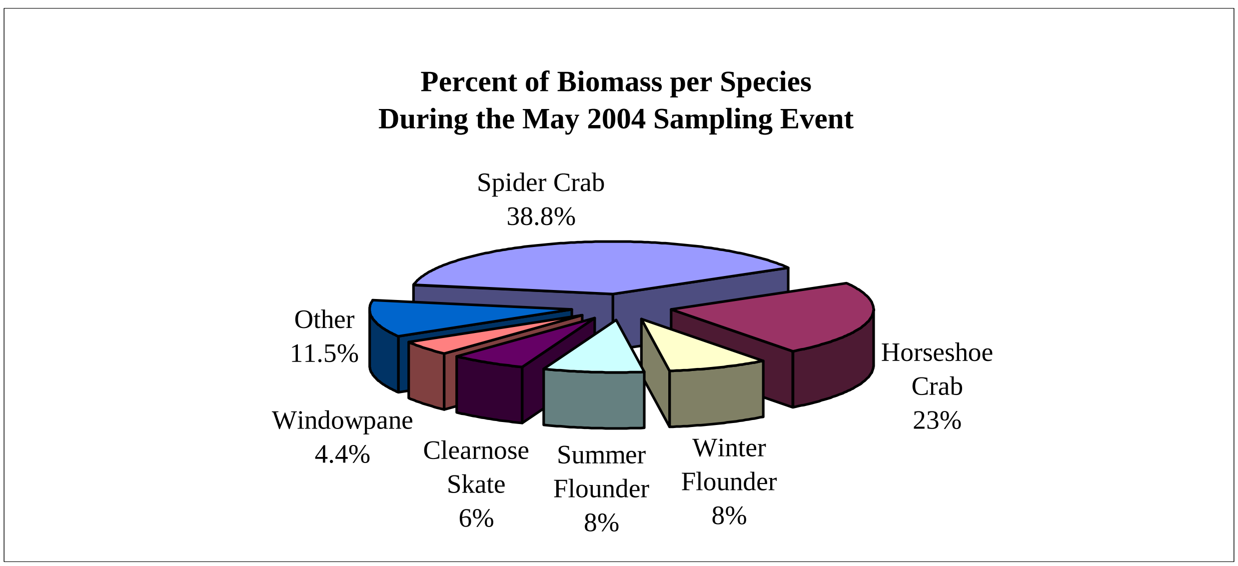


Figure 16D. Percent of Total Biomass by Species During the July 2004 Sampling Event.

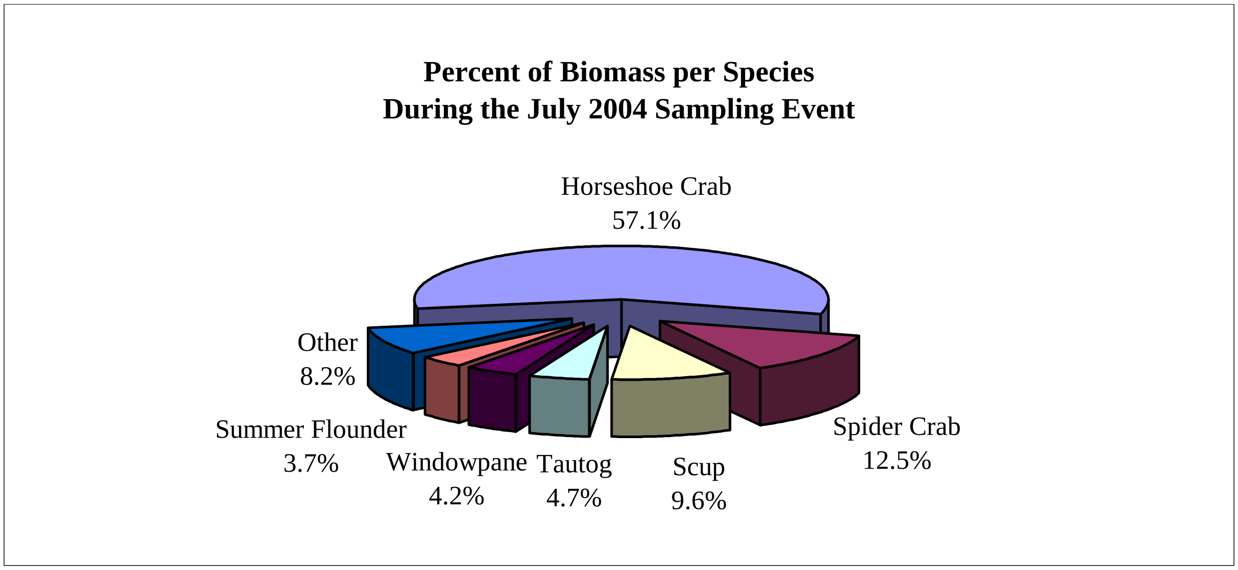


Figure 17. Relative Abundance of the Dominant Benthic Invertebrate Taxa Collected During the September 2003 Sampling Event.

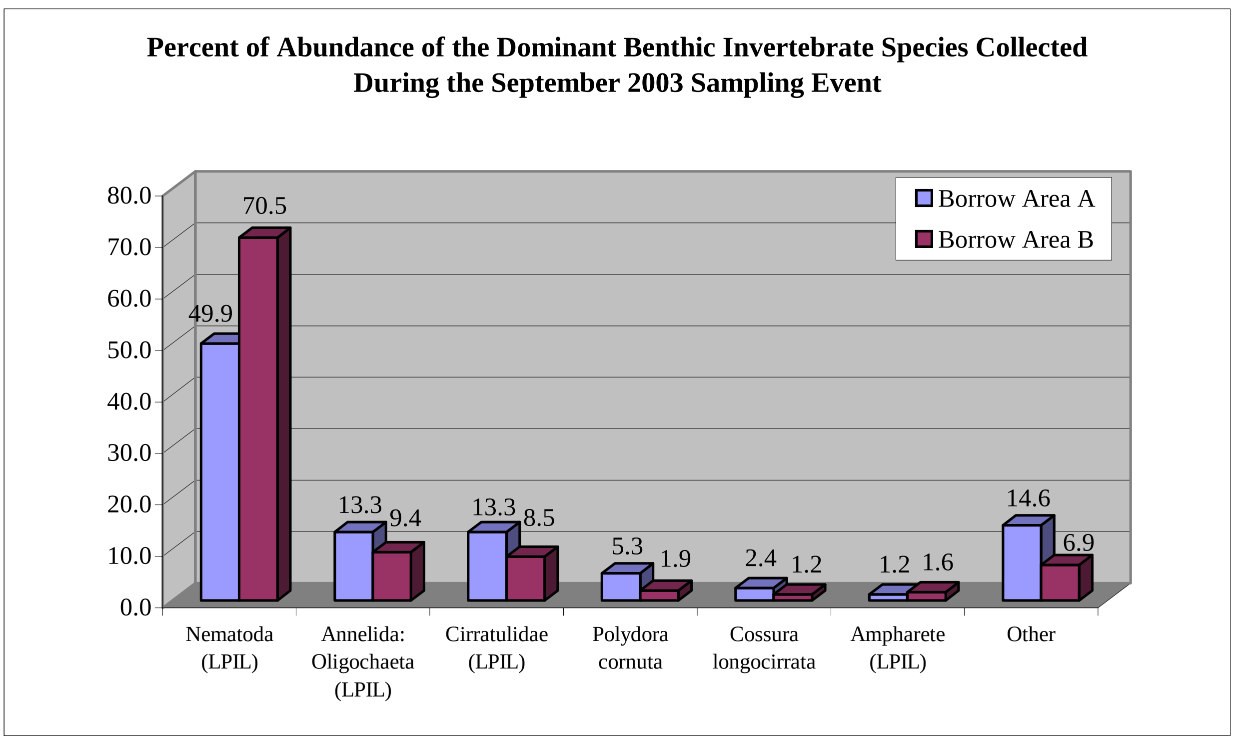


Figure 18. Percent of Abundance of the Dominant Benthic Invertebrate Species Collected During the May 2004 Sampling Event.

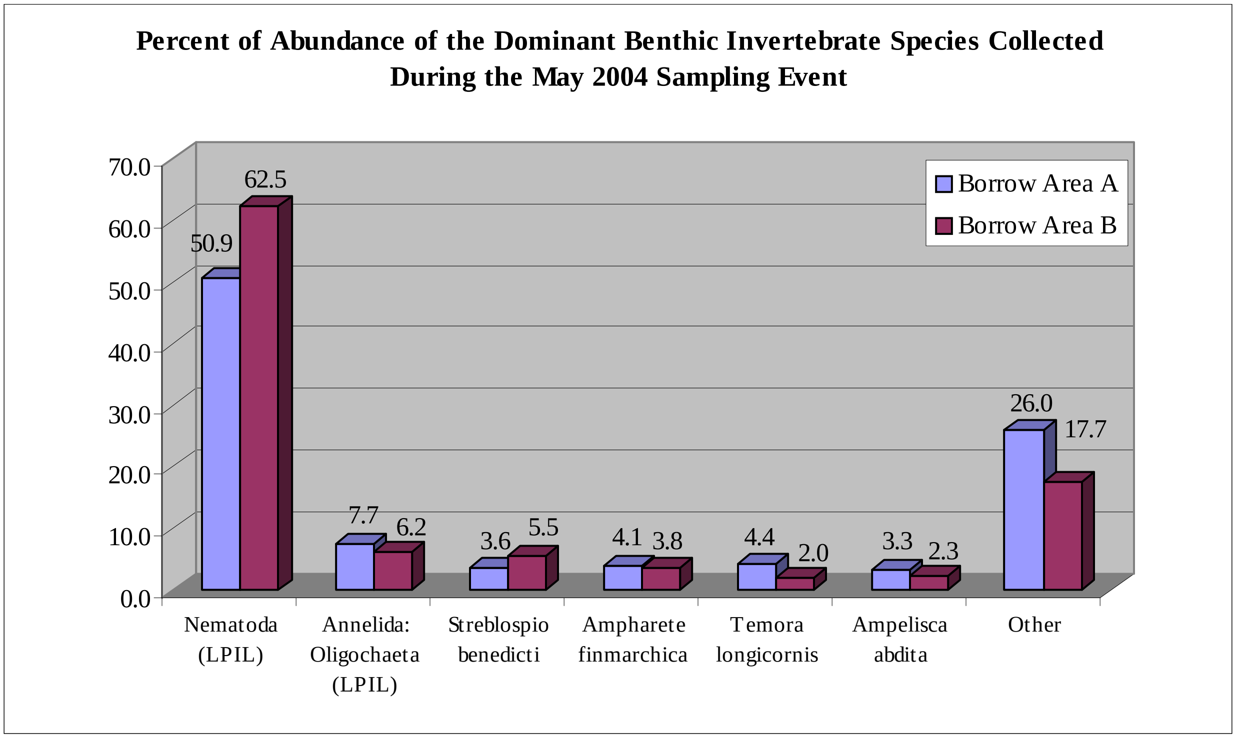


Figure 19. Biomass (Wet Weight) of Dominant Benthic Invertebrate Taxa During All Sampling Events.

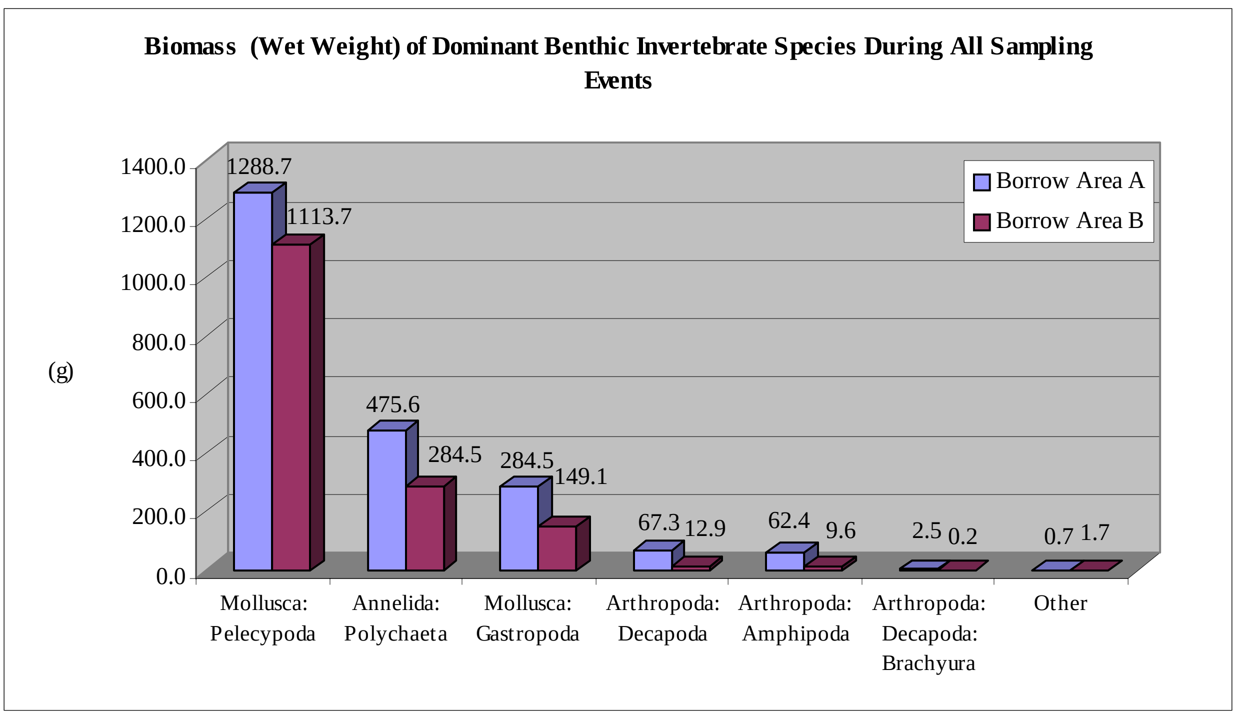


Figure 20. Percent of Benthic Invertebrate Biomass by Taxonomic Class During the September 2003 Sampling Event.

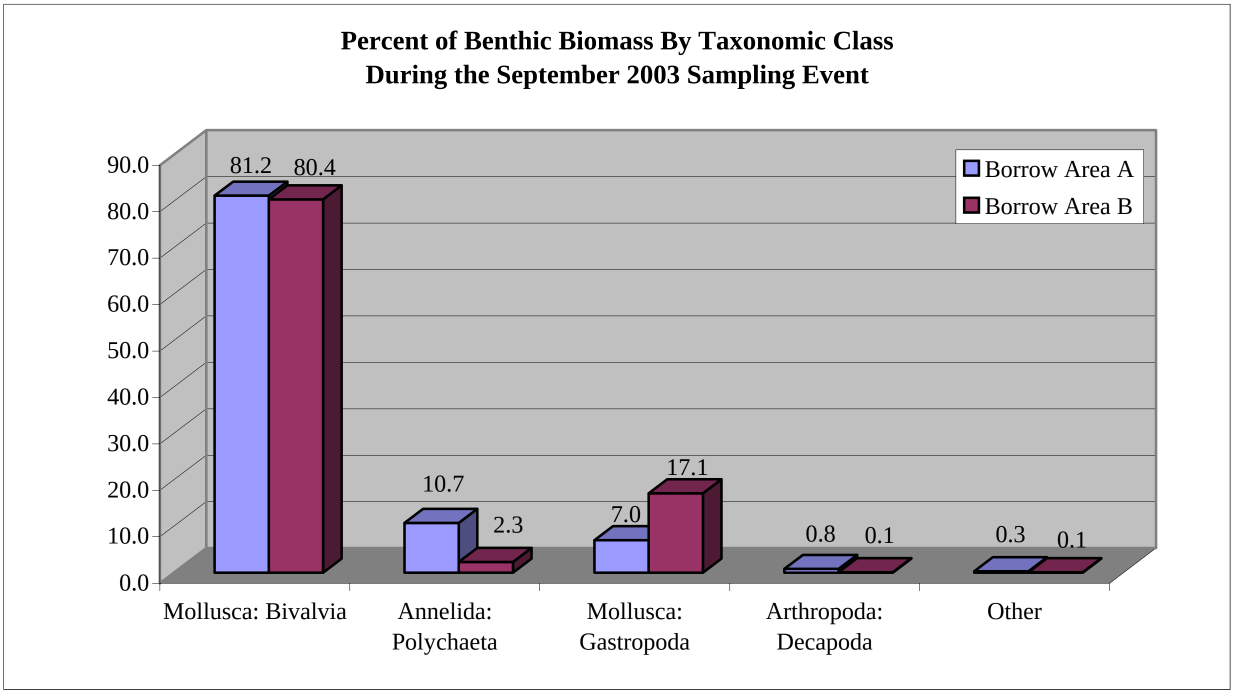


Figure 21. Percent of Benthic Invertebrate Biomass by Taxonomic Class During the May 2004 Sampling Event.

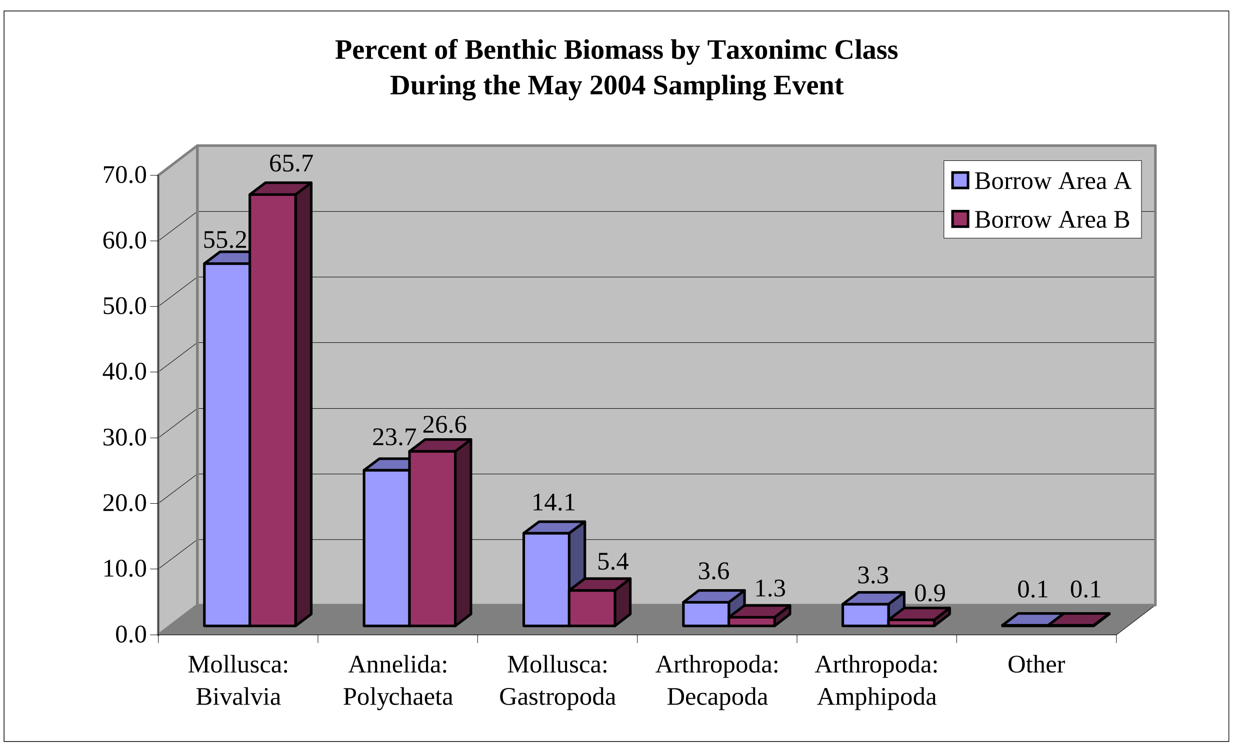


Figure 22. Comparison of Average Grain Size (% by Weight) Between Asharoken Borrow Areas A and B.

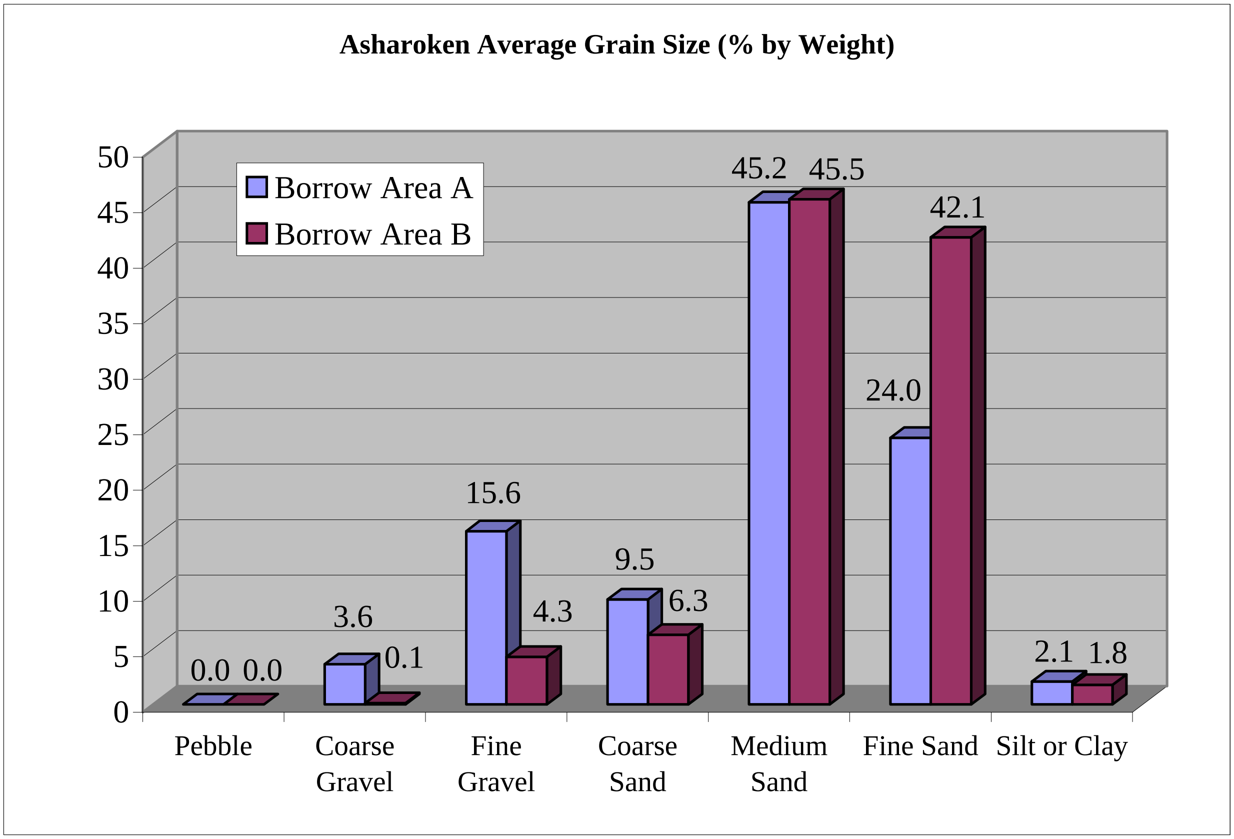


Figure 23. Comparison of Average Grain Size in Asharoken Borrow Area A Between September 2003 and May 2004.

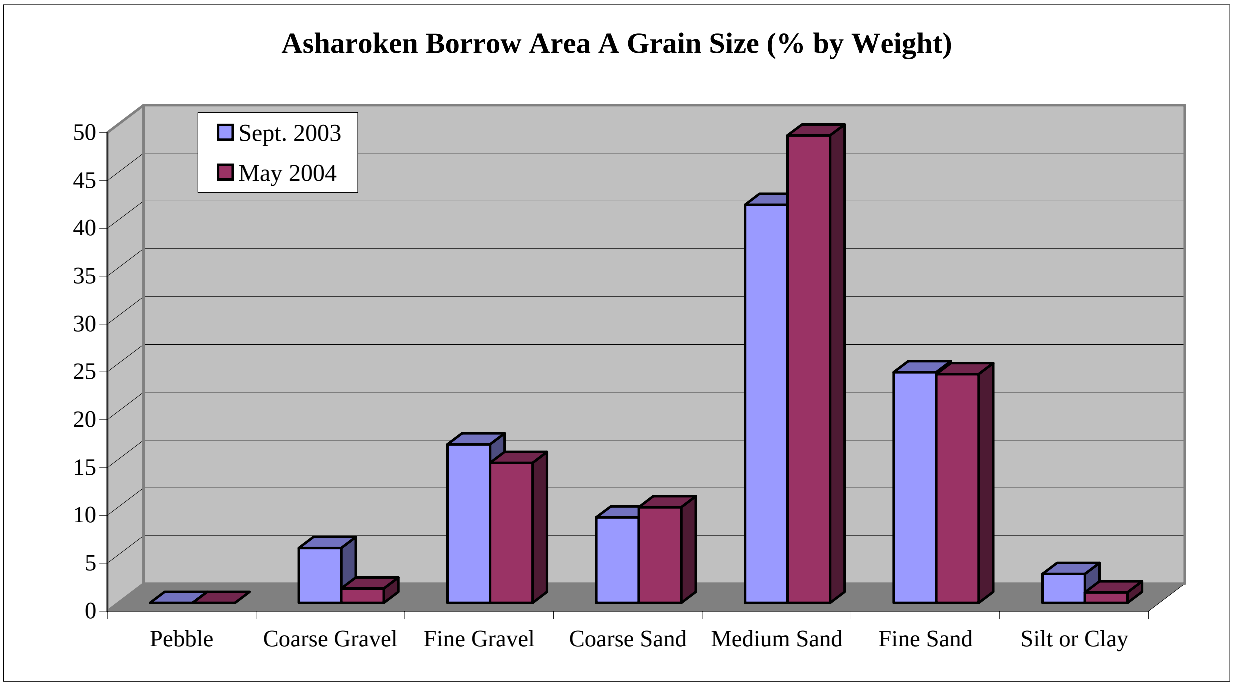
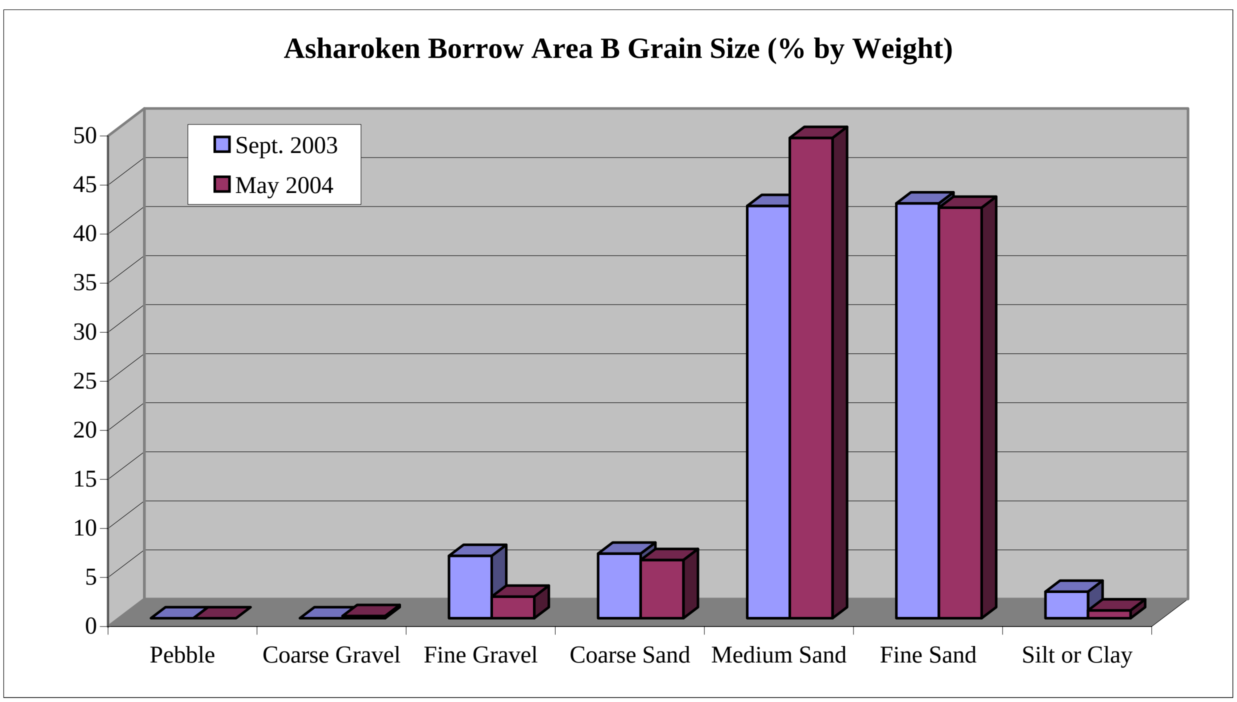


Figure 24. Comparison of Average Grain Size in Asharoken Borrow Area B Between September 2003 and May 2004.



Appendix A

Fish and Invertebrate Data

September 2003	Alewife	Atlantic Herring	Bay Anchovy	Black Sea Bass	Blueback Herring	Bluefish	Butterfish	Cunner	Channel Whelk	Horseshoe Crab	Long-finned Squid	Lookdown
Total Catch	*Alosa pseudoharengus*	*Clupea harengus*	*Anchoa mitchilli*	*Centropristis striata*	*Alosa aestivalis*	*Pomatomus saltatrix*	*Peprilus triacanthus*	*Tautogolabrus adspersus*	*Busycon canaliculatum*	*Limulus polyphemus*	*Loligo pealei*	*Selene vomer*
	38	105	94	412	86	249	107	132	111	195	150	59
			100	428		236	105	170	53		120	
			95			195	97				125	
			90			207	109				130	
			33			234	100				120	
			57			135	122				95	
			41			212	71				90	
			40				82				125	
			40				110				100	
			31				80				86	
			39				81				80	
			40				80				94	
			34				83				140	
			37				100				135	
			30				116				95	
			35				96				115	
			48				110				114	
			35				118				84	
			40				93				103	
			38				107				84	
			41				93				103	
			42				119				95	
			40				94				110	
			40				84				130	
			41				85				105	
			38				101				100	
			41				84				131	
			40				94				115	
			40				97				104	
			36				95				150	
			41				85				125	
			37				97				151	
			34				86				110	
			38				90				90	
			39				90				145	
			37				94				86	
			45				93				116	
			40				91				111	
			41				81				117	
			54				88				124	
			40				90				122	
			41				84				115	
			34				86				113	
			39				94				77	
			38				95				162	
			40				97				71	
			36				85				130	
			34				81				155	
			40				93				100	
			35				89				130	
			35				87				62	
			35				90				95	
			31				94				90	
			36				87				177	
			37				93				114	
			36				95				93	
			39				87				90	
			36				92				165	
			37				93				120	
			39				96				135	
			38				80				130	
			36				91				123	
			34				90				120	
			34				88				71	
			35				71				80	
			34				93				103	
			36				90				70	
			33				80				120	
			37				90				100	
			32				88				110	
			35				91				80	
			37				89				120	
			35				90				115	
			34				92				100	
			34				96				111	
			35				100				90	
			35				90				90	
			36				84				62	
			36				85				115	
			36				84				80	
			31				91				110	
			40				96				70	
			36				95				90	
			34				84					
			37				94					
			30				76					
			34				69					
			38				80					
			34				90					
			36				98					
			77				100					
			43				84					
			35				85					
			33				78					
			37				97					
			39				85					
			35				93					
			33				91					
			42				74					
			34				115					
			40				135					
			37				105					
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			35									
			31									

September 2003 **Total Catch**	Alewife *Alosa pseudoharengus*	Atlantic Herring *Clupea harengus*	Bay Anchovy *Anchoa mitchilli*	Black Sea Bass *Centropristis striata*	Blueback Herring *Alosa aestivalis*	Bluefish *Pomatomus saltatrix*	Butterfish *Peprilus triacanthus*	Cunner *Tautogolabrus adspersus*	Channel Whelk *Busycon canaliculatum*	Horseshoe Crab *Limulus polyphemus*	Long-finned Squid *Loligo pealei*	Lookdown *Selene vomer*
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September 2003	Alewife	Atlantic Herring	Bay Anchovy	Black Sea Bass	Blueback Herring	Bluefish	Butterfish	Cunner	Channel Whelk	Horseshoe Crab	Long-finned Squid	Lookdown
Total Catch	*Alosa pseudoharengus*	*Clupea harengus*	*Anchoa mitchilli*	*Centropristis striata*	*Alosa aestivalis*	*Pomatomus saltatrix*	*Peprilus triacanthus*	*Tautogolabrus adspersus*	*Busycon canaliculatum*	*Limulus polyphemus*	*Loligo pealei*	*Selene vomer*
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September 2003	Alewife	Atlantic Herring	Bay Anchovy	Black Sea Bass	Blueback Herring	Bluefish	Butterfish	Cunner	Channel Whelk	Horseshoe Crab	Long-finned Squid	Lookdown
Total Catch	*Alosa pseudoharengus*	*Clupea harengus*	*Anchoa mitchilli*	*Centropristis striata*	*Alosa aestivalis*	*Pomatomus saltatrix*	*Peprilus triacanthus*	*Tautogolabrus adspersus*	*Busycon canaliculatum*	*Limulus polyphemus*	*Loligo pealei*	*Selene vomer*
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September 2003	Alewife	Atlantic Herring	Bay Anchovy	Black Sea Bass	Blueback Herring	Bluefish	Butterfish	Cunner	Channel Whelk	Horseshoe Crab	Long-finned Squid	Lookdown
Total Catch	*Alosa pseudoharengus*	*Clupea harengus*	*Anchoa mitchilli*	*Centropristis striata*	*Alosa aestivalis*	*Pomatomus saltatrix*	*Peprilus triacanthus*	*Tautogolabrus adspersus*	*Busycon canaliculatum*	*Limulus polyphemus*	*Loligo pealei*	*Selene vomer*
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September 2003	Alewife	Atlantic Herring	Bay Anchovy	Black Sea Bass	Blueback Herring	Bluefish	Butterfish	Cunner	Channel Whelk	Horseshoe Crab	Long-finned Squid	Lookdown
Total Catch	*Alosa pseudoharengus*	*Clupea harengus*	*Anchoa mitchilli*	*Centropristis striata*	*Alosa aestivalis*	*Pomatomus saltatrix*	*Peprilus triacanthus*	*Tautogolabrus adspersus*	*Busycon canaliculatum*	*Limulus polyphemus*	*Loligo pealei*	*Selene vomer*
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September 2003	Alewife	Atlantic Herring	Bay Anchovy	Black Sea Bass	Blueback Herring	Bluefish	Butterfish	Cunner	Channel Whelk	Horseshoe Crab	Long-finned Squid	Lookdown
Total Catch	*Alosa pseudoharengus*	*Clupea harengus*	*Anchoa mitchilli*	*Centropristis striata*	*Alosa aestivalis*	*Pomatomus saltatrix*	*Peprilus triacanthus*	*Tautogolabrus adspersus*	*Busycon canaliculatum*	*Limulus polyphemus*	*Loligo pealei*	*Selene vomer*
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			101									

September 2003	Alewife	Atlantic Herring	Bay Anchovy	Black Sea Bass	Blueback Herring	Bluefish	Butterfish	Cunner	Channel Whelk	Horseshoe Crab	Long-finned Squid	Lookdown
Total Catch	*Alosa pseudoharengus*	*Clupea harengus*	*Anchoa mitchilli*	*Centropristis striata*	*Alosa aestivalis*	*Pomatomus saltatrix*	*Peprilus triacanthus*	*Tautogolabrus adspersus*	*Busycon canaliculatum*	*Limulus polyphemus*	*Loligo pealei*	*Selene vomer*
			44									
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September 2003	Alewife	Atlantic Herring	Bay Anchovy	Black Sea Bass	Blueback Herring	Bluefish	Butterfish	Cunner	Channel Whelk	Horseshoe Crab	Long-finned Squid	Lookdown
Total Catch	*Alosa pseudoharengus*	*Clupea harengus*	*Anchoa mitchilli*	*Centropristis striata*	*Alosa aestivalis*	*Pomatomus saltatrix*	*Peprilus triacanthus*	*Tautogolabrus adspersus*	*Busycon canaliculatum*	*Limulus polyphemus*	*Loligo pealei*	*Selene vomer*
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September 2003	Alewife	Atlantic Herring	Bay Anchovy	Black Sea Bass	Blueback Herring	Bluefish	Butterfish	Cunner	Channel Whelk	Horseshoe Crab	Long-finned Squid	Lookdown
Total Catch	*Alosa pseudoharengus*	*Clupea harengus*	*Anchoa mitchilli*	*Centropristis striata*	*Alosa aestivalis*	*Pomatomus saltatrix*	*Peprilus triacanthus*	*Tautogolabrus adspersus*	*Busycon canaliculatum*	*Limulus polyphemus*	*Loligo pealei*	*Selene vomer*
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			32									
			30									
			36									
Total Count	1	1	45,606	2	1	7	102	2	2	1	83	1
LENGTH (TL mm)												
Mean	38.00	105.00	38.57	420.00	86.00	209.71	92.1	151.0	82.0	195.0	109.4	59.0
Smallest	38	105	27	412	86	135	69	132	53	195	62	59
Largest	38	105	100	428	86	249	135	170	111	195	177	59
SD	0.00	0.00	10.66	11.31	0.00	37.94	10.93	26.87	41.01	0.00	24.18	0.00
BIOMASS (g)												
Total	1	7	61,060	3,300	15	770	1,899	180	325	1,000	2,420	5
Mean	1.00	7.00	1.34	1650.00	15.00	110.00	18.6	90.0	162.5	1000.0	29.2	5.0
			N=1018									

September 2003	Menhaden	Norther Puffer	Northern Searobin	Oyster Toadfish	Rock Crab	Scup	Silverside	Spider Crab	Weakfish	Asteriid Sea Star	Winter Flounder
Total Catch	*Brevoortia tyrannus*	*Sphoeroides maculatus*	*Prionotus carolinus*	*Opsanus tau*	*Cancer irroratus*	*Stenotomus chrysops*	*Menidia menidia*	*Libinia dubia*	*Cynoscion regalis*	*Asterias forbesi*	*Pseudopleuronectes americanus*
	375	65	92	107	23	310	96	50	135	125	270
					21	281			69	200	170
					14	293			83		157
						325			84		173
						312			84		171
						97			84		174
						64			74		233
						67			115		240
						274			92		95
						55			35		
						81			31		
						60			94		
						68			128		
						70			95		
						68			78		
						60			74		
						67			136		
						87			187		
						90			168		
						55			190		
						65			182		
						64			64		
						60			67		
						68			68		
						64			76		
						75			80		
						54			80		
						95			81		
						52			76		
						59			73		
						57			75		
						52			68		
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						50			67		
						81			95		
						89			87		
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						67			86		
						67			72		
						54			87		
						66			102		
						61			76		
						67			71		
						77			81		
						66			81		
						50			87		
						64			87		
						55			83		
						67			75		
						61			105		
						320			70		
						55			111		
						51			90		
						71			80		
						69			76		
						67			89		
						90			83		
						85			100		
						70			104		
						76			74		
						71			83		
						69			73		
						87			91		
						87			140		
						76			98		
						49			80		
						79			87		
						80			85		
						62			93		
						66			83		
						61			77		
						51			86		
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						64			90		
						61			87		
						72			98		
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						51			78		
						56			95		
						59			80		
						50			84		
						56			84		
						81			87		
						53			25		
						80			85		
						64			55		
						55					
						58					
						370					
						84					

September 2003	Menhaden	Norther Puffer	Northern Searobin	Oyster Toadfish	Rock Crab	Scup	Silverside	Spider Crab	Weakfish	Asteriid Sea Star	Winter Flounder
Total Catch	*Brevoortia tyrannus*	*Sphoeroides maculatus*	*Prionotus carolinus*	*Opsanus tau*	*Cancer irroratus*	*Stenotomus chrysops*	*Menidia menidia*	*Libinia dubia*	*Cynoscion regalis*	*Asterias forbesi*	*Pseudopleuronectes americanus*
						178					
						82					
						71					
						61					
						52					
						57					
						54					
						87					
						87					
						100					
						49					
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						57					

September 2003	Menhaden	Norther Puffer	Northern Searobin	Oyster Toadfish	Rock Crab	Scup	Silverside	Spider Crab	Weakfish	Asteriid Sea Star	Winter Flounder
Total Catch	*Brevoortia tyrannus*	*Sphoeroides maculatus*	*Prionotus carolinus*	*Opsanus tau*	*Cancer irroratus*	*Stenotomus chrysops*	*Menidia menidia*	*Libinia dubia*	*Cynoscion regalis*	*Asterias forbesi*	*Pseudopleuronectes americanus*
Total Count	1	1	1	1	3	3228	1	1	219	2	9
LENGTH (TL mm)											
Mean	375.0	65.0	92.0	107.0	19.3	78.4	96.0	50.0	87.8	162.5	187.0
Smallest	375	65	92	107	14	45	96	50	25	125	95
Largest	375	65	92	107	23	370	96	50	190	200	270
SD	0.0	0.00	0.00	0.00	4.73	57.70	0.00	0.00	25.80	53.03	0.00
BIOMASS (g)											
Total	500	16	20	45	20	14,899	10	70	1,240	750	1,100
Mean	500.0	16.0	20.0	45.0	6.7	4.6	10.0	70.0	5.7	375.0	122.2
						N=165			N=101		

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February 2004 **Total Catch**	Atlantic Herring *Clupea harengus*	Black Sea Bass *Centropristis striata*	Grubby *Myoxocephalus aenaeus*	Cunner *Tautogolabrus adspersus*	Rock Crab *Cancer irroratus*	Rock Gunnel *Pholis gunnellus*	Asteriid Sea Star *Asterias forbsei*	Spider Crab *Libinia dubia*	Tautog *Tautoga onitis*	Winter Flounder *Pseudopleuronectes americanus*
	230	110	104	48	42	125	150	70	76	50
	231		70	50		74	216	80		66
	265		58	57			185	35		58
	225		82	61			194	72		47
	222		96	42			175			72
	200		72	48			128			52
	195		77	47			221			125
	235		62	52			200			87
			84	48			190			110
			92	37			194			104
			68	38			215			52
			66	46			175			300
			62	47			176			80
			58	43			200			62
			62	51			208			87
			65	42						75
			58	45						65
			72	42						
			87	53						
			58	38						
			57	28						
			65	33						
			62	41						
			52	31						
			62							
			103							
			55							
			80							
			64							
			82							
			85							
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			72							
			67							
			65							

February 2004	Atlantic Herring	Black Sea Bass	Grubby	Cunner	Rock Crab	Rock Gunnel	Asteriid Sea Star	Spider Crab	Tautog	Winter Flounder
Total Catch	*Clupea harengus*	*Centropristis striata*	*Myoxocephalus aenaeus*	*Tautogolabrus adspersus*	*Cancer irroratus*	*Pholis gunnellus*	*Asterias forbsei*	*Libinia dubia*	*Tautoga onitis*	*Pseudopleuronectes americanus*
			82							
			65							
			78							
			62							
			78							
			98							
			65							
			78							
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			94							
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			74							
			66							
			70							
			72							
			61							
Total Count	8	1	80	24	1	2	15	4	1	17
LENGTH (TL mm)										
Mean	225.38	110.00	72.64	44.5	42.0	99.50	188.47	64.25	76.00	87.8
Smallest	195	110	52	28	42	74	128	35	76	47
Largest	265	110	104	61	42	125	221	80	76	300
SD	21.69	0.00	13.30	7.92	0.00	36.06	25.21	19.97	0.00	59.08
BIOMASS (g)										
Total	615	15	644	56	9	7	1,950	620	5	501
Mean	76.88	15.00	8.05	2.3	9.0	3.25	130.00	155.00	5.0	29.4

May 2004	Alewife	American Lobster	Asteriid Sea Star	Banded Gunnel	Clearnose Skate	Cunner	Feather Blenny	Grubby	Hogchocker	Horseshoe Crab	Long-finned Squid	Red Hake
Total Catch	*Alosa pseudoharengus*	*Homarus americanus*	*Asterias forbesi*	*Pholis fasciata*	*Raja eglanteria*	*Tautogolabrus adspersus*	*Hypsoblennius hentzi*	*Myoxocephalus aenaeus*	*Trinectes maculatus*	*Limulus polyphemus*	*Loligo pealei*	*Urophycis chuss*
	68	110	140	125	409	70	165	83	61	220	275	79
		100	230		432	142		70		177	235	105
			162		510	65		72		156	175	87
			195		410	55		65		125	170	92
			218		400	39		85		245	240	77
			169		440	20		68		190	337	82
			190		455	58		84		125	322	91
			224		420	63		70		198	340	101
			130		400	59		75		210	290	89
			183		85	52		107		198	335	101
			210		422			81		270	195	88
			189		130			80		180	202	92
			72		452			62		175	180	79
			220		400					220	145	93
			248		459					222	195	95
			205		441					146	210	90
					352					174	225	90
					368					229	165	90
										253	170	30
										240	193	98
										145	175	111
										150	195	147
											135	146
											180	121
											145	126
											155	95
											300	84
											170	89
											145	321
											160	100
											175	98
												108
												52
												72
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												103

May 2004 Total Catch	Alewife *Alosa pseudoharengus*	American Lobster *Homarus americanus*	Asteriid Sea Star *Asterias forbesi*	Banded Gunnel *Pholis fasciata*	Clearnose Skate *Raja eglanteria*	Cunner *Tautogolabrus adspersus*	Feather Blenny *Hypsoblennius hentzi*	Grubby *Myoxocephalus aenaeus*	Hogchocker *Trinectes maculatus*	Horseshoe Crab *Limulus polyphemus*	Long-finned Squid *Loligo pealei*	Red Hake *Urophycis chuss*
Total Count	1	2	16	1	18	10	1	13	1	22	31	86
LENGTH (TL mm)												
Mean	68.00	105.00	186.56	125.00	388.06	62.30	165.00	77.08	61.00	193.09	210.77	99.81
Smallest	68	100	72	125	85	20	165	62	61	125	135	30
Largest	68	110	248	125	510	142	165	107	61	270	340	321
SD	0.00	7.07	44.40	0.00	108.35	31.52	0.00	11.73	0.00	41.68	62.93	29.98
BIOMASS (g)												
Total	5	1,000	2,140	7	8,800	86	20	122	115	33,000	5,090	845
Mean	5.00	500.00	133.75	7.00	488.89	8.60	20.00	9.38	115.00	1500.00	164.19	9.83

May 2004	Rock Crab	Rock Gunnel	Round Herring	Scup	Silver Hake	Smallmouth Flounder	Spider Crab	Stone Crab	Summer Flounder	Tautog	Tomcod	Windowpane	Winter Flounder
Total Catch	*Cancer irroratus*	*Pholis gunnellus*	*Estrumeus sadina*	*Stenotomus chrysops*	*Merluccius bilinearis*	*Etropus microstomus*	*Libinia dubia*	*Menippe mercenaria*	*Paralichthys dentatus*	*Tautoga onitis*	*Microgadus tomcod*	*Scophthalmus aquosus*	*Pseudopleuronectes americanus*
	90	78	64	322	127	120	95	18	400	124	93	243	215
	82	62			104	114	84	10	600	510	151	255	196
	97	75			78	100	80		600	150	191	283	86
	15				91	62	82		600	480	52	174	116
	22					70	88		365	407	56	272	215
	17					105	81		462			260	100
	14					66	75		400			270	90
	14					104	75		267			97	100
	20					126	78		486			68	90
	18					100	80					240	85
	23						75					295	97
	14						69					75	210
	15						42					60	117
	23						45					120	87
	22						65					135	119
	17						50					125	120
	12						80					195	130
	14						58					172	85
							72					265	100
							49					171	115
							60					80	83
							85					186	100
							87					115	81
							42					149	116
							87					74	87
							60					62	74
							87					186	90
							40					265	88
							32					257	82
							65					192	116
							71					274	185
							53					215	99
							50					155	97
							53					69	73
							72					64	86
							65					281	86
							55					225	82
							42					128	79
							42					145	65
							60					141	81
							62					161	82
							90					90	65
							64					145	78
							53					89	260
							47					64	90
							63					73	76
							61					300	78
							70					134	65
							43					129	75
							60					84	65
							42					296	92
							54					271	65
							48					238	68
							66						80
							53						69
							48						86
							59						71
							50						98
							48						65
							45						104
							62						74
							81						178
							65						120
							58						72
							83						100
							95						95
							74						104
							80						70
							42						83
							70						110
							78						84
							72						89
							60						72
							53						64
							55						66
							78						65
							50						72
							60						59
							42						115
							58						83
							63						92
							78						76
							68						84
							86						172
							70						231
							70						264
							70						195
							53						128
							66						215
							58						96
							73						87
							73						260
							67						105
							66						117
							54						85
							60						126
							78						89
							59						70
							66						75
							55						107
							64						87
							45						83

May 2004 **Total Catch**	Rock Crab *Cancer irroratus*	Rock Gunnel *Pholis gunnellus*	Round Herring *Estrumeus sadina*	Scup *Stenotomus chrysops*	Silver Hake *Merluccius bilinearis*	Smallmouth Flounder *Etropus microstomus*	Spider Crab *Libinia dubia*	Stone Crab *Menippe mercenaria*	Summer Flounder *Paralichthys dentatus*	Tautog *Tautoga onitis*	Tomcod *Microgadus tomcod*	Windowpane *Scophthalmus aquosus*	Winter Flounder *Pseudopleuronectes americanus*
							50						79
							60						96
							77						76
							78						84
							60						128
							60						107
							55						102
							48						74
							48						84
							53						263
							54						137
							54						72
							50						140
							85						145
							85						133
							30						82
							65						84
							52						67
							35						98
							64						84
							48						105
							85						98
							72						97
							52						86
							94						102
							81						78
							62						137
							84						72
							91						86
							56						138
							52						89
							72						72
							85						213
							53						263
							68						97
							50						103
							35						156
							94						179
							70						183
							95						75
							52						76
							77						86
							95						92
							87						74
							78						82
							70						110
							52						97
							60						82
							51						80
							54						85
							74						84
							61						102
							58						74
							42						100
							90						92
							72						80
							55						123
							70						84
							90						110
							72						98
							71						112
							84						75
							89						192
							42						72
							52						138
							53						91
							50						97
							84						80
							94						95
							65						72
							48						91
							70						95
							45						94
							63						87
							92						85
							42						74
							51						300
							79						96
							72						248
							60						97
							52						78
							73						65
							56						121
							44						85
							41						103
							47						72
							52						75
							50						200
							68						83
							91						91
							45						88
							40						84
							52						90
							54						66
							77						60
							50						77
							50						82
							43						83
							55						80
							48						94
							32						134
							41						75

May 2004 **Total Catch**	Rock Crab *Cancer irroratus*	Rock Gunnel *Pholis gunnellus*	Round Herring *Estrumeus sadina*	Scup *Stenotomus chrysops*	Silver Hake *Merluccius bilinearis*	Smallmouth Flounder *Etropus microstomus*	Spider Crab *Libinia dubia*	Stone Crab *Menippe mercenaria*	Summer Flounder *Paralichthys dentatus*	Tautog *Tautoga onitis*	Tomcod *Microgadus tomcod*	Windowpane *Scophthalmus aquosus*	Winter Flounder *Pseudopleuronectes americanus*
							37						296
							31						219
							51						77
							50						77
							58						84
							44						321
							81						68
							48						96
							50						89
							52						251
							71						76
							47						81
							53						71
							54						135
							76						85
							91						196
							91						77
							85						143
							68						225
							72						87
							74						130
							85						85
							51						74
							47						75
							52						204
							64						87
							50						103
							51						87
							53						196
							71						80
							60						200
							54						182
							56						201
							62						98
							68						202
							71						188
							57						186
							48						173
							55						77
							57						86
							52						69
							80						135
							81						76
							85						90
							42						92
							56						146
							78						125
							58						96
							84						89
							58						80
							57						79
							78						82
							65						74
							72						79
							58						95
							68						76
							50						97
							73						92
							44						88
							53						75
							82						82
							73						89
							52						65
							51						86
							70						92
							60						66
							42						148
							50						88
							51						80
							75						84
							72						69
							85						45
							92						125
							80						115
							49						186
							68						82
							85						360
							49						76
							45						85
							52						109
							60						96
							68						200
							39						90
							50						85
							52						101
							54						89
							55						68
							72						85
							83						102
							49						81
							72						113
							57						94
							48						90
							60						115
							49						146
							35						119
							58						91
							62						94
							50						140
							71						141
							42						55
							48						188

May 2004 **Total Catch**	Rock Crab *Cancer irroratus*	Rock Gunnel *Pholis gunnellus*	Round Herring *Estrumeus sadina*	Scup *Stenotomus chrysops*	Silver Hake *Merluccius bilinearis*	Smallmouth Flounder *Etropus microstomus*	Spider Crab *Libinia dubia*	Stone Crab *Menippe mercenaria*	Summer Flounder *Paralichthys dentatus*	Tautog *Tautoga onitis*	Tomcod *Microgadus tomcod*	Windowpane *Scophthalmus aquosus*	Winter Flounder *Pseudopleuronectes americanus*
							64						137
							58						88
							60						155
							42						93
							48						83
							46						100
							45						85
							60						104
							70						94
							67						112
							55						91
							58						76
							55						88
							54						84
							85						74
							59						109
							78						138
							50						101
							75						131
							55						54
							52						134
							94						61
							68						110
							65						81
							72						64
							72						73
							50						69
							61						95
							64						131
							90						140
							105						91
							67						88
							55						66
							52						125
							50						98
							51						145
							48						131
							60						102
							45						90
							60						75
							50						93
							68						109
							52						123
							58						154
							52						93
							61						84
							68						101
							60						92
							94						100
							58						105
							85						87
							58						90
							50						78
							52						87
							54						91
							60						77
							55						149
							45						75
							42						61
							60						95
							58						97
							78						100
							52						74
							75						73
							85						97
							50						94
							60						82
							95						101
							58						72
							90						104
							56						74
							78						90
							50						72
							50						86
							55						77
							61						101
							60						95
							72						90
							58						95
							71						70
							50						121
							50						65
							55						83
							50						225
							48						71
							65						65
							72						103
							40						71
							92						80
							82						72
							51						67
							45						
							60						
							82						
							60						
							48						
							76						
							61						
							65						
							51						
							75						
							57						

May 2004	Rock Crab	Rock Gunnel	Round Herring	Scup	Silver Hake	Smallmouth Flounder	Spider Crab	Stone Crab	Summer Flounder	Tautog	Tomcod	Windowpane	Winter Flounder
Total Catch	*Cancer irroratus*	*Pholis gunnellus*	*Estrumeus sadina*	*Stenotomus chrysops*	*Merluccius bilinearis*	*Etropus microstomus*	*Libinia dubia*	*Menippe mercenaria*	*Paralichthys dentatus*	*Tautoga onitis*	*Microgadus tomcod*	*Scophthalmus aquosus*	*Pseudopleuronectes americanus*
							55						
							42						
							90						
							65						
							44						
							55						
							84						
							57						
							56						
							55						
							50						
							68						
							54						
							55						
							55						
							48						
							62						
							73						
							70						
							50						
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							53						
							71						
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							60						
							66						
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							71						
							78						
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							65						
							50						
							78						
							53						
							42						
							47						
							67						
							58						
							50						
							55						
							50						
							42						
							85						
							55						
							52						
							55						
							88						
							56						
							47						
Total Count	18	3	1	1	4	10	457	2	9	5	5	53	397
LENGTH (TL mm)													
Mean	29.39	71.67	64.00	322.00	100.00	96.70	62.01	14.00	464.44	334.20	108.60	171.92	105.34
Smallest	12	62	64	322	78	62	30	10	267	124	52	60	45
Largest	97	78	64	322	127	126	105	18	600	510	191	300	360
SD	28.07	8.50	0.00	0.00	20.90	22.86	14.50	5.66	118.73	184.10	60.83	78.67	46.09
BIOMASS (g)													
Total	249	10	3	500	50	92	55,790	3	11,420	6,055	70	6,275	11,905
Mean	13.83	3.33	3.00	500.00	12.50	9.20	122.08	1.50	1268.89	1211.00	14.00	118.40	29.99

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July 2004	Asteriid Se	Bay Ancho	Blueback H	Butterfish	Clearnose S	Cunner	Grubby	Hogchocker	Horseshoe Cr	Lady Crab
Total Catch	Asterias for	Anchoa mit	Alosa aestiv	Poronotus tria	Raja eglante	Tautogolabrus ad	Myoxocephalus ae	Trinectes mac	Limulus polyph	Ovalipes oc
	182	62	75	135	435	102	42	167	200	11
	150	85	82	102		85			205	61
	215	78	77	105		78			245	74
	171	82	100	122		72			215	8
	172	87	78	143		95			218	4
	172	84	92	132		61			250	
		81	94	141		52			158	
		65	90	114		66			160	
		62	82	138		71			145	
		74	95	129		52			250	
		69	87	134		49			235	
		60	85	120		76			128	
		58	82	136		77			205	
		92	95	107		103			172	
		72	91	126		60			191	
		92	84	99		106			157	
		70	90						204	
		65	89						182	
		62	88						147	
		85	90						222	
		90	94						200	
		94	87						205	
		74	85							
		72	92							
		90	86							
		79	80							
		84	94							
		72	94							
		91	78							
		70	76							
		80	94							
		93	86							
		96	86							
		70	78							
		84	83							
		92	82							
		90	83							
		68	86							
		75	84							
		94	91							
		87	83							
		64	85							
		72	87							
		91	82							
		90	94							
		67	79							
		71	86							
		90	97							
		85	87							
		72	87							
		95	100							
		98	81							
		92	90							
		90	88							
		97	89							
		72	65							
		74	77							
		68	97							
		72	96							
		95	80							
		97								
		84								
		80								
		75								
		68								
		70								
		75								
		92								
		91								
		78								
		75								
		82								
		70								
		90								
		87								
		82								
		78								
		75								
		78								
		92								
		65								
		78								
		77								
		72								
		78								
		90								
		84								
		75								
		80								
		98								
		90								
		82								

July 2004	Asteriid Se	Bay Ancho	Blueback H	Butterfish	Clearnose S	Cunner	Grubby	Hogchocker	Horseshoe Cr	Lady Crab
Total Catch	Asterias fo	Anchoa mi	Alosa aesti	Poronotus tria	Raja eglante	Tautogolabrus a	Myoxocephalus a	Trinectes ma	Limulus polyp	Ovalipes o
		72								
		75								
		80								
		68								
		50								
		76								
		91								
		71								
		82								
		78								
		72								
		65								
		72								
		84								
		74								
		92								
		75								
		81								
		85								
		82								
		68								
		94								
		85								
		67								
		72								
		80								
		77								
		75								
		70								
		90								
		75								
		87								
		72								
		75								
		72								
		70								
		68								
		84								
		91								
		80								
		72								
		75								
		81								
		78								
		92								
		74								
		75								
		92								
		68								
		91								
		90								
		78								
		68								
		64								
		65								
		76								
		95								
		75								
		76								
		76								
		85								
		83								
		74								
		77								
		75								
		78								
		75								
		75								
		87								
		76								
		83								
		84								
		78								
		86								
		67								
		84								
		92								
		97								
		90								
		87								
		74								
		83								
		76								
		77								
		88								
		85								
		71								
		87								
		71								
		84								
		83								
		75								

July 2004	Asteriid Se	Bay Ancho	Blueback H	Butterfish	Clearnose S	Cunner	Grubby	Hogchocker	Horseshoe Cr	Lady Crab
Total Catch	Asterias for	Anchoa mit	Alosa aestiv	Poronotus tria	Raja eglante	Tautogolabrus a	Myoxocephalus ae	Trinectes mac	Limulus polyp	Ovalipes o
		82								
		81								
		72								
		80								
		72								
		80								
		84								
		81								
		83								
		75								
		76								
		84								
		79								
		84								
		81								
		81								
		76								
		82								
		65								
		74								
		80								
		73								
		74								
		78								
		74								
		78								
		87								
		80								
		76								
		74								
		72								
		76								
		64								
		70								
		66								
		74								
		74								
		73								
		70								
		72								
		66								
		65								
		76								
		68								
		69								
		76								
		75								
		65								
		74								
		63								
		83								
		88								
		80								
		79								
		73								
		70								
		74								
		94								
		71								
		70								
		74								
		87								
		86								
		85								
		82								
		82								
		95								
		82								
		82								
		81								
		71								
		92								
		81								
		85								
		76								
		72								
		70								
		74								
		85								
		85								
		80								
		69								
		87								
		69								
		81								
		74								
		84								
		73								
		82								
		78								
		70								
		80								

July 2004	Asteriid Se	Bay Ancho	Blueback H	Butterfish	Clearnose S	Cunner	Grubby	Hogchocker	Horseshoe Cr	Lady Crab
Total Catch	Asterias for	Anchoa mit	Alosa aestiv	Poronotus tria	Raja eglante	Tautogolabrus ad	Myoxocephalus ae	Trinectes mac	Limulus polyph	Ovalipes oc
		70								
		82								
		79								
		80								
		77								
		64								
		62								
		85								
		75								
		76								
		91								
		68								
		90								
		80								
		75								
		89								
		82								
		70								
		75								
		70								
		77								
		80								
		75								
		69								
		94								
		61								
		84								
		83								
Total Count	6	304	60	16	1	16	1	1	22	5
LENGTH (TL mm)										
Mean	177	78.45724	86.583333	123.9375	435	75.3125	42	167	195.1818182	31.6
Smallest	150	50	65	99	435	49	42	167	128	4
Largest	215	98	100	143	435	106	42	167	250	74
SD	21.37288	8.696846	6.8353311	14.5669432	0	18.70372066	0	0	35.37773898	33.18584
BIOMASS (g)										
Total	470	10172	445	630	500	172	3	110	41600	107
Mean	78.33333	#DIV/0!	7.4166667	39.375	500	10.75	3	110	1890.909091	21.4

July 2004	Long-finned S	Mantis Shri	Rock Crab	Scup	Smallmouth Flo	Spider Cr	Spotted Hal	Striped Sea	Summer Flour	Tautog	Windowpane	Winter Flounder
Total Catch	Loligo pealei	Squilla emp	Cancer irro	Stenotomus ch	Etropus microst	Libinia du	Urophycis r	Prionotus e	Paralichthys d	Tautoga or	Scophthalmus a	Pseudopleuronectes a
	83	142	11	262	83	65	201	315	281	372	252	46
	56	139	18	285		82	162		435	426	184	42
	70	138	140	271		62	158		485		191	50
	86		12	242		90	182		290		186	54
	120		16	251		57	172				287	58
	104		12	240		92	161				195	49
	95		10	186		65	158				279	53
	84		12	196		72	182				205	51
	90			248		60					182	60
				211		92					152	66
				268		84					182	58
				247		62					80	50
				200		70					91	56
				327		65					148	52
				285		54					120	105
				207		71					179	98
				186		65					197	52
				255		82					220	47
				273		63					61	103
				294		82					189	58
				290		84					143	56
						95					127	49
						85					216	52
						65						172
						84						184
						61						36
						79						38
						86						37
						83						52
						73						34
						84						50
						86						110
						70						109
						62						52
						72						51
						90						48
						84						52
						60						107
						92						110
						47						127
						31						109
						65						119
						69						110
						65						115
						60						45
						52						110
						75						46
						87						52
						72						242
												127
												106
												59
												103
												62
												41
												138
												68
												150
												274
												180
												105
												62
												134
												115
												120
												120
												125
												123
												132
												108
												58
												126
												144
												117
												108
												127
												62
												41
												55
												63
												66
												112
												59
												123
												105
												100
												65
												52
												59
												117
												64
												122

July 2004	Long-finned S	Mantis Shri	Rock Crab	Scup	Smallmouth Flo	Spider Cr	Spotted Hal	Striped Sea	Summer Flour	Tautog	Windowpane	Winter Flounder
Total Catch	Loligo pealei	Squilla emp	Cancer irro	Stenotomus ch	Etropus microst	Libinia du	Urophycis r	Prionotus ev	Paralichthys d	Tautoga on	Scophthalmus a	Pseudopleuronectes ar
												63
												147
												113
												56
												127
												162
												118
												42

July 2004	Long-finned S	Mantis Shri	Rock Crab	Scup	Smallmouth Flo	Spider Cr	Spotted Hal	Striped Sea	Summer Flour	Tautog	Windowpane	Winter Flounder
Total Catch	Loligo pealei	Squilla em	Cancer irro	Stenotomus ch	Etropus microst	Libinia du	Urophycis r	Prionotus e	Paralichthys d	Tautoga or	Scophthalmus a	Pseudopleuronectes ar
Total Count	9	3	8	21	1	49	8	1	4	2	23	100
LENGTH (TL mm)												
Mean	87.5555556	139.6667	28.875	248.7619048	83	72.5102	172	315	372.75	399	176.7826087	89.07
Smallest	56	138	10	186	83	31	158	315	281	372	61	34
Largest	120	142	140	327	83	95	201	315	485	426	287	274
SD	18.4533947	2.081666	44.98075	39.05240679	0	13.617	15.371588	0	102.8603422	38.18377	57.27204341	44.91838952
BIOMASS (g)												
Total	252	170	14	6980	8	9100	365	500	2725	3400	3075	2228
Mean	28	56.66667	1.75	332.3809524	8	185.714	45.625	500	681.25	1700	133.6956522	22.28

Appendix B

Benthic Macroinvertebrate Data

Taxon/Sample Abundance	A1	B1	A2	B2	A3	B3	A4	B4	A5	B5	A6	B6	A7	B7	A8	B8	A9	B9	A10	B10	A11	B11	A12	B12	A13	B13	A14	B14	A15	B15	A16	A17	A18	A19	A20	A21
Nematoda (LPIL)	120	96	8	168	204	1352	76	320	368	104	130	63	42	448	136	56	98	208	20	1092	76	384	35	204	196	444	152	652	396	272	348	172	1036	668	72	160
Annelida: Oligochaeta (LPIL)	16	52		21	8	184	32	24	80	16	102	4	20	88	8	4	30	40	4	48	12	64	19	64	64	108	12	20	96	44	80	24	130	280	28	60
Annelida: Polychaeta (LPIL):												1																								
Ampharetidae (LPIL)								4				13						4						10												
Ampharete (LPIL)	12			12	20	8			12		8			32	8		8			32				2		8		4	16	36	20	8	14	16	4	4
Ampharete lindstroemi	4				4			4			2			8		4	4			20	12	12		8		52	24	12		12			6	4		
Asabellides oculata					8	4					4																									
Melinna (LPIL)																																		4		
Arabellidae (LPIL):																																			4	
Drilonereis longa																																				
Capitellidae:																																				
Mediomastus (LPIL)				9	12							1									12	8														
Cossuridae:																																				
Cossura longocirrata				12	12	16	16		28				8	8	20	10	24					12		4	4	4	8	28	24	8	56	8	16	4		
Cirratulidae (LPIL)	12	8			24	12	112	4	28	24	72	26	12	48	20	26	34	36		56	68	36	104	138	4	180	56	80	244	36	32	96	38	156	48	64
Chaetozone sp. A																	2																			
Tharyx (LPIL)							4	4		8							4	4		20		12		2		8	20		16			28				
Eunicidae:																																				
Marphysa (LPIL)																																4				
Flabelligeridae (LPIL):											2																									
Pherusa plumosa																			2		4													8		
Glyceridae:																																				
Glycera (LPIL):	4							4	8			1								4				10		8			12						4	
Glycera americana	4											1												2												
Hesionidae (LPIL)											2																				4					
Maldanidae (LPIL):						8												4												4		4				
Asychis (=Sabaco) elongata	12	12			8	8				8		1	8		4				2						4	4										
Euclymene zonalis								4				1																			4	4		8		
Praxillella praetermissa					8						2	4					2							4						20						
Nephtyidae:																																				
Nephtys (LPIL)	4	16		21	36	8	4		12	16		9		16				8	6				8	6	4	20			4	4		12	10	28		
Nephtys incisa			4					8	8		4		12		12		6		6		8						12				8					4
Nephtys picta																6				8		16		4		8			8	4			4			
Nereididae (LPIL)																																				
Neanthes (Nereis) succinea							4																													
Orbiniidae:																																				
Scoloplos (=Leitoscoloplos) robustus												1																				4				

Taxon/Sample Abundance	A1	B1	A2	B2	A3	B3	A4	B4	A5	B5	A6	B6	A7	B7	A8	B8	A9	B9	A10	B10	A11	B11	A12	B12	A13	B13	A14	B14	A15	B15	A16	A17	A18	A19	A20	A21
Paraonidae:																																				
Aricidea (LPIL)																				12				8		20				4				4		4
Levinsenia gracilis																																				
Paraonis fulgens																																				
Pectinariidae:																																				
Cistenides (=Pectinaria) hyperborea	4				12	20		4	24	8	4	1	8	4	8		18		4	4	16				36	4	8	12	12	4	20	4	18	16	4	4
Polynoidae (LPIL):																							4													
Eunoe nodosa																																				
Harmothoe extenuata											2													2												
Sabellariidae:																																				
Sabellaria vulgaris																							4													
Sabellidae:																																				
Pseudopotamilla (=Potamilla) reniformis																																				
Demonax (=Sabella) microphthalma																																				
Scalibregmidae:																																				4
Scalibregma inflatum					16			8		8		3		4		2	2			8		12		12		32		8	8	12		16	2	12	8	
Sigalionidae:																																				
Sthenelais boa																																			4	
Spionidae (LPIL):						4																		6											4	
Polydora cornuta	40			6	8	4	16	16		16	4	31		12	16	8	12	4		8	48	16	16	10		20	56		316	4	4	16				
Spiophanes bombyx					4							4		4		2						12				8				8						

Taxon/Sample Abundance	A1	B1	A2	B2	A3	B3	A4	B4	A5	B5	A6	B6	A7	B7	A8	B8	A9	B9	A10	B10	A11	B11	A12	B12	A13	B13	A14	B14	A15	B15	A16	A17	A18	A19	A20	A21
Streblospio benedicti	44					4						1					2							6			8		8	4			2			
Syllidae (LPIL):											2	1																								
Brania wellfleetensis																		4					12					4	16							
Syllides (LPIL)											2																									
Phyllodocidae (LPIL):																																				
Eteone (LPIL)																																				
Anaitides (=Phyllodoce) mucosa					4						2							4			4			4		4	8		4	8					8	
Mollusca:																																				
Gastropoda (LPIL):							4		4																4						4					
Calyptraeidae:																																				
Crepidula fornicata								4			8	39		8			4							36		8									4	20
Crepidula plana												11												6		4	12									4
Muricidae:																																				
Eupleura caudata																	2																			
Nassariidae:																																				
Nassarius (=Ilyanassa) trivittatus		4	4	3	8	4			8	8			16		8	2	2		4					2	4	4	4		4	4		4	10	8		
Retusidae:																																				
Acteocina canaliculata															4				2		8															
Pyramidellidae:																																				
Turbonilla (LPIL)	32	16		3	4				8			4	12	8		2	2		2	4	4				12	12	8			4	4				4	
Bivalvia (LPIL):	12	32	4				4		8	8	4	3	4	8	8	4	10		4			12		2	28	8		4	32				4	8		
Arcidae:																																				
Anadara transversa												1												4				4								
Pandoridae:																																				
Pandora gouldiana		8		6		12				8		6		4								4				12										
Tellinidae:																																				
Tellina agilis	4		4	6			4		16	8	2	3									12						4	4	4		4					4
Thraciidae:																																				
Thracia (LPIL)	4		4						12		4						6		2	8	28				12		16		12		8		8		4	
Lyonsiidae																																				
Lyonsia hyalina											2		4														4	4	4		8		8		12	4
Nuculidae:																																				
Nucula proxima			204																2														2			
Veneridae:																																				
Pitar morrhuanus		8	4		4			8		16				4						4		4		2		4										4
Yoldiidae:																																				
Yoldia (LPIL)	4																																			

Taxon/Sample Abundance	A1	B1	A2	B2	A3	B3	A4	B4	A5	B5	A6	B6	A7	B7	A8	B8	A9	B9	A10	B10	A11	B11	A12	B12	A13	B13	A14	B14	A15	B15	A16	A17	A18	A19	A20	A21
Sipuncula																																				
Phascolion strombus													8						4												4					
Crustacea:																																				
Ostracoda (LPIL)											10						2		2														4			
Amphipoda (LPIL):																																				4
Ampeliscidae:																																				
Ampelisca abdita					12	8		4		16	6	6		16		4		4		12				38		28		16		60				12	4	
Aoridae (LPIL):																																				
Leptocheirus pinguis											2		4																4			4	4	12		
Unciola (LPIL)												1												4						4				4		
Unciola irrorata	12	4											8																							
Corophiidae:																																				
Corophium (LPIL)																						8				4			8				2			
Mysida: Mysidae (LPIL)																								2							4					
Heteromysis formosa																																				
Decapoda:																																				
Crangon septemspinosa																										4										
Anomura: *Pagurus longicarpus*												1						4												4						
Porcellanidae (LPIL)	4																																			
Brachyura: Xanthidae (LPIL):					4		4	8	4		2	3					2			8			4	6	4		4	4		4	8	4	2			
Dyspanopeus (=Neopanope) sayi																					4								8						4	
Pisces: Gobiidae (LPIL)																																				
Total sample abundance	348	256	236	267	420	1656	280	428	628	272	384	245	166	720	252	130	276	324	66	1348	316	612	206	608	376	1020	416	856	1256	564	620	412	1320	1252	220	344
Sample ID A = Borrow Area A																																				
Sample ID B = Borrow Area B																																				

Taxon/Sample Abundance	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	A35	Total/species, all samples
Nematoda (LPIL)	408	38	368	408	416	276	252	80	104	212	212	164	304	240	13858
Annelida: Oligochaeta (LPIL)	120	28	168	116	88	108	76	44	56	28	16	48	40	92	2914
Annelida: Polychaeta (LPIL):															1
Ampharetidae (LPIL)	8			28											67
Ampharete (LPIL)	16	1	12				8								321
Ampharete lindstroemi	4						8	10	12	16	8	4	12	24	290
Asabellides oculata															16
Melinna (LPIL)															4
Arabellidae (LPIL):															4
Drilonereis longa									4						4
Capitellidae:															
Mediomastus (LPIL)								8							50
Cossuridae:															
Cossura longocirrata				4			68		52		12	8	16		490
Cirratulidae (LPIL)	60	33		96	256	40	56	26	72	32	64	52	56	64	2841
Chaetozone sp. A															2
Tharyx (LPIL)	4	3		4	8		4	4	4	20	80	12	12	16	301
Eunicidae:															
Marphysa (LPIL)															4
Flabelligeridae (LPIL):															2
Pherusa plumosa					8										22
Glyceridae:															
Glycera (LPIL):	12	1													68
Glycera americana															7
Hesionidae (LPIL)															6
Maldanidae (LPIL):		1													21
Asychis (=Sabaco) elongata															71
Euclymene zonalis							24	2	12		4		4	4	71
Praxillella praetermissa															40
Nephtyidae:															
Nephtys (LPIL)	4	1		4	8					4					273
Nephtys incisa							12	6	8		8		8	8	142
Nephtys picta	4				8										70
Nereididae (LPIL)						4		2							6
Neanthes (Nereis) succinea													4		8
Orbiniidae:															
Scoloplos (=Leitoscoloplos) robustus															5

Taxon/Sample Abundance	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	A35	Total/species, all samples
Paraonidae:															
Aricidea (LPIL)		3	4		8	4		14	12	12	12	12	12	16	161
Levinsenia gracilis										8					8
Paraonis fulgens								2							2
Pectinariidae:															
Cistenides (=Pectinaria) hyperborea		2					76								359
Polynoidae (LPIL):	8		8												20
Eunoe nodosa				4											4
Harmothoe extenuata	4														8
Sabellariidae:															
Sabellaria vulgaris		2	12	4	8						8	12	4	4	58
Sabellidae:															
Pseudopotamilla (=Potamilla) reniformis									4						4
Demonax (=Sabella) microphthalma	4														4
Scalibregmidae:															4
Scalibregma inflatum	4	1		4	8				4	8	4	4			210
Sigalionidae:															
Sthenelais boa						4									8
Spionidae (LPIL):	4		12	8		12	20								70
Polydora cornuta	4	4	12	16	16		40	18	36		44	44	20	48	1009
Spiophanes bombyx													12		54

Taxon/Sample Abundance	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	A35	Total/species, all samples
Streblospio benedicti	4	2	4	16	8	4	56	6			4			8	191
Syllidae (LPIL):					8									4	15
Brania wellfleetensis	16	1				12	4		8			4			81
Syllides (LPIL)															2
Phyllodocidae (LPIL):			4												4
Eteone (LPIL)			4												4
Anaitides (=Phyllodoce) mucosa		4					8		4	4		4	8	4	86
Mollusca:															
Gastropoda (LPIL):				4	8	4									32
Calyptraeidae:															
Crepidula fornicata	36			4					28		8				207
Crepidula plana											4	12			53
Muricidae:															
Eupleura caudata															2
Nassariidae:															
Nassarius (=Ilyanassa) trivittatus							4						4		123
Retusidae:															0
Acteocina canaliculata															14
Pyramidellidae:															
Turbonilla (LPIL)							12						8	4	169
Bivalvia (LPIL):			4			4	40						16		275
Arcidae:															
Anadara transversa															9
Pandoridae:															
Pandora gouldiana														4	64
Tellinidae:															
Tellina agilis	4		12	4			8	6	8		8	12	12	12	165
Thraciidae:															
Thracia (LPIL)		1		4			68		4						205
Lyonsiidae															
Lyonsia hyalina	12		4	8			4	2				4		8	92
Nuculidae:															
Nucula proxima							4								212
Veneridae:															
Pitar morrhuanus				4					4	4		4			78
Yoldiidae:															
Yoldia (LPIL)															4

Taxon/Sample Abundance	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	A35	Total/species, all samples
Sipuncula															
Phascolion strombus															16
Crustacea:															
Ostracoda (LPIL)							4								22
Amphipoda (LPIL):			4												8
Ampeliscidae:															
Ampelisca abdita	16				8	8	4	4			2			12	300
Aoridae (LPIL):							4								4
Leptocheirus pinguis															30
Unciola (LPIL)	8														21
Unciola irrorata															24
Corophiidae:															
Corophium (LPIL)							8								30
Mysida: Mysidae (LPIL)											4				10
Heteromysis formosa							4								4
Decapoda:															
Crangon septemspinosa															4
Anomura: *Pagurus longicarpus*				8											17
Porcellanidae (LPIL)															4
Brachyura: Xanthidae (LPIL):	4		4	4			8	4	12					4	115
Dyspanopeus (=Neopanope) sayi				12											28
Pisces: Gobiidae (LPIL)											4				4
Total sample abundance	768	126	636	764	864	480	884	238	448	348	506	400	552	576	26690
Sample ID A = Borrow Area A															
Sample ID B = Borrow Area B															

Asharoken Borrow Area Investigation
Northport, NY
May/June 2004

Name/Site: wet weight (g)	**1A**	**ww**	**2A**	**ww**	**3A**	**ww**	**4A**	**ww**	**5A**	**ww**	**6A**	**ww**	**7A**	**ww**	**8A**	**ww**	**9A**	**ww**	**10A**
BRYOZOZA																			
*Bowerbankia gracilis**			1		1						1		1				1		
*Bowerbankia imbricata**			1		1						1		1				1		
MOLLUSCA/Pelecypoda																			
Anadara transversa													1	0.0011					
Gemma gemma	1	0.0001			2	0.0001			4	0.0003									
Ensis directus					1	0.0835													
Hiatella spp.																			
Mercenaria mercenaria	2	5.7782	56	42.6755	1	5.4212			6	8.0009					1	0.245			1
Mulinia lateralis			3	1.8891							6	0.0043					2	0.0021	
Mya arenaria																			
Nucula proxima	1	0.0001	55	2.4375					5	0.0006					2	0.0056			
Pandora gouldiana			5	2.7657			18	8.8667							1	0.0089	2	0.0034	2
Pitar morrhuanus					1	12.0665	39	98.4495							3	67.9221	1	9.0008	16
Tellina agilis	1	0.0002							10	0.0023	10	0.0678	1	0.0006					
Yoldia limatula																			
MOLLUSCA/Gastropoda																			
Acteocina canaliculata (Retusa c.)													3	0.0019					
Boonea bisuturalis (Odostomia b.)													2	0.0049					
Crepidula convexa																	1	0.0005	
Crepidula fornicata							3	4.4493											
Crepidula plana																			
Illyanassa obsoleta					1	0.1899	1	0.6774					3	0.3827					8
Urosalpinx cinerea																			
ANNELIDA																			
polytroch larvae***			>100								3								8
Ampharete acutifrons			2	0.0007			4	0.0045			10	0.0022			4	0.0068			9
Ampharete finmarchica	23	0.2389	1	0.0001	21	0.6756	23	0.08989	7	0.0098	12	0.0135			3	0.0021	23	0.0301	18
Amphicteis gunneri					9	0.0124							13	0.0199					
Amphitrite ornata											4	0.0067							
Arenicola marina																			
Asychis elongata	4	0.1099							19	0.10977							13	7.8809	23
Asychis elongata (juveniles)			2																51
Autolytus cornutus															3	0.0006			
Capitella capitata	2	0.0003	17	0.0034			12	0.0067	56	0.0067			26	0.0031	5	0.0091			58

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Name/Site: wet weight (g)	ww	11A	ww	12A	ww	13A	ww	14A	ww	15A	ww	16A	ww	17A	ww	18A	ww	19A	ww
BRYOZOZA																			
*Bowerbankia gracilis**				1				1				1		1		1			
*Bowerbankia imbricata**				1				1				1		1		1			
MOLLUSCA/Pelecypoda																			
Anadara transversa										7	4.5298								
Gemma gemma		59	0.59945					3	0.0002										
Ensis directus														1	0.0056				
Hiatella spp.																			
Mercenaria mercenaria	13.7785	5	7.8894																
Mulinia lateralis						2	0.0442	6	0.0199			2	0.0051	2	0.0068				
Mya arenaria		4	0.0201																
Nucula proxima				23	1.3344											4	0.0017	1	0.0002
Pandora gouldiana	1.4539	34	10.8867																
Pitar morrhuanus	216.0095					3	2.1449			1	7.7509							3	8.1127
Tellina agilis				8	0.8864							1	0.0002						
Yoldia limatula																		1	0.3294
MOLLUSCA/Gastropoda																			
Acteocina canaliculata (Retusa c.)																			
Boonea bisuturalis (Odostomia b.)																			
Crepidula convexa																			
Crepidula fornicata				17	18.2231					43	45.1283								
Crepidula plana				6	0.7591					5	3.2157								
Illyanassa obsoleta	4.9952					3	0.2875											1	0.0912
Urosalpinx cinerea										2	0.5651								
ANNELIDA																			
polytroch larvae***																			
Ampharete acutifrons	0.3378					29	1.7786					41	4.5561	4	0.0774	46	1.0272		
Ampharete finmarchica	0.0893					14	1.9988	56	3.0056	12	0.9224	33	6.9911	9	0.1877	31	0.8911	19	2.0009
Amphicteis gunneri																		5	0.0101
Amphitrite ornata																			
Arenicola marina																			
Asychis elongata	3.7786																		
Asychis elongata (juveniles)																			
Autolytus cornutus																			
Capitella capitata	5.5539							3	0.0009										

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Name/Site: wet weight (g)	**20A**	**ww**	**21A**	**ww**	**22A**	**ww**	**23A**	**ww**	**24A**	**ww**	**25A**	**ww**	**26A**	**ww**	**27A**	**ww**	**28A**	**ww**	**29A**
BRYOZOZA																			
*Bowerbankia gracilis**	1		1				1						1				1		1
*Bowerbankia imbricata**	1		1		1		1						1				1		1
MOLLUSCA/Pelecypoda																			
Anadara transversa			1	0.0011															
Gemma gemma																			
Ensis directus																			
Hiatella spp.													6	2.0334					
Mercenaria mercenaria					1	5.667			1	25.6019					1	2.6679			2
Mulinia lateralis					2	0.0619			3	0.0039									
Mya arenaria																			
Nucula proxima																			
Pandora gouldiana	1	1.3609			1	1.3412			1	0.7942			1	0.0897	1	0.0045	9	6.7702	
Pitar morrhuanus			2	0.0445	1	4.6671											34	146.8874	1
Tellina agilis			4	0.0056	1	0.0022					4	0.0039	4	0.0284					3
Yoldia limatula													1	0.0023					
MOLLUSCA/Gastropoda																			
Acteocina canaliculata (Retusa c.)																			
Boonea bisuturalis (Odostomia b.)																			
Crepidula convexa																			
Crepidula fornicata	1	0.0087	7	3.7774	1	0.0751					1	0.0076					5	7.0933	2
Crepidula plana					1	0.0087													6
Illyanassa obsoleta																			
Urosalpinx cinerea																			
ANNELIDA																			
polytroch larvae***																			
Ampharete acutifrons	4	0.0077	16	0.0093	37	0.0304					49	4.0056	8	0.0092			10	0.0891	33
Ampharete finmarchica	29	1.5538	45	4.9987	19	0.0023	32	3.0112	36	2.9988	32	2.884	2	0.0067	78	2.9974	12	0.0782	12
Amphicteis gunneri							5	0.0089											
Amphitrite ornata			3	0.1098															
Arenicola marina																			
Asychis elongata																			
Asychis elongata (juveniles)																			
Autolytus cornutus			6	0.0128									69	2.6675					
Capitella capitata													23	2.6691			4	0.0011	

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Name/Site: wet weight (g)	ww	30A	ww	31A	ww	32A	ww	33A	ww	34A	ww	35A	ww	Total number of occupied sites (A Sites)	Percent site occupation (A Sites)
BRYOZOZA															
*Bowerbankia gracilis**										1		1		**19**	**0.54**
*Bowerbankia imbricata**										1		1		**20**	**0.57**
MOLLUSCA/Pelecypoda															
Anadara transversa				9	14.9964									**5**	**0.14**
Gemma gemma		1	,0001											**7**	**0.20**
Ensis directus		1	0.0665											**4**	**0.11**
Hiatella spp.														**2**	**0.06**
Mercenaria mercenaria	6.772	1	2.6755									4	54.9871	**13**	**0.37**
Mulinia lateralis										3	0.0072			**11**	**0.31**
Mya arenaria														**2**	**0.06**
Nucula proxima				3	0.0002	17	0.8876	45	2.8776					**11**	**0.31**
Pandora gouldiana														**12**	**0.34**
Pitar morrhuanus	8.9956	11	67.4432	8	78.1241							6	39.9932	**16**	**0.46**
Tellina agilis	0.0078	23	8.5543			4	0.3772	6	0.6744	5	0.0056			**16**	**0.46**
Yoldia limatula														**3**	**0.09**
MOLLUSCA/Gastropoda															
Acteocina canaliculata (Retusa c.)														**2**	**0.06**
Boonea bisuturalis (Odostomia b.)														**2**	**0.06**
Crepidula convexa												6	19.0087	**3**	**0.09**
Crepidula fornicata	0.0666			23	102.7851	34	39.0015	19	7.0334					**13**	**0.37**
Crepidula plana	0.0209			2	1.9932	6	0.6689	2	0.8876					**8**	**0.23**
Illyanassa obsoleta														**7**	**0.20**
Urosalpinx cinerea		1	0.437	1	0.1095									**4**	**0.11**
ANNELIDA															
polytroch larvae***														**4**	**0.11**
Ampharete acutifrons	0.0298									21	3.0012			**18**	**0.51**
Ampharete finmarchica	0.0178			5	0.0733			14	0.6675	21	2.9987	17	0.00176	**30**	**0.86**
Amphicteis gunneri														**5**	**0.14**
Amphitrite ornata														**3**	**0.09**
Arenicola marina										12	2.4451			**2**	**0.06**
Asychis elongata		1	0.0023									19	9.2245	**7**	**0.20**
Asychis elongata (juveniles)														**3**	**0.09**
Autolytus cornutus														**4**	**0.11**
Capitella capitata		22	0.03329											**12**	**0.34**

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Name/Site: wet weight (g)	Total number of individuals (A Sites)		1B	ww	2B	ww	3B	ww	4B	ww	5B	ww	6B	ww	7B	ww	8B
BRYOZOZA																	
*Bowerbankia gracilis**	**18**						1										
*Bowerbankia imbricata**	**19**				1		1				1						
MOLLUSCA/Pelecypoda	**0**																
Anadara transversa	**18**																
Gemma gemma	**70**																
Ensis directus	**3**						2	0.19978			1	0.0056					
Hiatella spp.	**6**																
Mercenaria mercenaria	**82**		1	0.0002	1	12.2076	3	6.77823	7	125.0097			2	0.6751	1	12.0077	
Mulinia lateralis	**31**																
Mya arenaria	**4**				4	2.6588							1	0.4599			
Nucula proxima	**156**																
Pandora gouldiana	**76**								2	1.4539	1	1.7685			12	21.2231	
Pitar morrhuanus	**130**						5	67.8977	16	216.0095	2	13.6661			7	154.9005	5
Tellina agilis	**85**												7	0.0558	15	0.0066	9
Yoldia limatula	**2**																
MOLLUSCA/Gastropoda	**0**																
Acteocina canaliculata (Retusa c.)	**3**																
Boonea bisuturalis (Odostomia b.)	**2**																
Crepidula convexa	**7**																
Crepidula fornicata	**156**																
Crepidula plana	**28**																
Illyanassa obsoleta	**17**						5	0.6509	2	2.0074							5
Urosalpinx cinerea	**4**																
ANNELIDA	**0**																
polytroch larvae***	**111**								5						67		
Ampharete acutifrons	**327**								12	1.8001	48	6.3302	3	0.0003	1	0.0031	1
Ampharete finmarchica	**659**		34	0.2877	5	0.0021			4	0.3329	62	15.8091	45	0.8091	34	0.0298	5
Amphicteis gunneri	**32**																
Amphitrite ornata	**7**												1	0.0001			
Arenicola marina	**12**																
Asychis elongata	**79**																
Asychis elongata (juveniles)	**53**		10	0.0004	5												
Autolytus cornutus	**78**																
Capitella capitata	**228**		1	0.0001	21	0.0056			58	5.5539							

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Name/Site: wet weight (g)	ww	9B	ww	10B	ww	11B	ww	12B	ww	13B	ww	14B	ww	15B	ww	Total number of occupied sites (B Sites)	Percent site occupation (B Sites)
BRYOZOZA																	
*Bowerbankia gracilis**				1		1		1								**4**	**0.27**
*Bowerbankia imbricata**				1		1		1		1						**7**	**0.47**
MOLLUSCA/Pelecypoda																	
Anadara transversa		2	0.0076													**1**	**0.07**
Gemma gemma												6	0.0023	10	0.0045	**2**	**0.13**
Ensis directus										3	0.0092					**3**	**0.20**
Hiatella spp.																**0**	**0.00**
Mercenaria mercenaria										1	2.009					**7**	**0.47**
Mulinia lateralis																**0**	**0.00**
Mya arenaria																**2**	**0.13**
Nucula proxima																**0**	**0.00**
Pandora gouldiana				29	7.9924	12	5.8862	3	2.001	3	2.9967					**7**	**0.47**
Pitar morrhuanus	2.6671									1	4.9967					**6**	**0.40**
Tellina agilis	6.7833									1	0.0005	7	0.0067	2	0.0011	**6**	**0.40**
Yoldia limatula																**0**	**0.00**
MOLLUSCA/Gastropoda																	
Acteocina canaliculata (Retusa c.)																**0**	**0.00**
Boonea bisuturalis (Odostomia b.)																**0**	**0.00**
Crepidula convexa																**0**	**0.00**
Crepidula fornicata		6	19.0087			5	2.7761	3	2.001			3	0.023	7	0.0082	**5**	**0.33**
Crepidula plana				27	15.9972	2	0.0067	7	0.0123							**3**	**0.20**
Illyanassa obsoleta	6.9982			3	0.9927							8	2.0089	9	2.8117	**6**	**0.40**
Urosalpinx cinerea																**0**	**0.00**
ANNELIDA																	
polytroch larvae***																**2**	**0.13**
Ampharete acutifrons	0.0001	4	0.0019	23	0.0187	12	0.0132	31	1.7893	21	1.0334					**10**	**0.67**
Ampharete finmarchica	0.0076	19	0.0234	14	0.9773	8	0.0089	4	0.0023	78	8.2267					**12**	**0.80**
Amphicteis gunneri																**0**	**0.00**
Amphitrite ornata																**1**	**0.07**
Arenicola marina												1	0.3005	5	0.9445	**2**	**0.13**
Asychis elongata				1	0.0067											**1**	**0.07**
Asychis elongata (juveniles)																**2**	**0.13**
Autolytus cornutus																**0**	**0.00**
Capitella capitata		29	0.0056	12	0.9987	34	1.2311	4	0.0201	104	6.0056	88	6.0098	101	7.9908	**10**	**0.67**

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Name/Site: wet weight (g)	Total number of individuals (B Sites)		Total of occupied sites (A + B Sites)	Percent site Percent site occupation (A + B Sites)	Total number of individuals (A + B Sites)
BRYOZOZA					
*Bowerbankia gracilis**	4		23	0.46	22
*Bowerbankia imbricata**	7		27	0.54	26
MOLLUSCA/Pelecypoda					
Anadara transversa	2		6	0.12	20
Gemma gemma	16		9	0.18	86
Ensis directus	6		7	0.14	9
Hiatella spp.	0		2	0.04	6
Mercenaria mercenaria	16		20	0.4	98
Mulinia lateralis	0		11	0.22	31
Mya arenaria	5		4	0.08	9
Nucula proxima	0		11	0.22	156
Pandora gouldiana	62		19	0.38	138
Pitar morrhuanus	36		22	0.44	166
Tellina agilis	41		22	0.44	126
Yoldia limatula	0		3	0.06	2
MOLLUSCA/Gastropoda					
Acteocina canaliculata (Retusa c.)	0		2	0.04	3
Boonea bisuturalis (Odostomia b.)	0		2	0.04	2
Crepidula convexa	0		3	0.06	7
Crepidula fornicata	24		18	0.36	180
Crepidula plana	36		11	0.22	64
Illyanassa obsoleta	32		13	0.26	49
Urosalpinx cinerea	0		4	0.08	4
ANNELIDA					
polytroch larvae***	72		6	0.12	>183
Ampharete acutifrons	156		28	0.56	483
Ampharete finmarchica	312		42	0.84	971
Amphicteis gunneri	0		5	0.1	32
Amphitrite ornata	1		4	0.08	8
Arenicola marina	6		4	0.08	18
Asychis elongata	1		8	0.16	80
Asychis elongata (juveniles)	15		5	0.1	68
Autolytus cornutus	0		4	0.08	78
Capitella capitata	452		22	0.44	680

Name/Site: wet weight (g)	1A	ww	2A	ww	3A	ww	4A	ww	5A	ww	6A	ww	7A	ww	8A	ww	9A	ww	10A
Cirriformia grandis (Cirratulus g.)																			
Cirriformia grandis (Cirratulus g.) (juveniles)			32	0.0078	78	0.9877			1						4				
Clymenella torquata			2	0.0327									7	0.7883					56
Clymenella torquata (juveniles)									77	4.889			10	0.0478					
Cossura longocirrata															1	0.0073			
Drilonereis longa											36	7.7731							
Eteone lactea															2	0.0001			
Eteone lactea (juveniles)															23	0.0002			
Eteone longa															1				
Eumida sanguinea															2	0.0078			
Glycera americana	1	0.8976							5	2.0808									2
Glycera dibranchiata									1	0.0043					3	0.6652			
*Glycera spp. (heads)***															6				
Glycera spp. (juveniles)													12	0.0003					
Glycinde solitaria			1	0.1784											5	0.0078			
*Glycinde solitaria (heads)***													4		3				
Haploscoloplos robustus (Scoloplos r.)			2	0.0001	26	3.3309	21	2.7743							7	2.5541			6
Harmothoe imbricata																			
Heteromastus filiformis																			
Hydroides dianthus																			
Leitoscoloplos fragilis (Scoloplos f.)							3	0.0853											
Lumbrinereis tenuis																			
Maldane sarsi									5	9.0056									14
Maldane sarsi (juveniles)									44	8.0001									3
Nephtys bucea	6	2.5655							6	1.667			9	7.779					
Nephtys picta			4		9	0.4567	5	2.7864			24	15.0078	11	3.5507			6	0.8977	
*Nephtys picta (heads)***							13		3		23		20				20		9
Nereis spp. (juveniles)											5	0.0031							20
Nereis succinea					1	1.1189			1	0.0009									12
Nereis virens							5	4.7785									2	4.0073	3
Notomastus latericeus																0.0002			
Paranaitis speciosa							4	0.2113											
Paraonis gracilis																			
Pectinaria gouldii					3	0.1546	1	0.2377			1	0.0089	3	0.1346			2	0.1002	4
Pherusa affinis			1	1.002															
Polydora ligni					1		56	0.2298	12	0.0005	1	0.0001			6	0.0008	3	0.0002	45
Polydora spp. (juveniles)									>100						4				
Potamilla reniformis																			

Name/Site: wet weight (g)	ww	11A	ww	12A	ww	13A	ww	14A	ww	15A	ww	16A	ww	17A	ww	18A	ww	19A	ww
Cirriformia grandis (Cirratulus g.)						15	1.7749	30	2.0077			39	0.9927					3	0.1156
Cirriformia grandis (Cirratulus g.) (juvenile																			
Clymenella torquata	13.6729	12	4.8871			42	23.2289	5	3.885	2	0.3771	27	3.9956			12	0.5615	11	9.0023
Clymenella torquata (juveniles)		12	0.0331							4	0.0002					56	0.1886		
Cossura longocirrata						1	0.0073												
Drilonereis longa						17	0.0069			19	0.0099	21	0.4452	56	0.6001				
Eteone lactea																			
Eteone lactea (juveniles)																			
Eteone longa																			
Eumida sanguinea																			
Glycera americana	0.7839																	1	0.0056
Glycera dibranchiata		1	0.8956			2	0.0299	3	0.0203			35	3.7781					3	0.0223
*Glycera spp. (heads)***																		10	
Glycera spp. (juveniles)																46	0.1008		
Glycinde solitaria		5	2.5562					6	0.01556										
*Glycinde solitaria (heads)***																			
Haploscoloplos robustus (Scoloplos r.)	0.0078																		
Harmothoe imbricata																			
Heteromastus filiformis								2	0.0023										
Hydroides dianthus																1	0.0517		
Leitoscoloplos fragilis (Scoloplos f.)												18	0.0188						
Lumbrinereis tenuis																			
Maldane sarsi	5.7731	4	2.8967			9	6.8873												
Maldane sarsi (juveniles)	0.0034	1	0.0001																
Nephtys bucea						8	2.0062	1	0.0034			29	1.9956			6	1.7739	17	9.3326
Nephtys picta		2	0.08443					4	3.1145			11	1.4432	1	0.0288	4	0.1089	12	9.0777
*Nephtys picta (heads)***		4										34		8					
Nereis spp. (juveniles)																			
Nereis succinea	4.7762							3	1.2366										
Nereis virens	3.7781																		
Notomastus latericeus																			
Paranaitis speciosa						6	0.0663												
Paraonis gracilis																			
Pectinaria gouldii	0.0107	29	2.7892			2	0.1332							2	0.0188			3	0.155
Pherusa affinis								1	0.3288										
Polydora ligni	2.9945													10	0.00005				
Polydora spp. (juveniles)														41					
Potamilla reniformis										16	0.1339								

Name/Site: wet weight (g)	20A	ww	21A	ww	22A	ww	23A	ww	24A	ww	25A	ww	26A	ww	27A	ww	28A	ww	29A
Cirriformia grandis (Cirratulus g.)					31	0.8769			19	2.9988	20	0.3444							2
Cirriformia grandis (Cirratulus g.) (juvenile																			
Clymenella torquata									6	8.0097	6	1.0042							
Clymenella torquata (juveniles)			29	0.5644															
Cossura longocirrata																			
Drilonereis longa			6	0.0231	14	0.0665	12	0.00299	7	0.0023	12	0.0078							6
Eteone lactea															98	0.3981			
Eteone lactea (juveniles)																			
Eteone longa																			
Eumida sanguinea					16	0.0783													10
Glycera americana																			
Glycera dibranchiata	18	8.1125			9	1.0897	2	0.7611			31	2.4437	16	8.4322	56	7.3218			2
*Glycera spp. (heads)***							6						17						
Glycera spp. (juveniles)													4						
Glycinde solitaria							4	0.0083											
*Glycinde solitaria (heads)***																			
Haploscoloplos robustus (Scoloplos r.)																			
Harmothoe imbricata			3	0.4223															
Heteromastus filiformis																			
Hydroides dianthus																			
Leitoscoloplos fragilis (Scoloplos f.)			10	0.9987	12	1.0776	16	0.0896							66	0.0301			4
Lumbrinereis tenuis																			
Maldane sarsi																			
Maldane sarsi (juveniles)																			
Nephtys bucea	6	0.7998	2	1.0067	6	7.1121													3
Nephtys picta							3	5.0021	9	7.0022			8	6.9982			9	3.0021	
*Nephtys picta (heads)***													4				23		
Nereis spp. (juveniles)																			
Nereis succinea	2	1.0041							4	3.7764	1	0.4522							
Nereis virens																			
Notomastus latericeus																			
Paranaitis speciosa																	1		
Paraonis gracilis																			
Pectinaria gouldii																	2	0.0337	
Pherusa affinis																			
Polydora ligni											10	0.0009					1		
Polydora spp. (juveniles)											34						23		
Potamilla reniformis			6	3.7761															

Name/Site: wet weight (g)	ww	30A	ww	31A	ww	32A	ww	33A	ww	34A	ww	35A	ww	Total number of occupied sites (A Sites)	Percent site occupation (A Sites)
Cirriformia grandis (Cirratulus g.)	0.0001									31	0.8879			**10**	**0.29**
Cirriformia grandis (Cirratulus g.) (juvenile		8												**6**	**0.17**
Clymenella torquata				1	1.0002			5	2.6654	12	2.0041			**16**	**0.46**
Clymenella torquata (juveniles)		34	2.0071	10	0.0012			3	0.0001					**10**	**0.29**
Cossura longocirrata														**3**	**0.09**
Drilonereis longa	0.0189			27	0.0144			7	0.0045	7	0.0322			**15**	**0.43**
Eteone lactea														**2**	**0.06**
Eteone lactea (juveniles)														**2**	**0.06**
Eteone longa														**2**	**0.06**
Eumida sanguinea	0.0443													**4**	**0.11**
Glycera americana														**5**	**0.14**
Glycera dibranchiata	0.9978	2	0.8776							21	2.0089			**16**	**0.46**
*Glycera spp. (heads)** *														**5**	**0.14**
Glycera spp. (juveniles)														**4**	**0.11**
Glycinde solitaria														**6**	**0.17**
*Glycinde solitaria (heads)** *														**3**	**0.09**
Haploscoloplos robustus (Scoloplos r.)														**6**	**0.17**
Harmothoe imbricata														**2**	**0.06**
Heteromastus filiformis														**2**	**0.06**
Hydroides dianthus														**2**	**0.06**
Leitoscoloplos fragilis (Scoloplos f.)	0.0776									9	0.0076			**8**	**0.23**
Lumbrinereis tenuis														**1**	**0.03**
Maldane sarsi														**5**	**0.14**
Maldane sarsi (juveniles)														**4**	**0.11**
Nephtys bucea	2.0008									34	2.0452			**14**	**0.40**
Nephtys picta										10	0.4429	11	2.8966	**19**	**0.54**
*Nephtys picta (heads)** *										35		2		**14**	**0.40**
Nereis spp. (juveniles)														**3**	**0.09**
Nereis succinea		4	0.3009											**9**	**0.26**
Nereis virens														**4**	**0.11**
Notomastus latericeus														**1**	**0.03**
Paranaitis speciosa														**4**	**0.11**
Paraonis gracilis														**1**	**0.03**
Pectinaria gouldii												4	3.1156	**13**	**0.37**
Pherusa affinis														**3**	**0.09**
Polydora ligni		2										1		**13**	**0.37**
Polydora spp. (juveniles)		2												**7**	**0.20**
Potamilla reniformis				38	1.3399			19	0.4008					**5**	**0.14**

Name/Site: wet weight (g)	Total number of individuals (A Sites)		1B	ww	2B	ww	3B	ww	4B	ww	5B	ww	6B	ww	7B	ww	8B
Cirriformia grandis (Cirratulus g.)	**190**				3	0.0002											
Cirriformia grandis (Cirratulus g.) (juvenile	**123**						6	0.0878									
Clymenella torquata	**206**										16	2.5652					
Clymenella torquata (juveniles)	**235**																
Cossura longocirrata	**2**																
Drilonereis longa	**247**												6	0.0104			
Eteone lactea	**100**																
Eteone lactea (juveniles)	**23**																
Eteone longa	**1**																
Eumida sanguinea	**28**																
Glycera americana	**9**																
Glycera dibranchiata	**205**										18	8.0932					
*Glycera spp. (heads)***	**39**				3						4						
Glycera spp. (juveniles)	**62**				34						23						
Glycinde solitaria	**21**																
*Glycinde solitaria (heads)***	**7**																
Haploscoloplos robustus (Scoloplos r.)	**62**						69	8.0016	3	0.0056							
Harmothoe imbricata	**3**																
Heteromastus filiformis	**2**								1	0.0001							
Hydroides dianthus	**1**																
Leitoscoloplos fragilis (Scoloplos f.)	**138**																
Lumbrinereis tenuis	**0**																
Maldane sarsi	**32**										7	8.0662					
Maldane sarsi (juveniles)	**48**										14	14.0044					
Nephtys bucea	**133**		1	0.0001											9	0.03488	
Nephtys picta	**143**										20	1.0601					
*Nephtys picta (heads)***	**198**		45						6		23						
Nereis spp. (juveniles)	**25**								10		9	0.0001					
Nereis succinea	**28**						2	3.0001							34	9.7714	
Nereis virens	**10**								2	3.2887					2	0.7784	
Notomastus latericeus	**0**						1	0.0001							1	0.0052	
Paranaitis speciosa	**11**								23	4.0981							
Paraonis gracilis	**0**																
Pectinaria gouldii	**56**						10	3.7789	1	0.0078							
Pherusa affinis	**2**																
Polydora ligni	**148**						3	0.0002	67	4.9917	22	0.0034					
Polydora spp. (juveniles)	**204**																
Potamilla reniformis	**79**																

Name/Site: wet weight (g)	ww	9B	ww	10B	ww	11B	ww	12B	ww	13B	ww	14B	ww	15B	ww	Total number of occupied sites (B Sites)	Percent site occupation (B Sites)
Cirriformia grandis (Cirratulus g.)																**1**	**0.07**
Cirriformia grandis (Cirratulus g.) (juvenile																**1**	**0.07**
Clymenella torquata		34	19.6755							19	3.9973					**3**	**0.20**
Clymenella torquata (juveniles)		2	0.0034							3	0.0005					**2**	**0.13**
Cossura longocirrata																**0**	**0.00**
Drilonereis longa				5	0.0034	9	0.0067	17	0.0091			23	0.02003	29	0.03	**6**	**0.40**
Eteone lactea												2	0.0012	8	0.004	**2**	**0.13**
Eteone lactea (juveniles)												2				**1**	**0.07**
Eteone longa												7	0.0034	2	0.003	**2**	**0.13**
Eumida sanguinea												2	0.0023	1	0.0011	**2**	**0.13**
Glycera americana						3	2.003									**1**	**0.07**
Glycera dibranchiata				1	0.8732			1	0.1761	8	2.4453					**4**	**0.27**
*Glycera spp. (heads)***				3		1		4								**5**	**0.33**
Glycera spp. (juveniles)										32						**3**	**0.20**
Glycinde solitaria						1	0.6011									**1**	**0.07**
*Glycinde solitaria (heads)***																**0**	**0.00**
Haploscoloplos robustus (Scoloplos r.)																**2**	**0.13**
Harmothoe imbricata																**0**	**0.00**
Heteromastus filiformis																**1**	**0.07**
Hydroides dianthus																**0**	**0.00**
Leitoscoloplos fragilis (Scoloplos f.)																**0**	**0.00**
Lumbrinereis tenuis												1	0.0561	4	0.2009	**2**	**0.13**
Maldane sarsi		3	5.8977	2	0.7762	6	2.0001	3	1.9987	2	2.9987					**6**	**0.40**
Maldane sarsi (juveniles)		1	0.09987													**2**	**0.13**
Nephtys bucea																**2**	**0.13**
Nephtys picta		5	0.7676													**2**	**0.13**
*Nephtys picta (heads)***										7						**4**	**0.27**
Nereis spp. (juveniles)		17	0.0966	20												**4**	**0.27**
Nereis succinea				4	1.9945	1	0.9365	1	0.3342	5	0.1998					**6**	**0.40**
Nereis virens		4	3.3342													**3**	**0.20**
Notomastus latericeus																**2**	**0.13**
Paranaitis speciosa																**1**	**0.07**
Paraonis gracilis												3	0.0023	8	0.0098	**2**	**0.13**
Pectinaria gouldii												4	0.0031	1	0.0012	**4**	**0.27**
Pherusa affinis																**0**	**0.00**
Polydora ligni		79	0.0379							24	0.0034	1		2		**7**	**0.47**
Polydora spp. (juveniles)																**0**	**0.00**
Potamilla reniformis																**0**	**0.00**

Name/Site: wet weight (g)	Total number of individuals (B Sites)		of occupied sites (A + B Sites)	Percent site occupation (A + B Sites)	Total number of individuals (A + B Sites)
Cirriformia grandis (Cirratulus g.)	3		11	0.22	193
Cirriformia grandis (Cirratulus g.) (juvenile	6		7	0.14	129
Clymenella torquata	69		19	0.38	275
Clymenella torquata (juveniles)	5		12	0.24	240
Cossura longocirrata	0		3	0.06	2
Drilonereis longa	89		21	0.42	336
Eteone lactea	10		4	0.08	110
Eteone lactea (juveniles)	2		3	0.06	25
Eteone longa	9		4	0.08	10
Eumida sanguinea	3		6	0.12	31
Glycera americana	3		6	0.12	12
Glycera dibranchiata	28		20	0.4	233
*Glycera spp. (heads)***	15		10	0.2	54
Glycera spp. (juveniles)	89		7	0.14	151
Glycinde solitaria	1		7	0.14	22
*Glycinde solitaria (heads)***	0		3	0.06	7
Haploscoloplos robustus (Scoloplos r.)	72		8	0.16	134
Harmothoe imbricata	0		2	0.04	3
Heteromastus filiformis	1		3	0.06	3
Hydroides dianthus	0		2	0.04	1
Leitoscoloplos fragilis (Scoloplos f.)	0		8	0.16	138
Lumbrinereis tenuis	5		3	0.06	5
Maldane sarsi	23		11	0.22	55
Maldane sarsi (juveniles)	15		6	0.12	63
Nephtys bucea	10		16	0.32	143
Nephtys picta	25		21	0.42	168
*Nephtys picta (heads)***	81		18	0.36	279
Nereis spp. (juveniles)	56		7	0.14	81
Nereis succinea	47		15	0.3	75
Nereis virens	8		7	0.14	18
Notomastus latericeus	2		3	0.06	2
Paranaitis speciosa	23		5	0.1	34
Paraonis gracilis	11		3	0.06	11
Pectinaria gouldii	16		17	0.34	72
Pherusa affinis	0		3	0.06	2
Polydora ligni	198		20	0.4	346
Polydora spp. (juveniles)	0		7	0.14	204
Potamilla reniformis	0		5	0.1	79

Name/Site: wet weight (g)	1A	ww	2A	ww	3A	ww	4A	ww	5A	ww	6A	ww	7A	ww	8A	ww	9A	ww	10A
Sabella crassicornis																			
Sabellaria vulgaris																			
Scalibregma inflatum					1	0.0207													
Scolecolepides viridis					6	0.0677													
Sigambra tentaculata																	3	0.0028	
*Spionids****					>100	0.2554					>100								
Spiophanes bombyx																			
Streblospio benedicti	56	0.0067	12	0.006	4	0.0001	11	0.0025	156	0.1778	49	0.0459	7	0.0002		0.0008	46	0.0376	
Syllis gracilis					1	0.0023													
Tharyx acutus					38	0.0034	43	0.0045	5	0.0003						0.0039	4	0.0002	7
Tharyx acutus (juveniles)	1				53	0.0067													34
*Oligochaeta****	>100	0.0002	45	0.0231	42	0.0012	9	0.0002	>300	0.0002	>200		10		23		43		30
*Nematoda****	>300		>200	0.0002	>200	0.0002	>400		>300		>900		>200				>250		>500
ARTHROPODA/Copepoda																			
Temora longicornis	45	0.0002	10	0.0001	67	0.0089	2		78	0.0003	36	0.0021	57	0.0089	19	0.0009	4		39
Halicyclops magniceps	10		1		1		2		3		2								3
Tachidius discipes	1		1				1		4						2				3
Alteutha depressa																			
ARTHROPODA/Ostracoda																			
Ostracod spp.	1		3				2		1		2		1						
ARTHROPODA/Amphipoda																			
Ampelisca abdita	1	0.0002			6	0.0023			6	0.0199			1	0.0001	89	7.0934	2	0.0004	67
Corophium insidiosum	1	0.0001							4	0.0002					6	0.0002	2	0.0002	
Corophium tuberculatum																			
Gammarus mucronatus							2	0.01564			1	0.0001							2
Melita nitida											2	0.0003					2	0.0002	
Leptocheirus pinguis											4	2.0009							
Unciola irrorata			3	0.0089															
ARTHROPODA/Decapoda																			
Crangon septemspinosa																			
Pagurus longicarpus							3	34.7768			1	0.2377							
Panopeus herbstii																			
Total taxa present per sample	**19**		**25**		**27**		**25**		**28**		**25**		**23**		**26**		**22**		**30**

Name/Site: wet weight (g)	ww	11A	ww	12A	ww	13A	ww	14A	ww	15A	ww	16A	ww	17A	ww	18A	ww	19A	ww
Sabella crassicornis																			
Sabellaria vulgaris																			
Scalibregma inflatum						1	0.0788							12	1.5563				
Scolecolepides viridis																			
Sigambra tentaculata																			
*Spionids****																			
Spiophanes bombyx		2	0.0562																
Streblospio benedicti		23						113	0.0176	12								4	
Syllis gracilis						6	0.0111					6	0.0056						
Tharyx acutus	0.0031	3						3	0.0001										
Tharyx acutus (juveniles)																			
*Oligochaeta****		7				33		22		5		34		23		4		20	
*Nematoda****		>400				>200		>300		>100		>200		>400		>100		>100	
ARTHROPODA/Copepoda																			
Temora longicornis		3				29		6		40		61	0.0056	10		9		16	
Halicyclops magniceps		8				1		3											
Tachidius discipes		21				1		3						1					
Alteutha depressa								7		3									
ARTHROPODA/Ostracoda																			
Ostracod spp.								3				2		12		10			
ARTHROPODA/Amphipoda																			
Ampelisca abdita	3.7651	5	0.0403					1	0.0134			21	3.0999	9	0.9989	129	5.0094	9	0.0155
Corophium insidiosum												4	0.0258					1	0.0001
Corophium tuberculatum																			
Gammarus mucronatus	0.0056																		
Melita nitida																			
Leptocheirus pinguis												27	4.6671	18	1.3352	36	3.1167	15	2.1167
Unciola irrorata																			
ARTHROPODA/Decapoda																			
Crangon septemspinosa												2	1.0002						
Pagurus longicarpus								1	0.0335							2	1.0034		
Panopeus herbstii										2	0.6232								
Total taxa present per sample		**22**		**6**		**21**		**26**		**16**		**23**		**20**		**18**		**21**	

Name/Site: wet weight (g)	**20A**	**ww**	**21A**	**ww**	**22A**	**ww**	**23A**	**ww**	**24A**	**ww**	**25A**	**ww**	**26A**	**ww**	**27A**	**ww**	**28A**	**ww**	**29A**
Sabella crassicornis			5	0.0045															
Sabellaria vulgaris			7	0.3342															
Scalibregma inflatum	10	2.5561			2	0.4734	3	1.0998			2	0.9978							5
Scolecolepides viridis																			
Sigambra tentaculata																			
*Spionids****																			
Spiophanes bombyx																			
Streblospio benedicti							13				37	0.0011					2		
Syllis gracilis	47	0.00277	3	0.0045	10	0.0099					18	0.0189							2
Tharyx acutus													3						
Tharyx acutus (juveniles)																			
*Oligochaeta****	2		12		10		43		45	0.0002	8		61	0.0034	1				3
*Nematoda****	>200		>100		>100		>200		>200		>200		>200		>500		>200		>100
ARTHROPODA/Copepoda																			
Temora longicornis	5		16	0.0002	5		12		20		3		3		23		1		29
Halicyclops magniceps																	1		
Tachidius discipes																			
Alteutha depressa																			
ARTHROPODA/Ostracoda																			
Ostracod spp.	4						5				4		3				3		
ARTHROPODA/Amphipoda																			
Ampelisca abdita			23	3.0081	15	1.8973			16	0.1046	8	0.3321							26
Corophium insidiosum									2	0.0032									
Corophium tuberculatum									1	0.0039									
Gammarus mucronatus																	1	0.0001	
Melita nitida					1	0.0006													
Leptocheirus pinguis			2	3.886							12	1.1332							9
Unciola irrorata			2	0.0023															
ARTHROPODA/Decapoda																			
Crangon septemspinosa													1	16.8843					
Pagurus longicarpus					1	0.5286			2	0.9447	1	0.5563	2	1.0897			1	0.3421	3
Panopeus herbstii																			
Total taxa present per sample	**15**		**25**		**24**		**16**		**16**		**21**		**22**		**9**		**21**		**23**

Name/Site: wet weight (g)	ww	30A	ww	31A	ww	32A	ww	33A	ww	34A	ww	35A	ww	Total number of occupied sites (A Sites)	Percent site occupation (A Sites)
Sabella crassicornis														**2**	**0.06**
Sabellaria vulgaris														**2**	**0.06**
Scalibregma inflatum	7.9983													**9**	**0.26**
Scolecolepides viridis														**2**	**0.06**
Sigambra tentaculata												1	0.0002	**3**	**0.09**
*Spionids****										31				**4**	**0.11**
Spiophanes bombyx														**2**	**0.06**
Streblospio benedicti				2				23	0.0041			12		**19**	**0.54**
Syllis gracilis	0.0031									4	0.0034			**10**	**0.29**
Tharyx acutus				1								1		**11**	**0.31**
Tharyx acutus (juveniles)														**4**	**0.11**
*Oligochaeta****		21		9				20		56				**31**	**0.89**
*Nematoda****		>300		>200				>300		>100		>300		**32**	**0.91**
ARTHROPODA/Copepoda															
Temora longicornis	0.0019	2		31				3		20		2		**33**	**0.94**
Halicyclops magniceps								1						**13**	**0.37**
Tachidius discipes								1						**12**	**0.34**
Alteutha depressa				1				1						**5**	**0.14**
ARTHROPODA/Ostracoda														**1**	**0.03**
Ostracod spp.		3						6		1				**19**	**0.54**
ARTHROPODA/Amphipoda															
Ampelisca abdita	2.9987	29	0.1288					47	0.5623	23	2.9987	6	0.0023	**23**	**0.66**
Corophium insidiosum		1	0.0001					1	0.0023	2	0.0067			**11**	**0.31**
Corophium tuberculatum														**2**	**0.06**
Gammarus mucronatus														**5**	**0.14**
Melita nitida												1	0.0002	**5**	**0.14**
Leptocheirus pinguis	5.6659									34	5.7721			**10**	**0.29**
Unciola irrorata														**3**	**0.09**
ARTHROPODA/Decapoda															
Crangon septemspinosa										1	0.2341			**4**	**0.11**
Pagurus longicarpus	7.9981													**11**	**0.31**
Panopeus herbstii								5	1.0002					**3**	**0.09**
Total taxa present per sample		**20**		**17**		**4**		**20**		**25**		**18**			**Total A Individuals**

Name/Site: wet weight (g)	Total number of individuals (A Sites)		1B	ww	2B	ww	3B	ww	4B	ww	5B	ww	6B	ww	7B	ww	8B
Sabella crassicornis	**5**																
Sabellaria vulgaris	**7**																
Scalibregma inflatum	**36**										9	16.5509			11	3.7789	
Scolecolepides viridis	**6**						111	10.8977			3	0.0045					
Sigambra tentaculata	**4**																
*Spionids****	**231**		45				90	0.2006									
Spiophanes bombyx	**2**																
Streblospio benedicti	**582**		102	0.0144	39	0.0098	152	4.5509			2		25	0.00553	34	0.1085	
Syllis gracilis	**97**																
Tharyx acutus	**108**						7	0.0002	7	0.0021	23	0.0061			5		
Tharyx acutus (juveniles)	**88**		2				2		19								
*Oligochaeta****	**1241**		>100		122	0.9899	4		45	0.0342	>100				12		
*Nematoda****	**8250**		>300		>200	0.0002	>300	0.0004	>500		>100				>900		
ARTHROPODA/Copepoda	**0**																
Temora longicornis	**706**		3		19	0.0001	56	0.0012	1		1		1		31	0.0011	
Halicyclops magniceps	**36**				23		4		5		1						
Tachidius discipes	**39**		1		4		1		7		1				6		
Alteutha depressa	**12**																
ARTHROPODA/Ostracoda	**0**																
Ostracod spp.	**66**				3				4		1						
ARTHROPODA/Amphipoda	**0**																
Ampelisca abdita	**539**								9	0.00124	1	0.0001	6	0.0052	67	7.0934	
Corophium insidiosum	**24**						1	0.0001	1	0.0001	9	0.0004					
Corophium tuberculatum	**1**																
Gammarus mucronatus	**6**				2	0.0234			1	0.001							
Melita nitida	**6**																
Leptocheirus pinguis	**157**																
Unciola irrorata	**5**																
ARTHROPODA/Decapoda	**0**																
Crangon septemspinosa	**4**																
Pagurus longicarpus	**17**								6	6.1051	1	4.0003					
Panopeus herbstii	**7**																
Total taxa present per sample	**>17606**		**13**		**17**		**23**		**28**		**29**		**10**		**19**		**5**

Name/Site: wet weight (g)	ww	9B	ww	10B	ww	11B	ww	12B	ww	13B	ww	14B	ww	15B	ww	Total number of occupied sites (B Sites)	Percent site occupation (B Sites)
Sabella crassicornis																**0**	**0.00**
Sabellaria vulgaris																**0**	**0.00**
Scalibregma inflatum		16	28.9897							9	16.5509					**4**	**0.27**
Scolecolepides viridis										3	0.0045					**3**	**0.20**
Sigambra tentaculata																**0**	**0.00**
*Spionids****																**2**	**0.13**
Spiophanes bombyx																**0**	**0.00**
Streblospio benedicti		23	0.00192									50	0.004	21	0.0023	**9**	**0.60**
Syllis gracilis																**0**	**0.00**
Tharyx acutus		2		36	0.0491	44	0.03342	23	0.0098							**8**	**0.53**
Tharyx acutus (juveniles)																**3**	**0.20**
*Oligochaeta****		34		45		21		3		7		4		8		**13**	**0.87**
*Nematoda****		>500		>400		>300		>300		>300		>500		>500		**13**	**0.87**
ARTHROPODA/Copepoda																	
Temora longicornis		1		2		2		7		34		3		3		**14**	**0.93**
Halicyclops magniceps										1		2		2		**7**	**0.47**
Tachidius discipes		3								1		34		23		**10**	**0.67**
Alteutha depressa																**0**	**0.00**
ARTHROPODA/Ostracoda																	
Ostracod spp.				3				2		1		6		9		**8**	**0.53**
ARTHROPODA/Amphipoda																**0**	
Ampelisca abdita										3	0.0098	67	1.0564	34	0.9923	**7**	**0.47**
Corophium insidiosum										9	0.0099					**4**	**0.27**
Corophium tuberculatum																**0**	**0.00**
Gammarus mucronatus		5	0.2887									1	0.0003	4	0.0026	**5**	**0.33**
Melita nitida																**0**	**0.00**
Leptocheirus pinguis																**0**	**0.00**
Unciola irrorata																**0**	**0.00**
ARTHROPODA/Decapoda																	
Crangon septemspinosa																**0**	**0.00**
Pagurus longicarpus		2	2.6755							1	0.09981	1	0.0056	1	0.0079	**6**	**0.40**
Panopeus herbstii																	
Total taxa present per sample		**22**		**20**		**18**		**18**		**28**		**25**		**24**			**Total B Individuals**

Name/Site: wet weight (g)	Total number of individuals (B Sites)		of occupied sites (A + B Sites)	Percent site occupation (A + B Sites)	Total number of individuals (A + B Sites)
Sabella crassicornis	**0**		**2**	**0.04**	**5**
Sabellaria vulgaris	**0**		**2**	**0.04**	**7**
Scalibregma inflatum	**45**		**13**	**0.26**	**81**
Scolecolepides viridis	**117**		**5**	**0.1**	**123**
Sigambra tentaculata	**0**		**3**	**0.06**	**4**
*Spionids****	**135**		**6**	**0.12**	**366**
Spiophanes bombyx	**0**		**2**	**0.04**	**2**
Streblospio benedicti	**448**		**28**	**0.56**	**1030**
Syllis gracilis	**0**		**10**	**0.2**	**97**
Tharyx acutus	**147**		**19**	**0.38**	**255**
Tharyx acutus (juveniles)	**23**		**7**	**0.14**	**111**
*Oligochaeta****	**>505**		**44**	**0.88**	**>1746**
*Nematoda****	**>5100**		**45**	**0.9**	**>13350**
ARTHROPODA/Copepoda					
Temora longicornis	**164**		**47**	**0.94**	**870**
Halicyclops magniceps	**38**		**20**	**0.4**	**74**
Tachidius discipes	**81**		**22**	**0.44**	**120**
Alteutha depressa	**0**		**5**	**0.1**	**12**
ARTHROPODA/Ostracoda					
Ostracod spp.	**29**		**27**	**0.54**	**95**
ARTHROPODA/Amphipoda					
Ampelisca abdita	**187**		**30**	**0.6**	**726**
Corophium insidiosum	**20**		**15**	**0.3**	**44**
Corophium tuberculatum	**0**		**2**	**0.04**	**1**
Gammarus mucronatus	**13**		**10**	**0.2**	**19**
Melita nitida	**0**		**5**	**0.1**	**6**
Leptocheirus pinguis	**0**		**10**	**0.2**	**157**
Unciola irrorata	**0**		**3**	**0.06**	**5**
ARTHROPODA/Decapoda					
Crangon septemspinosa	**0**		**4**	**0.08**	**4**
Pagurus longicarpus	**12**		**17**	**0.34**	**29**
Panopeus herbstii			**3**	**0.06**	**7**
Total taxa present per sample	**>9291**			**Total A + B Individuals**	**>26897**

Notes

* Only presence/absence of colonies determined.
** Biomass could not be determined for species of which only the heads were recovered.
*** Values accompanied by “>” indicate a quantified measurement of sub-sampled individuals.

Summary:

1. A minimum of 25997 individuals were identified across 97 taxa.
2. The most commonly occurring taxa across all of the samples are *Temora longicornis* (94%); Nematoda (88%); Oligochaeta (88%) and *Ampharete finmarchica* (84%).
3. The median number of taxa representing each site is 21 with the greatest diversity at site 10A (30 taxa), and the least diversity at site 32A (4 taxa).
4. *Tharyx acutus* was found in 36% of the samples and its presence usually indicates a disturbed or polluted area
5. *Nephtys bucea* was present in 30% of the sample sites indicating that those sample areas contained very “clean” sand containing little organics.

Appendix C

Grain Size Analysis

Sample Number	Sieve Size						
	Pebble	Gravel		Sand			Silt or Clay
		Coarse	Fine	Coarse	Medium	Fine	
September 2003 – Borrow Area A							
A1	0	0	0	18.5	26.7	49.05	5.75
A2	0	0	13.6	13.15	16.7	48.2	8.3
A3	0	0	2.3	3.4	58.95	33.75	1.6
A4	0	7.6	29.35	10.1	33.1	19.4	0.45
A5	0	0	1.9	2.3	32	59.4	4.4
A6	0	41.65	13.85	7.15	19	14.25	4.1
A7	0	0	4.55	9.55	43.15	41.1	1.65
A8	0	0	4.45	3.9	42.05	38.35	11.25
A9	0	21.57	17.28	8	34.2	16.8	2.15
A10	0	0	10.3	6.35	49.9	27.5	5.95
A11	0	0	13.35	9.15	51.85	23.55	2.1
A12	0	0	7.8	6.5	71.4	13.9	0.4
A13	0	22.05	8.05	5.6	45.05	15.95	3.3
A14	0	6	37.8	11.35	28.85	14.95	1.05
A15	0	13.85	16.75	10.05	46.35	11.8	1.2
A16	0	0	15.6	8.8	52.8	18	4.8
A17	0	6.9	20.9	15.1	38.55	16.2	2.35
A18	0	0	28.95	8.5	45.2	11	6.35
A19	0	0	13.65	8.1	41.15	32.65	4.45
A20	0	10.9	19.3	7	40.65	21.4	0.75
A21	0	7.15	17.55	7.9	47.1	18.2	2.1
A22	0	0	17.1	6.05	44.05	30.55	2.25
A23	0	46.35	13.6	6.28	28.07	4.68	1.02
A24	0	0	28.4	11.65	46.8	12.6	0.55
A25	0	0.15	37.38	12.2	30.63	8.78	10.86
A26	0	0	30	18.25	44.8	6.1	0.85
A27	0	0	9.4	6.35	40.5	42.85	0.9
A28	0	16.6	19.9	6.4	35.05	19.2	2.85
A28	0	0	35.35	13.25	44.45	6.75	0.2
A30	0	0	5.5	4.95	43.75	44.35	1.45
A31	0	0	11.95	6.65	43.05	32.65	5.7
A32	0	0	36.1	10.35	40.35	11.65	1.55
A33	0	0	14.3	11.85	53.05	19.7	1.1
A34	0	0	13.45	7.2	40.65	37.5	1.2
A35	0	0	10.5	10.7	56.75	21	1.05

May 2004 – Borrow Area A							
A1	0	0	7.39	8.19	43.74	38.03	2.65
A2	0	0	13.27	18.8	31.04	33.31	3.57
A3	0	0	14.5	7.35	38.94	38.21	1
A4	0	0	9.38	11.32	41.99	36.12	1.19
A5	0	0	0.08	0.76	67.55	31.3	0.31
A6	0	0	5.73	3.65	49.68	40.66	0.27
A7	0	0	19.03	13.75	49.16	15.96	2.1
A8	0	0	5.53	12.02	55.68	24.62	2.15
A9	0	11.23	31.39	6.95	31.45	18.22	0.75
A10	0	0	11.52	7.07	59.24	19.95	2.21
A11	0	5.35	31.24	6.89	35.99	19.72	0.81
A12	0	1.99	13.42	10.57	54.84	18.66	0.52
A13	0	0	13.78	13.74	54.85	16.29	1.34
A14	0	1.98	19.77	9.32	40.12	27.85	0.97
A15	0	3.52	18.23	16.05	52.65	8.3	1.25
A16	0	0	30.59	9.54	45.44	13.52	0.91
A17	0	0	15.86	8.59	54.73	19.78	1.04
A18	0	2.06	1.83	38.12	47.54	9.48	0.97
A19	0	0	5.61	9.56	50.35	31.97	2.5
A20	0	0	5.45	4.15	51.87	38.03	0.5
A21	0	0	17.12	8.78	53.62	19.98	0.49
A22	0	0	11.8	7.83	58.99	20.66	0.72
A23	0	2.33	27.9	9.75	48.45	11.04	0.52
A24	0	7.61	26.87	9.67	40.14	15.29	0.42
A25	0	3.25	31.58	15.59	44.14	4.95	0.48
A26	0	2.79	18.21	10.09	54.71	13.55	0.65
A27	0	0	20.16	7.22	31.65	40.6	0.37
A28	0	0	3.37	4.07	39.39	51.06	2.11
A29	0	8.36	10.24	11.29	50.42	18.8	0.89
A30	0	0	8.23	8.73	62.32	20.06	0.65
A31	0	0	14.94	8.06	54.04	21.51	1.45
A32	0	2.18	11.34	7.09	59.91	18.91	0.58
A33	0	0	11.56	5.92	44.48	37.34	0.7
A34	0	0	2.77	4.4	60.54	31.72	0.58
A35	0	0	22.73	14.81	50.23	11.41	0.82

Sample Number	Sieve Size						
	Pebble	Gravel		Sand			Silt or Clay
		Coarse	Fine	Coarse	Medium	Fine	
September 2003 - Borrow Area B							
B1	0	0	0.4	0.95	44.3	46	8.35
B2	0	0	0.95	7.45	37.1	53.2	1.3
B3	0	0	7.35	9.3	35.25	43.75	4.35
B4	0	0	0.7	3.95	28.05	62.9	4.4
B5	0	0	5.6	8.45	36.15	45.25	4.55
B6	0	0	0.45	2	19.65	76.5	1.4
B7	0	0	5	5	36.2	48.8	5
B8	0	0	2.35	6.85	44.05	44.35	2.4
B9	0	0	1.9	9.4	57.3	30.5	0.9
B10	0	0	3.2	8.65	53.9	33.25	1
B11	0	0	5.7	2.85	46.45	44.5	0.5
B12	0	0	9.5	7.35	52.85	29.35	0.95
B13	0	0	34.35	10.2	36.9	15.55	3
B14	0	0	10.9	9.75	55.75	22.4	1.2
B15	0	0	7.2	6.8	46.65	38.05	1.3
May 2004 - Borrow Area B							
B1	0	0	1.63	5.6	53.8	37.42	1.55
B2	0	3.51	2.17	6.31	41.49	45.9	0.61
B3	0	0	2.49	5.69	48.59	41.69	1.55
B4	0	0	2.39	5.83	36.35	53.42	2
B5	0	0	2.24	5.84	44.86	45.86	1.2
B6	0	0	1.76	5.69	29.05	62.46	1.03
B7	0	0	0.84	5.08	43.54	50.23	0.3
B8	0	0	3.88	7.44	44.6	43.2	0.87
B9	0	0	1.79	7.01	55.61	35.24	0.34
B10	0	0	4.27	10.41	55.62	29.15	0.55
B11	0	0	0.07	3.21	62.53	33.88	0.31
B12	0	0	2.75	6.29	53.15	37.53	0.27
B13	0	0	1.78	5.13	58.79	33.97	0.33
B14	0	0	3.48	6.05	55.2	34.54	0.74
B15	0	0	1.48	3.59	51.3	43.27	0.37

Appendix D

Sediment Chemical Analysis

Volatile Compounds

SUMMARY OF ANALYTICAL RESULTS: P882

VOAMS-SW8260-SOLID

Sample ID	New York TAGM	B2		B4		B6		B8		B10	
Lab Sample No.	Rec. Soil	465454		465455		465456		465457		465458	
Sampling Date	Cleanup Objective	09/22/03		09/22/03		09/22/03		09/22/03		09/22/03	
Matrix	Criteria*	SOLID		SOLID		SOLID		SOLID		SOLID	
Dilution Factor		1		1		1		1		1	
Units	mg/kg	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
VOLATILE COMPOUNDS (GC/MS)											
Chloromethane	NA	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
Bromomethane	NA	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
Vinyl Chloride	0.12	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
Chloroethane	1.9	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
Methylene Chloride	0.1	0.0037	U	0.0013	JB	0.0037	U	0.0021	JB	0.0023	JB
Acetone	0.11	0.028		0.041		0.026		0.022		0.0055	U
Carbon Disulfide	2.7	0.001	J	0.0026	J	0.0011	J	0.0036	J	0.0011	J
1,1-Dichloroethene	0.4	0.0025	U	0.0027	U	0.0024	U	0.0025	U	0.0022	U
1,1-Dichloroethane	0.2	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
trans-1,2-Dichloroethene	0.3	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
cis-1,2-Dichloroethene	NA	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
Chloroform	0.3	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
1,2-Dichloroethane	0.1	0.0025	U	0.0027	U	0.0024	U	0.0025	U	0.0022	U
2-Butanone	0.3	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
1,1,1-Trichloroethane	0.76	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
Carbon Tetrachloride	0.6	0.0025	U	0.0027	U	0.0024	U	0.0025	U	0.0022	U
Bromodichloromethane	NA	0.0012	U	0.0013	U	0.0012	U	0.0013	U	0.0011	U
1,2-Dichloropropane	NA	0.0012	U	0.0013	U	0.0012	U	0.0013	U	0.0011	U
cis-1,3-Dichloropropene	NA	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
Trichloroethene	0.7	0.0012	U	0.0013	U	0.0012	U	0.0013	U	0.0011	U
Dibromochloromethane	NA	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
1,1,2-Trichloroethane	NA	0.0037	U	0.004	U	0.0037	U	0.0038	U	0.0033	U
Benzene	0.06	0.0012	U	0.0013	U	0.0012	U	0.0013	U	0.0011	U
trans-1,3-Dichloropropene	NA	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
Bromoform	NA	0.005	U	0.0053	U	0.0049	U	0.0051	U	0.0044	U
4-Methyl-2-Pentanone	1	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
2-Hexanone	NA	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
Tetrachloroethene	1.4	0.0011	J	0.0018		0.002		0.0025		0.0018	
1,1,2,2-Tetrachloroethane	0.6	0.0012	U	0.0013	U	0.0012	U	0.0013	U	0.0011	U
Toluene	1.5	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
Chlorobenzene	1.7	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
Ethylbenzene	5.5	0.005	U	0.0053	U	0.0049	U	0.0051	U	0.0044	U
Styrene	NA	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
Xylene (Total)	1.2	0.0062	U	0.0067	U	0.0061	U	0.0064	U	0.0055	U
Total Confident Conc.		0.028		0.0428		0.028		0.0245		0.0018	
Total Estimated Conc. (TICs)		0		0		0		0		0	

Volatile Compounds (continued)

Sample ID	New York TAGM	B12		A1		A3		A6		A9	
Lab Sample No.	Rec. Soil	465459		465460		465461		465462		465463	
Sampling Date	Cleanup Objective	09/22/03		09/22/03		09/22/03		09/22/03		09/22/03	
Matrix	Criteria*	SOLID		SOLID		SOLID		SOLID		SOLID	
Dilution Factor		1		1		1		1		1	
Units	mg/kg	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
VOLATILE COMPOUNDS (GC/MS)											
Chloromethane	NA	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
Bromomethane	NA	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
Vinyl Chloride	0.12	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
Chloroethane	1.9	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
Methylene Chloride	0.1	0.0037	U	0.0007	JB	0.0008	JB	0.019	B	0.0094	B
Acetone	0.11	0.03		0.0068	U	0.0058	U	0.0066	U	0.0062	U
Carbon Disulfide	2.7	0.0017	J	0.0068	U	0.0015	J	0.0014	J	0.0018	J
1,1-Dichloroethene	0.4	0.0025	U	0.0027	U	0.0023	U	0.0027	U	0.0025	U
1,1-Dichloroethane	0.2	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
trans-1,2-Dichloroethene	0.3	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
cis-1,2-Dichloroethene	NA	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
Chloroform	0.3	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
1,2-Dichloroethane	0.1	0.0025	U	0.0027	U	0.0023	U	0.0027	U	0.0025	U
2-Butanone	0.3	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
1,1,1-Trichloroethane	0.76	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
Carbon Tetrachloride	0.6	0.0025	U	0.0027	U	0.0023	U	0.0027	U	0.0025	U
Bromodichloromethane	NA	0.0012	U	0.0014	U	0.0012	U	0.0013	U	0.0012	U
1,2-Dichloropropane	NA	0.0012	U	0.0014	U	0.0012	U	0.0013	U	0.0012	U
cis-1,3-Dichloropropene	NA	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
Trichloroethene	0.7	0.0012	U	0.0014	U	0.0012	U	0.0013	U	0.0012	U
Dibromochloromethane	NA	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
1,1,2-Trichloroethane	NA	0.0037	U	0.0041	U	0.0035	U	0.004	U	0.0037	U
Benzene	0.06	0.0012	U	0.0014	U	0.0012	U	0.0013	U	0.0012	U
trans-1,3-Dichloropropene	NA	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
Bromoform	NA	0.005	U	0.0054	U	0.0047	U	0.0053	U	0.005	U
4-Methyl-2-Pentanone	1	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
2-Hexanone	NA	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
Tetrachloroethene	1.4	0.0035		0.0012	J	0.0018		0.0012	J	0.0015	
1,1,2,2-Tetrachloroethane	0.6	0.0012	U	0.0014	U	0.0012	U	0.0013	U	0.0012	U
Toluene	1.5	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
Chlorobenzene	1.7	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
Ethylbenzene	5.5	0.005	U	0.0054	U	0.0047	U	0.0053	U	0.005	U
Styrene	NA	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
Xylene (Total)	1.2	0.0062	U	0.0068	U	0.0058	U	0.0066	U	0.0062	U
Total Confident Conc.		0.0335		0		0.0018		0		0.0015	
Total Estimated Conc. (TICs)		0.021		0		0		0		0	

Volatile Compounds (continued)

Sample ID	New York TAGM	A12		A15		A18		A21		A24	
Lab Sample No.	Rec. Soil	465464		465465		465466		465467		465468	
Sampling Date	Cleanup Objective	09/22/03		09/22/03		09/23/03		09/23/03		09/23/03	
Matrix	Criteria*	SOLID		SOLID		SOLID		SOLID		SOLID	
Dilution Factor		1		1		1		1		1	
Units	mg/kg	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
VOLATILE COMPOUNDS (GC/MS)											
Chloromethane	NA	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
Bromomethane	NA	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
Vinyl Chloride	0.12	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
Chloroethane	1.9	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
Methylene Chloride	0.1	0.0065	B	0.0031	U	0.0014	JB	0.0036	U	0.0011	JB
Acetone	0.11	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.043	
Carbon Disulfide	2.7	0.0011	J	0.0052	U	0.0017	J	0.006	U	0.011	
1,1-Dichloroethene	0.4	0.0023	U	0.0021	U	0.0026	U	0.0024	U	0.0021	U
1,1-Dichloroethane	0.2	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
trans-1,2-Dichloroethene	0.3	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
cis-1,2-Dichloroethene	NA	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
Chloroform	0.3	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
1,2-Dichloroethane	0.1	0.0023	U	0.0021	U	0.0026	U	0.0024	U	0.0021	U
2-Butanone	0.3	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
1,1,1-Trichloroethane	0.76	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
Carbon Tetrachloride	0.6	0.0023	U	0.0021	U	0.0026	U	0.0024	U	0.0021	U
Bromodichloromethane	NA	0.0012	U	0.001	U	0.0013	U	0.0012	U	0.0011	U
1,2-Dichloropropane	NA	0.0012	U	0.001	U	0.0013	U	0.0012	U	0.0011	U
cis-1,3-Dichloropropene	NA	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
Trichloroethene	0.7	0.0012	U	0.001	U	0.0013	U	0.0012	U	0.0011	U
Dibromochloromethane	NA	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
1,1,2-Trichloroethane	NA	0.0035	U	0.0031	U	0.0039	U	0.0036	U	0.0032	U
Benzene	0.06	0.0012	U	0.001	U	0.0013	U	0.0012	U	0.0011	U
trans-1,3-Dichloropropene	NA	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
Bromoform	NA	0.0046	U	0.0042	U	0.0052	U	0.0048	U	0.0043	U
4-Methyl-2-Pentanone	1	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
2-Hexanone	NA	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
Tetrachloroethene	1.4	0.002		0.0022		0.0011	J	0.002		0.0011	U
1,1,2,2-Tetrachloroethane	0.6	0.0012	U	0.001	U	0.0013	U	0.0012	U	0.0011	U
Toluene	1.5	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
Chlorobenzene	1.7	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
Ethylbenzene	5.5	0.0046	U	0.0042	U	0.0052	U	0.0048	U	0.0043	U
Styrene	NA	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
Xylene (Total)	1.2	0.0058	U	0.0052	U	0.0065	U	0.006	U	0.0054	U
Total Confident Conc.		0.002		0.0022		0		0.002		0.054	
Total Estimated Conc. (TICs)		0		0		0		0		0	

Volatile Compounds (continued)

Sample ID	New York TAGM	A27		A30		A33	
Lab Sample No.	Rec. Soil	465469		465470		465471	
Sampling Date	Cleanup Objective	09/23/03		09/23/03		09/23/03	
Matrix	Criteria*	SOLID		SOLID		SOLID	
Dilution Factor		1		1		1	
Units	mg/kg	mg/kg		mg/kg		mg/kg	
VOLATILE COMPOUNDS (GC/MS)							
Chloromethane	NA	0.0056	U	0.0062	U	0.0058	U
Bromomethane	NA	0.0056	U	0.0062	U	0.0058	U
Vinyl Chloride	0.12	0.0056	U	0.0062	U	0.0058	U
Chloroethane	1.9	0.0056	U	0.0062	U	0.0058	U
Methylene Chloride	0.1	0.0016	JB	0.0006	JB	0.0014	JB
Acetone	0.11	0.0056	U	0.0062	U	0.0058	U
Carbon Disulfide	2.7	0.0014	J	0.0021	J	0.0016	J
1,1-Dichloroethene	0.4	0.0023	U	0.0025	U	0.0023	U
1,1-Dichloroethane	0.2	0.0056	U	0.0062	U	0.0058	U
trans-1,2-Dichloroethene	0.3	0.0056	U	0.0062	U	0.0058	U
cis-1,2-Dichloroethene	NA	0.0056	U	0.0062	U	0.0058	U
Chloroform	0.3	0.0056	U	0.0062	U	0.0058	U
1,2-Dichloroethane	0.1	0.0023	U	0.0025	U	0.0023	U
2-Butanone	0.3	0.0056	U	0.0062	U	0.0058	U
1,1,1-Trichloroethane	0.76	0.0056	U	0.0062	U	0.0058	U
Carbon Tetrachloride	0.6	0.0023	U	0.0025	U	0.0023	U
Bromodichloromethane	NA	0.0011	U	0.0012	U	0.0012	U
1,2-Dichloropropane	NA	0.0011	U	0.0012	U	0.0012	U
cis-1,3-Dichloropropene	NA	0.0056	U	0.0062	U	0.0058	U
Trichloroethene	0.7	0.0011	U	0.0012	U	0.0012	U
Dibromochloromethane	NA	0.0056	U	0.0062	U	0.0058	U
1,1,2-Trichloroethane	NA	0.0034	U	0.0037	U	0.0035	U
Benzene	0.06	0.0011	U	0.0012	U	0.0012	U
trans-1,3-Dichloropropene	NA	0.0056	U	0.0062	U	0.0058	U
Bromoform	NA	0.0045	U	0.005	U	0.0046	U
4-Methyl-2-Pentanone	1	0.0056	U	0.0062	U	0.0058	U
2-Hexanone	NA	0.0056	U	0.0062	U	0.0058	U
Tetrachloroethene	1.4	0.002		0.0024		0.0032	
1,1,2,2-Tetrachloroethane	0.6	0.0011	U	0.0012	U	0.0012	U
Toluene	1.5	0.0056	U	0.0062	U	0.0058	U
Chlorobenzene	1.7	0.0056	U	0.0062	U	0.0058	U
Ethylbenzene	5.5	0.0045	U	0.005	U	0.0046	U
Styrene	NA	0.0056	U	0.0062	U	0.0058	U
Xylene (Total)	1.2	0.0056	U	0.0062	U	0.0058	U
Total Confident Conc.		0.002		0.0024		0.0032	
Total Estimated Conc. (TICs)		0		0		0	

Volatile Compounds (continued)

NR - Not analyzed.

U - The compound was not detected at the indicated concentration.

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero. The concentration given is an approximate value.

TAGM = Technical and Administrative Guidance Memorandum

B - The analyte was found in the laboratory blank as well as the sample. This indicates possible laboratory contamination of the sample.

Sample ID B = Borrow Area B

Sample ID A = Borrow Area A

***The Action Levels listed reflect current knowledge of New York State standards and are intended as general guidance for the user.**

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Semi-volatile Compounds

SUMMARY OF ANALYTICAL RESULTS: P882

BNAMS-SW8270-SOLID

Sample ID	New York TAGM	B2		B4		B6		B8		B10		B12	
Lab Sample No.	Rec. Soil	465454		465455		465456		465457		465458		465459	
Sampling Date	Cleanup Objective	09/22/03		09/22/03		09/22/03		09/22/03		09/22/03		09/22/03	
Matrix	Criteria*	SOLID		SOLID		SOLID		SOLID		SOLID		SOLID	
Dilution Factor		1		1		1		1		1		1	
Units	mg/kg	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
SEMIVOLATILE COMPOUNDS (GC/MS)													
Naphthalene	13	0.43	U	0.46	U	0.43	U	0.44	U	0.39	U	0.42	U
Acenaphthylene	41	0.43	U	0.46	U	0.43	U	0.44	U	0.39	U	0.42	U
Acenaphthene	90	0.43	U	0.46	U	0.43	U	0.44	U	0.39	U	0.42	U
Fluorene	350	0.43	U	0.46	U	0.43	U	0.44	U	0.39	U	0.42	U
Phenanthrene	220	0.43	U	0.46	U	0.43	U	0.44	U	0.39	U	0.42	U
Anthracene	700	0.43	U	0.46	U	0.43	U	0.44	U	0.39	U	0.42	U
Fluoranthene	1900	0.43	U	0.018	J	0.43	U	0.44	U	0.39	U	0.42	U
Pyrene	665	0.43	U	0.022	J	0.43	U	0.44	U	0.39	U	0.011	J
Benzo(a)anthracene	3	0.043	U	0.046	U	0.043	U	0.044	U	0.039	U	0.042	U
Chrysene	0.4	0.43	U	0.014	J	0.43	U	0.44	U	0.39	U	0.42	U
Benzo(b)fluoranthene	1.1	0.043	U	0.046	U	0.043	U	0.044	U	0.039	U	0.042	U
Benzo(k)fluoranthene	1.1	0.043	U	0.046	U	0.043	U	0.044	U	0.039	U	0.042	U
Benzo(a)pyrene	11	0.043	U	0.046	U	0.043	U	0.044	U	0.039	U	0.042	U
Indeno(1,2,3-cd)pyrene	3.2	0.043	U	0.046	U	0.043	U	0.044	U	0.039	U	0.042	U
Dibenz(a,h)anthracene	165000	0.043	U	0.046	U	0.043	U	0.044	U	0.039	U	0.042	U
Benzo(g,h,i)perylene	800	0.43	U	0.46	U	0.43	U	0.44	U	0.39	U	0.42	U
Total Confident Conc.		0		0		0		0		0		0	
Total Estimated Conc. (TICs)		NA		NA		NA		NA		NA		NA	

Semi-volatile Compounds (continued)

Sample ID	New York TAGM	A1		A3		A6		A9		A12	
Lab Sample No.	Rec. Soil	465460		465461		465462		465463		465464	
Sampling Date	Cleanup Objective	09/22/03		09/22/03		09/22/03		09/22/03		09/22/03	
Matrix	Criteria*	SOLID		SOLID		SOLID		SOLID		SOLID	
Dilution Factor		1		1		1		1		1	
Units	mg/kg	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
SEMIVOLATILE COMPOUNDS (GC/MS)											
Naphthalene	13	0.46	U	0.4	U	0.46	U	0.43	U	0.41	U
Acenaphthylene	41	0.46	U	0.4	U	0.46	U	0.43	U	0.41	U
Acenaphthene	90	0.46	U	0.4	U	0.46	U	0.43	U	0.41	U
Fluorene	350	0.46	U	0.4	U	0.46	U	0.43	U	0.41	U
Phenanthrene	220	0.02	J	0.4	U	0.015	J	0.43	U	0.41	U
Anthracene	700	0.46	U	0.4	U	0.46	U	0.43	U	0.41	U
Fluoranthene	1900	0.025	J	0.4	U	0.033	J	0.43	U	0.41	U
Pyrene	665	0.035	J	0.4	U	0.04	J	0.43	U	0.41	U
Benzo(a)anthracene	3	0.012	J	0.04	U	0.015	J	0.043	U	0.041	U
Chrysene	0.4	0.021	J	0.4	U	0.023	J	0.012	J	0.41	U
Benzo(b)fluoranthene	1.1	0.021	J	0.04	U	0.026	J	0.014	J	0.041	U
Benzo(k)fluoranthene	1.1	0.024	J	0.04	U	0.032	J	0.016	J	0.041	U
Benzo(a)pyrene	11	0.046	U	0.04	U	0.029	J	0.043	U	0.041	U
Indeno(1,2,3-cd)pyrene	3.2	0.046	U	0.04	U	0.046	U	0.043	U	0.041	U
Dibenz(a,h)anthracene	165000	0.046	U	0.04	U	0.046	U	0.043	U	0.041	U
Benzo(g,h,i)perylene	800	0.46	U	0.4	U	0.46	U	0.43	U	0.41	U
Total Confident Conc.		0		0		0		0		0	
Total Estimated Conc. (TICs)		NA		NA		NA		NA		NA	

Semi-volatile Compounds (continued)

NR - Not analyzed.

U - The compound was not detected at the indicated concentration.

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero. The concentration given is an approximate value.

B - The analyte was found in the laboratory blank as well as the sample. This indicates possible laboratory contamination of the sample.

Sample ID B = Borrow Area B

Sample ID A = Borrow Area A

TAGM = Technical and Administrative Guidance Memorandum

Shaded cell indicate analyzed samples exceeding the New York TAGM criteria

***The Action Levels listed reflect current knowledge of New York State standards and are intended as general guidance for the user.**

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Pesticides / PCBs 8081

SUMMARY OF ANALYTICAL RESULTS: P882

PESTGC-SW8081-SOLID

Sample ID	New York TAGM	B2		B4		B6		B8		B10		B12	
Lab Sample No.	Rec. Soil	465454		465455		465456		465457		465458		465459	
Sampling Date	Cleanup Objective	09/22/03		09/22/03		09/22/03		09/22/03		09/22/03		09/22/03	
Matrix	Criteria*	SOLID		SOLID		SOLID		SOLID		SOLID		SOLID	
Dilution Factor		1		1		1		1		1		1	
Units	mg/kg	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
PESTICIDES/PCBs													
Aldrin	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
alpha-BHC	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
beta-BHC	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
delta-BHC	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
gamma-BHC (Lindane)	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
Chlordane	NA	0.086	U	0.092	U	0.086	U	0.088	U	0.078	U	0.085	U
4,4'-DDD	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
4,4'-DDE	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
4,4'-DDT	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
Dieldrin	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
Endosulfan I	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
Endosulfan II	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
Endosulfan sulfate	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
Endrin	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
Endrin aldehyde	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
Endrin ketone	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
Heptachlor	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
Heptachlor epoxide	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
Methoxychlor	NA	0.0086	U	0.0092	U	0.0086	U	0.0088	U	0.0078	U	0.0085	U
Toxaphene	NA	0.086	U	0.092	U	0.086	U	0.088	U	0.078	U	0.085	U

Pesticides / PCBs 8081 (continued)

Sample ID	New York TAGM	A1		A3		A6		A9		A12		A15	
Lab Sample No.	Rec. Soil	465460		465461		465462		465463		465464		465465	
Sampling Date	Cleanup Objective	09/22/03		09/22/03		09/22/03		09/22/03		09/22/03		09/22/03	
Matrix	Criteria*	SOLID		SOLID		SOLID		SOLID		SOLID		SOLID	
Dilution Factor		1		1		1		1		1		1	
Units	mg/kg	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
PESTICIDES/PCBs													
Aldrin	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
alpha-BHC	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
beta-BHC	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
delta-BHC	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
gamma-BHC (Lindane)	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
Chlordane	NA	0.093	U	0.08	U	0.093	U	0.086	U	0.083	U	0.072	U
4,4'-DDD	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
4,4'-DDE	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
4,4'-DDT	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
Dieldrin	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
Endosulfan I	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
Endosulfan II	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
Endosulfan sulfate	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
Endrin	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
Endrin aldehyde	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
Endrin ketone	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
Heptachlor	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
Heptachlor epoxide	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
Methoxychlor	NA	0.0093	U	0.008	U	0.0093	U	0.0086	U	0.0083	U	0.0072	U
Toxaphene	NA	0.093	U	0.08	U	0.093	U	0.086	U	0.083	U	0.072	U

Pesticides / PCBs 8081 (continued)

Sample ID	New York TAGM	A18		A21		A24		A27		A30		A33	
Lab Sample No.	Rec. Soil	465466		465467		465468		465469		465470		465471	
Sampling Date	Cleanup Objective	09/23/03		09/23/03		09/23/03		09/23/03		09/23/03		09/23/03	
Matrix	Criteria*	SOLID		SOLID		SOLID		SOLID		SOLID		SOLID	
Dilution Factor		1		1		1		1		1		1	
Units	mg/kg	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
PESTICIDES/PCBs													
Aldrin	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
alpha-BHC	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
beta-BHC	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
delta-BHC	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
gamma-BHC (Lindane)	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
Chlordane	NA	0.089	U	0.083	U	0.074	U	0.078	U	0.085	U	0.079	U
4,4'-DDD	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
4,4'-DDE	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
4,4'-DDT	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
Dieldrin	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
Endosulfan I	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
Endosulfan II	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
Endosulfan sulfate	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
Endrin	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
Endrin aldehyde	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
Endrin ketone	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
Heptachlor	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
Heptachlor epoxide	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
Methoxychlor	NA	0.0089	U	0.0083	U	0.0074	U	0.0078	U	0.0085	U	0.0079	U
Toxaphene	NA	0.089	U	0.083	U	0.074	U	0.078	U	0.085	U	0.079	U

NR - Not analyzed.

U - The compound was not detected at the indicated concentration.

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantification limit but greater than zero. The concentration given is an approximate value.

Sample ID B = Borrow Area B

Sample ID A = Borrow Area A

TAGM = Technical and Administrative Guidance Memorandum

B - The analyte was found in the laboratory blank as well as the sample. This indicates possible laboratory contamination of the sample.

***The Action Levels listed reflect current knowledge of New York State standards and are intended as general guidance for the user.**

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Pesticides / PCBs 8082

SUMMARY OF ANALYTICAL RESULTS: P882

PESTGC-SW8082-SOLID

Sample ID	New York TAGM	B2		B4		B6		B8		B10		B12		A1		A3		A6	
Lab Sample No.	Rec. Soil	465454		465455		465456		465457		465458		465459		465460		465461		465462	
Sampling Date	Cleanup Objective	09/22/03		09/22/03		09/22/03		09/22/03		09/22/03		09/22/03		09/22/03		09/22/03		09/22/03	
Matrix	Criteria	SOLID		SOLID		SOLID		SOLID		SOLID		SOLID		SOLID		SOLID		SOLID	
Dilution Factor		1		1		1		1		1		1		1		1		1	
Units	mg/kg	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
PESTICIDES/PCBs																			
Aroclor-1016	NA	0.086	U	0.092	U	0.086	U	0.088	U	0.078	U	0.085	U	0.093	U	0.08	U	0.093	U
Aroclor-1221	NA	0.086	U	0.092	U	0.086	U	0.088	U	0.078	U	0.085	U	0.093	U	0.08	U	0.093	U
Aroclor-1232	NA	0.086	U	0.092	U	0.086	U	0.088	U	0.078	U	0.085	U	0.093	U	0.08	U	0.093	U
Aroclor-1242	NA	0.086	U	0.092	U	0.086	U	0.088	U	0.078	U	0.085	U	0.093	U	0.08	U	0.093	U
Aroclor-1248	NA	0.086	U	0.092	U	0.086	U	0.088	U	0.078	U	0.085	U	0.093	U	0.08	U	0.093	U
Aroclor-1254	NA	0.086	U	0.092	U	0.086	U	0.088	U	0.078	U	0.085	U	0.093	U	0.08	U	0.093	U
Aroclor-1260	NA	0.086	U	0.092	U	0.086	U	0.088	U	0.078	U	0.085	U	0.093	U	0.08	U	0.093	U
Aroclor-1262	NA	0.086	U	0.092	U	0.086	U	0.088	U	0.078	U	0.085	U	0.093	U	0.08	U	0.093	U
Aroclor-1268	NA	0.086	U	0.092	U	0.086	U	0.088	U	0.078	U	0.085	U	0.093	U	0.08	U	0.093	U

Pesticides / PCBs 8082 (continued)

Sample ID	New York TAGM	A9		A12		A15		A18		A21		A24		A27		A30		A33	
Lab Sample No.	Rec. Soil	465463		465464		465465		465466		465467		465468		465469		465470		465471	
Sampling Date	Cleanup Objective	09/22/03		09/22/03		09/22/03		09/23/03		09/23/03		09/23/03		09/23/03		09/23/03		09/23/03	
Matrix	Criteria	SOLID		SOLID		SOLID		SOLID		SOLID		SOLID		SOLID		SOLID		SOLID	
Dilution Factor		1		1		1		1		1		1		1		1		1	
Units	mg/kg	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
PESTICIDES/PCBs																			
Aroclor-1016	NA	0.086	U	0.083	U	0.072	U	0.089	U	0.083	U	0.074	U	0.078	U	0.085	U	0.079	U
Aroclor-1221	NA	0.086	U	0.083	U	0.072	U	0.089	U	0.083	U	0.074	U	0.078	U	0.085	U	0.079	U
Aroclor-1232	NA	0.086	U	0.083	U	0.072	U	0.089	U	0.083	U	0.074	U	0.078	U	0.085	U	0.079	U
Aroclor-1242	NA	0.086	U	0.083	U	0.072	U	0.089	U	0.083	U	0.074	U	0.078	U	0.085	U	0.079	U
Aroclor-1248	NA	0.086	U	0.083	U	0.072	U	0.089	U	0.083	U	0.074	U	0.078	U	0.085	U	0.079	U
Aroclor-1254	NA	0.086	U	0.083	U	0.072	U	0.089	U	0.083	U	0.074	U	0.078	U	0.085	U	0.079	U
Aroclor-1260	NA	0.086	U	0.083	U	0.072	U	0.089	U	0.083	U	0.074	U	0.078	U	0.085	U	0.079	U
Aroclor-1262	NA	0.086	U	0.083	U	0.072	U	0.089	U	0.083	U	0.074	U	0.078	U	0.085	U	0.079	U
Aroclor-1268	NA	0.086	U	0.083	U	0.072	U	0.089	U	0.083	U	0.074	U	0.078	U	0.085	U	0.079	U

NR - Not analyzed.

U - The compound was not detected at the indicated concentration.

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero. The concentration is an approximate value.

B - The analyte was found in the laboratory blank as well as the sample. sample. This indicates possible laboratory contamination of the sample.

Sample ID B = Borrow Area B

Sample ID A = Borrow Area A

TAGM = Technical and Administrative Guidance Memorandum

***The Action Levels listed reflect current knowledge of New York State standards and are intended as general guidance for the user.**

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Metals - Solid

SUMMARY OF ANALYTICAL RESULTS: P882

METALS-SOLID

Sample ID	New York TAGM	B2		B4		B6		B8		B10		B12		A1		A3		A6	
Lab Sample No.	Rec. Soil	465454		465455		465456		465457		465458		465459		465460		465461		465462	
Sampling Date	Cleanup Objective	09/22/03		09/22/03		09/22/03		09/22/03		09/22/03		09/22/03		09/22/03		09/22/03		09/22/03	
Matrix	Criteria*	SOLID		SOLID		SOLID		SOLID		SOLID		SOLID		SOLID		SOLID		SOLID	
Units	mg/kg	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Antimony	NA	1	U	1.1	U	1	U	1	U	0.9	U	0.99	U	1.1	U	0.93	U	1.1	U
Arsenic	NA	0.9	B	1.8		1.4		1	B	1.7		0.86	U	1.9		1.1	B	3	
Beryllium	NA	0.08	B	0.18	B	0.09	B	0.08	B	0.07	B	0.08	B	0.17	B	0.06	B	0.24	B
Cadmium	NA	0.1	U	0.11	U	0.1	U	0.1	U	0.093	U	0.1	U	0.11	U	0.096	U	0.11	U
Chromium	NA	4.4		14.4		8.5		5.6		6.1		7.4		14.7		5		22.4	
Copper	NA	4.9	B	16.1		8.3		6	B	6.8		7.6		18.3		6		25.6	
Lead	NA	4		11.5		6.8		5.2		5.2		5.5		12.5		3.8		18.6	
Mercury	NA	0.021	U	0.04	B	0.03	B	0.03	B	0.02	B	0.03	B	0.06		0.02	B	0.06	
Nickel	NA	1.8	B	5.7	B	2.9	B	2.3	B	2.7	B	2.7	B	5.8	B	2.3	B	8.7	B
Selenium	NA	1	U	1.1	U	1	U	1	U	0.9	U	0.99	U	1.1	U	0.93	U	1.1	U
Silver	NA	0.18	U	0.19	U	0.22	B	0.18	U	0.16	U	0.18	U	0.19	U	0.17	U	0.28	B
Thallium	NA	1.1	U	1.2	U	1.1	U	1.2	U	1	U	1.1	U	1.2	U	1.1	U	1.2	U
Zinc	NA	18		45.4		29.2		21.6		22.5		23.4		48.6		18.2		64.7	

Metals – Solid (continued)

Sample ID	New York TAGM	A9		A12		A15		A18		A21		A24		A27		A30		A33	
Lab Sample No.	Rec. Soil	465463		465464		465465		465466		465467		465468		465469		465470		465471	
Sampling Date	Cleanup Objective	09/22/03		09/22/03		09/22/03		09/23/03		09/23/03		09/23/03		09/23/03		09/23/03		09/23/03	
Matrix	Criteria*	SOLID		SOLID		SOLID		SOLID		SOLID		SOLID		SOLID		SOLID		SOLID	
Units	mg/kg	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Antimony	NA	1	U	0.96	U	0.83	U	1	U	0.96	U	0.87	U	0.91	U	0.99	U	0.92	U
Arsenic	NA	1.8		0.84	U	0.98	B	0.95	B	2.2		0.75	U	0.8	U	1.1	B	0.8	U
Beryllium	NA	0.12	B	0.02	B	0.04	B	0.13	B	0.15	B	0.03	B	0.023	U	0.06	B	0.04	B
Cadmium	NA	0.1	U	0.099	U	0.085	U	0.11	U	0.099	U	0.089	U	0.094	U	0.1	U	0.094	U
Chromium	NA	10.1		3.2		2.9		10.4		13.4		6.1		2.2		6.1		4.1	
Copper	NA	12.5		4	B	3.5	B	11.7		15		3.2	B	2.7	B	6.6		4.7	B
Lead	NA	8.3		3.2		2.6		8.8		11		2.8		2.6		4.7		3.5	
Mercury	NA	0.05		0.021	U	0.018	U	0.04		0.04	B	0.018	U	0.019	U	0.03	B	0.02	B
Nickel	NA	4.1	B	1.4	B	1.3	B	4.1	B	5.3	B	4.6	B	0.9	B	2	B	1.5	B
Selenium	NA	1	U	0.96	U	0.83	U	1	U	0.96	U	0.87	U	0.91	U	0.99	U	0.92	U
Silver	NA	0.19	B	0.17	U	0.15	U	0.19	U	0.26	B	0.16	U	0.16	U	0.18	U	0.17	U
Thallium	NA	1.1	U	1.1	U	1.4	U	1.2	U	1.1	U	0.98	U	1	U	1.1	U	1	U
Zinc	NA	32.8		12.2		11.3		31.5		39.3		11		10.5		20.6		16.4	

NR - Not analyzed.

U - The compound was not detected at the indicated concentration.

B - Reported value is less than the Reporting Limit but greater than the Instrument Detection Limit.

N - The spiked sample recovery is not within control limits.

Sample ID B = Borrow Area B

Sample ID A = Borrow Area A

TAGM = Technical and Administrative Guidance Memorandum

***The Action Levels listed reflect current knowledge of New York State standards and are intended as general guidance for the user.**

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Appendix E

Photographic Documentation

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District
Project: Asharoken Burrow Area Investigation

Photographer: D. Santillo
Date: 9/22/04
Photo No.: 1
Direction:

Comments:
Deployment of Smith-McIntyre benthic grab.

Photographer: D. Santillo
Date: 9/22/04
Photo No.: 2
Direction:

Comments:
Retrieving the Smith-McIntyre benthic grab.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District
Project: Asharoken Burrow Area Investigation

Photographer: J. Wu
Date: 9/22/04
Photo No.: 3
Direction:

Comments:
Retrieving the Smith-McIntyre benthic grab.

Photographer: D. Santillo
Date: 9/23/04
Photo No.: 4
Direction:

Comments:
Waiting to deploy the Smith-McIntyre benthic grab. Strong wind and heavy rain conditions throughout the entire sampling.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District
Project: Asharoken Burrow Area Investigation

Photographer: P. Fellion
Date: 9/24/04
Photo No.: 5
Direction:

Comments:
Deployment of trawl net.

Photographer: P. Fellion
Date: 9/24/04
Photo No.: 6
Direction:

Comments:
Retrieving of trawl net.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District
Project: Asharoken Burrow Area Investigation

Photographer: P. Fellion
Date: 9/24/04
Photo No.: 7
Direction:

Comments:
Emptying content of the net. Note the abundance of bay anchovy in the tote.

Photographer: P. Fellion
Date: 9/24/04
Photo No.: 8
Direction:

Comments:
Tote with contents from a trawl.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District
Project: Asharoken Burrow Area Investigation

Photographer: P. Fellion
Date: 9/24/04
Photo No.: 9
Direction:

Comments:
Deployment of trawl net.

Photographer: P. Fellion
Date: 9/24/04
Photo No.: 10
Direction:

Comments:
Blackfish caught from the trawl net.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District
Project: Asharoken Burrow Area Investigation

Photographer: P. Fellion
Date: 9/24/04
Photo No.: 11
Direction:

Comments:
Scup caught from the trawl net.

Photographer: P. Fellion
Date: 9/24/04
Photo No.: 12
Direction:

Comments:
Juvenile scup caught from the trawl net.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District
Project: Asharoken Burrow Area Investigation

Photographer: P. Fellion
Date: 9/24/04
Photo No.: 13
Direction:

Comments:
Black sea bass caught from the trawl net.

Appendix B

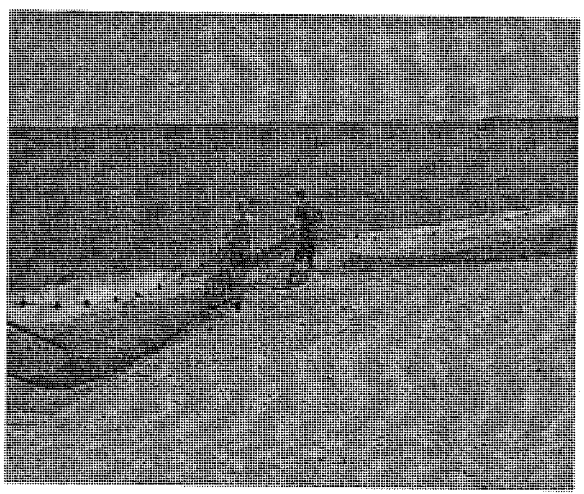
Asharoken and Bayville Nearshore Investigation

U.S. Army Corps of Engineers,
New York District

Asharoken and Bayville Nearshore Investigation.

Final 2005 FINFISH, INVERTEBRATE INFAUNA AND WATER QUALITY SUMMARY REPORT

July 2005



Prepared by:
U.S. Army Corps of Engineers
Planning Division
New York District
26 Federal Plaza
New York, New York 10278-0090

EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers, New York District, and the New York State Department of Environmental Conservation have partnered to conduct a feasibility study to look at hurricane and storm damage reduction measures for the communities of Asharoken and Bayville, New York. In order to assess environmental impacts of proposed Federal actions, the District conducted the following "Asharoken and Bayville Nearshore Investigation" to gather information on the baseline biological conditions that would potentially be affected by future actions. Investigation activities included beach seining to collect finfish data, benthic beach cores to collect macroinvertebrate data, and water quality sampling. Baseline investigations took place from September 2003 through July 2004.

A total of 21 species of finfish were collected on Asharoken and Bayville beaches during the Fall 2003, Spring 2004 and Summer 2004 sampling events. Menhaden was the most abundant species accounting for 60% of the overall catch, followed by Atlantic silversides with 29%. At the Asharoken location, both the species richness and abundance of finfish species were greatest in Summer 2004 season. There were no seasonal effects on species richness at the Bayville location, but the abundances were significantly higher in the Summer 2004. At both locations the most commonly found EFH listed species was bluefish, which had the greatest abundance in Summer 2004.

With respect to benthic macroinvertebrates, a total of 8 phyla consisting of 46 taxa were collected throughout the study period. The most commonly abundant phylum was Annelida which was composed of Oligochaetes of various species and accounted for 84.1% of the encountered organisms. At both locations, the benthic macroinvertebrate species richness and abundance was greatest in the Spring/Summer 2004. Long Island Sound samples were also found to have greater abundances at both locations relative to samples collected at their respective bay beach transects.

The above findings describe the finfish and benthic communities encountered at the Asharoken and Bayville locations during 3 seasons in 2003-2004. The findings also suggest that the environmental impacts of any beach nourishing activities could be minimized if they were conducted in the early spring, where finfish species richness and abundances are reduced.

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C	degrees Celsius (temperature)
District	New York District
DO	Dissolved oxygen
EFH	Essential Fish Habitat
g	gram
Investigation	Asharoken and Bayville Nearshore Investigation
LPIL	lowest possible identification level
Location	Asharoken and Bayville Beaches
mg/l	milligrams per liter (dissolved oxygen)
Max	maximum
Mean	average
Min	minimum
mm	millimeter
N	number measured
NYSDEC	New York State Department of Environmental Conservation
PAH	polyaromatic hydrocarbon
ppt	parts per thousand (salinity)
SD	standard deviation
SL	Standard Length
Study	Asharoken & Bayville hurricane and storm damage reduction feasibility Study
TL	total length
USACE	U.S. Army Corps of Engineers

1.0 INTRODUCTION

The U.S. Army Corps of Engineers, New York District (District), in partnership with the New York State Department of Environmental Conservation (NYSDEC), is conducting two feasibility phase studies to evaluate hurricane and storm damage reduction measures for two Long Island north shore, New York locations. The study areas include the Village of Bayville and the Village of Asharoken, New York. The investigation discussed in this report was undertaken to provide supporting environmental baseline data for environmental assessment of potential federal action in these areas.

The Village of Asharoken lies on a narrow section of land that connects Eatons Neck peninsula to the mainland of the Town of Huntington and is located in Suffolk County (Figure 1). The length of Asharoken Beach is approximately 2.5 miles, while width varies from 100 feet at the northwestern end to 1,000 feet at the southeastern end. Asharoken Avenue, which generally runs parallel to the Long Island Sound shoreline, provides the only vehicular access to the Village and the Eatons Neck Community. The preservation of this roadway to keep access open during storm events is one of the primary considerations of the feasibility study. Beach erosion is also a primary consideration of the feasibility study. The District is evaluating structural alternatives that could involve placement of sand to create an elevated and wider sand berm, and the construction of a protective sand dune along Asharoken beach.

The Village of Bayville is located on the north shore of Nassau County, generally between Long Island Sound and Oyster Bay (Figure 2). The project study area extends from Long Island Sound on the north, Mill Neck Creek and Oyster Bay Harbor on the south, Centre Island on the east, and to the western municipal boundary of the Village of Bayville. The District is evaluating a number of structural and non-structural alternatives for Bayville. Placement of sand on the beach was initially one of the considered alternatives, which has since been screened from further development. Dissimilar to Asharoken, the Long Island Sound beach at Bayville has not experienced erosion based on analysis of historical and current bathymetry and aerial photographs. Structural alternatives are now focused on fortification of existing seawalls, construction of a protective dune, and construction of protective walls with associated drainage and pump stations along the Oyster Bay/Mill Neck Creek shoreline of the community.

Figure 1. Asharoken beach sample transects and water quality stations.

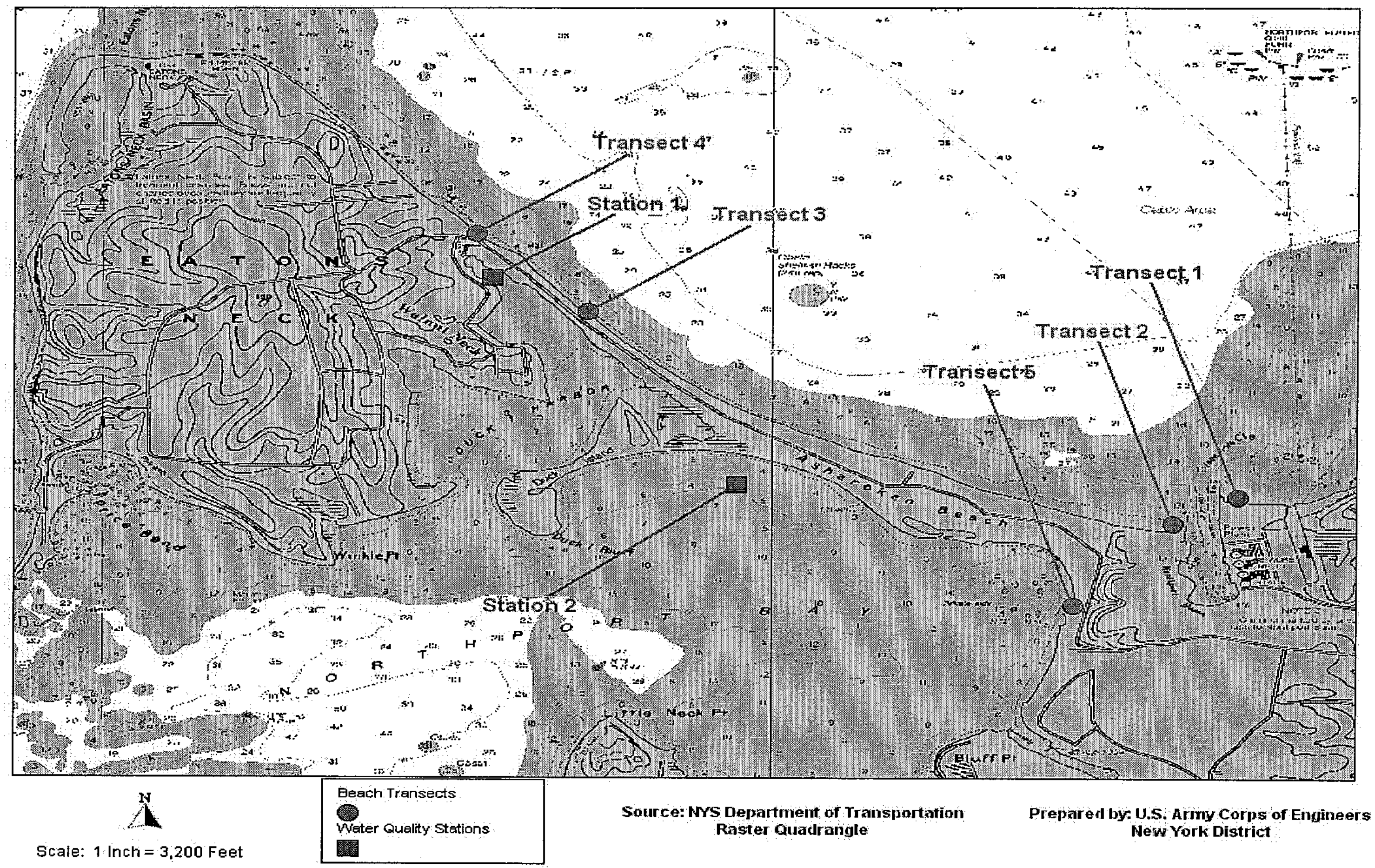
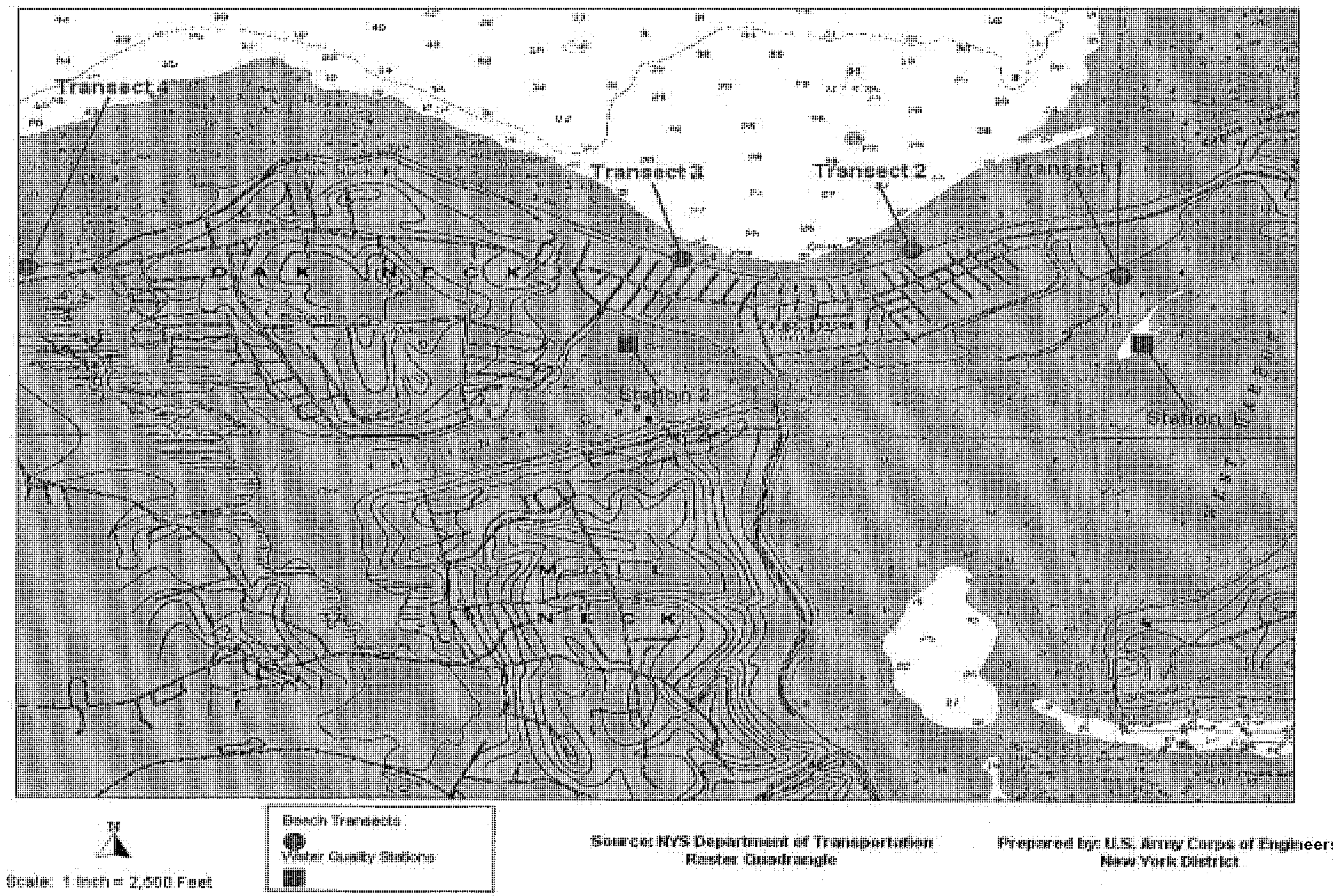


Figure 2. Bayville beach sample transect and water quality stations.



2.0 OBJECTIVES

The primary objective of the Asharoken and Bayville Nearshore Investigation was to collect data to characterize the existing environmental condition of the two feasibility study areas for purposes of environmental assessment of potential federal actions in these locations. As sand placement and dune construction are two alternatives that the District has considered for both study locations, the investigation focused baseline data collection efforts on the beach and intertidal zone environments. Benthic macroinvertebrate and fisheries species found within the intertidal zone community were sampled. Water quality data was collected for the beach intertidal transects and at nearshore locations to establish the condition of the water resources that could potentially be affected by federal actions. Sediment data for beach transects was collected for purposes of benthic macroinvertebrate community analysis, and to also establish the sediment grain size of the beaches. Any potential sand material to be placed on the beaches shall have a comparable grain size to the existing condition.

3.0 SAMPLING METHODOLOGY

Fish and basic water quality data were collected at the two proposed locations, Ahsaroken and Bayville, during the following dates: September 29-30 and October 29-30, 2003 (Fall samples), May 24-25 and June 14-15, 2004 (Spring samples), and July 19-20 and July 26-27, 2004 (Summer samples). Cornell University Cooperative Extension assisted the District in all sampling efforts. Fixed transects were pre-determined for each location (Asharoken: n=5, Bayville: n=4) and included one bayside beach at each location (See Table 1 for GPS coordinates and Figures 1 & 2).

Finfish sampling was conducted using a beach seine (dimension: 15.2 x 1.8 m, with a 1.8 x 1.8 x 1.8m bag and a 6mm square mesh net) that was pulled perpendicular to the shoreline starting at a depth of approximately 1.25 m. Asharoken and Bayville transects were sampled on separate, but consecutive days (Table 2). All fish were identified to the lowest practical taxonomic level and counted immediately after the haul. Standard length (SL= tip of snout to the base of the caudal peduncle) and Total length (TL= tip of snout to end of caudal fin) were measured for the first 100 randomly selected fish from each taxonomic group. When counts exceeded 100 for a species, the additional fish were enumerated. Any fish that passed through the net mesh on the beach were not included in the sample.

Benthic sampling occurred on the same transects as the finfish sampling at each location, but only once for each season (Table 2). Furthermore, Bayville transects (B1-B4) and the Asharoken Bayside transect (A5) were not sampled in the summer 2004. At each transect, three replicate samples were collected beginning at MLW (0 m) and at +1 m and -1 m intervals with a 7.5 cm PVC coring tube to a depth of 10-15 cm. A 0.5 mm sieve was used to separate infauna from the sediment. Infaunal samples were preserved in the field with a buffered 10% formalin solution and stained with 1% Rose Bengal. Samples were transferred to 70% isopropyl alcohol after fixing for sorting and analysis. Organisms were separated from debris and hand picked to identify taxonomy and for enumeration. Identifications were made to the lowest practical identification level (LPIL) when not to the species level. Organisms were then grouped by taxa within each station and wet-weight biomass was determined to 0.01 mg after blotting to remove excess liquid. While sorting, the replicate samples taken from Asharoken transects A1-A4 in Summer 2004, were inadvertently pooled with the Spring

Table 1. Sample station locations.

Site	Station Label	Longitude	Latitude
Asharoken	A1	-73.34029147	40.92727061
Asharoken	A2	-73.34662540	40.92577835
Asharoken	A3	-73.37529552	40.93834905
Asharoken	A4	-73.38098034	40.94390060
Asharoken	A5	-73.35158743	40.92044137
Asharoken	Water Quality Station 1 (WQ1)	-73.38038224	40.94110529
Asharoken	Water Quality Station 2 (WQ2)	-73.36870636	40.92791828
Bayville	B1	-73.53319295	40.90915101
Bayville	B2	-73.54267372	40.91019139
Bayville	B3	-73.55302074	40.90971127
Bayville	B4	-73.58291640	40.90925175
Bayville	Water Quality Station 1 (WQ1)	-73.53210897	40.90595499
Bayville	Water Quality Station 2 (WQ2)	-73.55533197	40.90496600
Note: All coordinates are in New York State Plane (NAD 1983, feet)			

Table 2. Summary of sampling events and measurements taken.

Date	Location	Fishery Survey	Benthic Survey	Grain Size Analysis	Basic Water Chemistry	Chemical Analysis
29-Sep-03	Bayville	X	X	X	X	
30-Sep-03	Asharoken	X	X	X	X	
1-Oct-03	Bayville				X	X
10-Oct-03	Asharoken				X	X
27-Oct-03	Bayville				X	X
28-Oct-03	Asharoken				X	X
29-Oct-03	Bayville	X			X	
30-Oct-03	Asharoken	X			X	
24-May-04	Bayville	X	X	X	X	
25-May-04	Asharoken	X	X	X	X	
14-Jun-04	Asharoken	X			X	
15-Jun-04	Bayville	X			X	
19-Jul-04	Asharoken	X	X	X	X	
20-Jul-04	Bayville	X			X	
26-Jul-04	Asharoken	X			X	
27-Jul-04	Bayville	X			X	

2004 samples. Hence, it is not possible to discriminate between these two seasons, and we categorized them as: Sping-Summer 2004 samples. The Bayville samples were not affected by this merging of samples because there were no summer samples collected; and Asharoken station A5 was also unaffected. Therefore, in our analyses the Asharoken samples that were inadvertently pooled (i.e. A1-A4 Spring 2004 and Summer 2004) were always averaged for the 6 samples at each transect to better reflect the actual number of replicates taken.

Since the benthic data is unbalanced it requires additional explanation for the anlaysis of seasonal and Long Island Sound (Sound) versus bay beach (Bay) transects. To determine seasonal trends we averaged the data from the three replicates at each transect and then pooled these transect averages within each location and season. For the overall average comparison between Sound and the Bay beaches we averaged the transect replicates, and then took an overall average of the transect values. The overall averages were then averaged within each season for the respective Sound and Bay transects at Asharoken and Bayville location. This grand average represents a single core on the Sound and Bay transects respectively.

Concurrent with intertidal benthos sampling, a sediment sample along each station transect was taken. Sediment samples were collected using a 5 cm, PVC coring tube to a depth of 10-15 cm. The samples were transferred to whirl-pack bags processed for grain-size distribution in the lab. We collected a total of 22 samples.

During both the finfish and benthic sampling events, physical measurements were recorded at the beginning of each event. Water quality parameters were measured with a YSI 85 probe at approximate depth of 1 m, and included: temperature, salinity, dissolved oxygen, and conductivity. A sample of water was also collected simultaneously for determination of pH (Oakton pH Testr3 Double Junction) and turbidity (LaMotte Smart 2 colorimeter). Wind velocity and direction data were also estimated at the time of sampling with a (Kestrel 2000) and weather conditions and wave height were also observed and noted.

In addition to the general water quality measurements described above, water quality sampling was conducted at two Bay stations in Bayville within Oyster Bay (east and west of the Bayville bridge, Figure 2) and two Bay stations at Asharoken in Duck Island Harbor (Figure 1) during Fall 2003. The first sample event at each location was a non-storm/rain condition and the second sample event was during a storm/post-rainfall event; both at high tide. At Oyster Bay, water samples were collected sub-surface with a Van Dorn sampling bottle and the water was transferred to a polypropylene bottle (500 ml) that was kept on ice and brought to ECOTEST Laboratories, Inc., North Babylon, NY that same day for analysis. ECOTEST Laboratories tested the samples for nitrogen, phosphorous, total suspended solids, pesticides, and a volatile organic compound library search (EPA 8260/8240). In addition to the aforementioned chemical analyses, measures of general water quality including: turbidity, salinity, dissolved oxygen, pH were made at the 2 Oyster Bay stations. The water quality readings for Asharoken only included basic parameters such as: dissolved oxygen, salinity, pH, turbidity and temperature.

4.0 FISH SAMPLING RESULTS

A total of 21 species of finfish were collected on Asharoken and Bayville Beaches during the Fall 2003, Spring 2004 and Summer 2004 field sampling events (Table 3). Results of the beach seining events are provided in Appendix A. Species richness overall was slightly higher in the Summer (15 species) than the Fall (13 species) and Spring (13 species). A detailed list of species for each sampling event is shown in Table 4.

4.1 TOTAL SPECIES COMPOSITION AND ABUNDANCE

Two species accounted for 89.13% of the 12,768 individuals captured over all the seasons and beach seines combined. Menhaden (*Brevortia tyrannus*) was the most abundant species, accounting for 60% of the overall catch, and Atlantic silverside (*Menidia menidia*) was the second most abundant accounting for 29% of the overall catch (Table 4). Menhaden and silversides were also captured during each season, but it is important to note the high abundance of Menhaden was the result of two beach seining events that captured large schools. The top two species overall were also most abundant during the Summer 2004 sampling event. Other abundant species include: bluefish (*Pomatomus saltatrix*), bay anchovy (*Anchoa mitchilli*), weakfish (*Cynoscion regalis*), striped killifish (*Fundulus majalis*) and mummichog (*Fundulus heterclitus*). Sandlance (*Ammodytes americanus*) were also in large abundance in the Spring 2004 sampling event, but many individuals sampled escaped through the net mesh and were under-represented as a result.

4.1.1 Fall 2003 Sampling Event

A total of 13 taxa were collected in the Fall 2003 sampling event at both locations, and 2,809 fish were captured (Table 4). Menhaden was the dominant species and represented 80.3% of the catch. Atlantic silverside was the second most abundant species and accounted for 14.6% of the catch. Other common species included the striped killifish and mummichog.

4.1.2 Spring 2004 Sampling Event

A total of 13 taxa were collected in the Spring 2004 sampling event at both locations and 492 fish were captured (Table 4). Bay anchovy and Atlantic silverside were equally dominant species and represented 31.3% and 30.3% of the catch. Other common species included sandlance and bluefish.

4.1.3 Summer 2004 Sampling Event

A total of 15 taxa were collected in the Summer 2004 sampling event at both locations, and 9,467 fish were captured (Table 4). Menhaden was the dominant species and represented 57.4% of the catch. Atlantic silverside was the second most abundant species and accounted for 33% of the catch. Other common species included bluefish, weakfish, bay anchovy and blueback herring (*Alosa aestivalis*).

Table 3. Fish species collected during the Fall 2003, Spring and Summer 2004 beach surveys.

Family	Scientific Name	Common Name	Total Captured	Percentage of Total Catch
Atherinidae	*Menidia menidia*	Atlantic Silverside	3,684	28.86
Engraulidea	*Anchoa mitchilli*	Bay Anchovy	158	1.24
Labridae	*Tautoga onitis*	Blackfish	1	0.01
Clupeidae	*Alosa aestivalis*	Blueback Herring	109	0.86
Pomatomidae	*Pomatomus saltatrix*	Bluefish	548	4.3
Labridae	*Tautogolabrus adspersus*	Cunner	12	0.1
Cottidae	*Myoxocephalus aenaeus*	Grubby	7	0.06
Clupeidae	*Brevoortia tyrannus*	Menhaden	7,695	60.27
Mugilidae	*Mugil cephalus*	Mullet	3	0.03
Cyprinodontidae	*Fundulus heteroclitus*	Mummichog	103	0.81
Syngnathidae	*Syngnathus fuscus*	Northern Pipefish	29	0.23
Triglidae	*Prionotus carolinus*	Northern Sea Robin	1	0.01
Sparidae	*Stenotomus chrysops*	Porgy	4	0.04
Ammodytidae	*Ammodytes americanus*	Sandlance	67	0.53
Cyprinodontidae	*Cyprinodon variegatus*	Sheepshead Minnow	3	0.03
Moronidae	*Morone saxatilis*	Striped Bass	1	0.01
Cyprinodontidae	*Fundulus majalis*	Striped Killifish	131	1.03
Gadidae	*Microgadus tomcod*	Tomcod	21	0.17
Sciaenidae	*Cynoscion regalis*	Weakfish	157	1.23
Bothidae	*Scophthalmus aquosus*	Windowpane Flounder	2	0.02
Pleuronectidae	*Pleuronectes americanus*	Winter Flounder	32	0.26
		Total # of Organisms Collected	**12,768**	
		Total Number of Taxa Collected	**21**	

* Shaded cells indicate Essential Fish Habitat designated species.

Table 4. Total fish species composition and abundance by season.

			Total Catch				Percentage of Total Catch			
Family	Common Name	Scientific Name	Fall	Spring	Summer	TOTAL	Fall	Spring	Summer	TOTAL
Atherinidae	Atlantic Silverside	*Menidia menidia*	409	149	3,126	**3,684**	14.56	30.285	33.02	**28.86**
Engraulidea	Bay Anchovy	*Anchoa mitchilli*	2	154	2	**158**	0.071	31.301	0.0211	**1.24**
Labridae	Blackfish	*Tautoga onitis*	1	--	--	**1**	0.036	--	--	**0.01**
Clupeidae	Blueback Herring	*Alosa aestivalis*	--	--	109	**109**	--	--	1.1514	**0.86**
Pomatomidae	Bluefish	*Pomatomus saltatrix*	--	58	490	**548**	--	11.789	5.1759	**4.3**
Labridae	Cunner	*Tautogolabrus adspersus*	8	3	1	**12**	0.285	0.6098	0.0106	**0.1**
Cottidae	Grubby	*Myoxocephalus aenaeus*	--	4	3	7	--	0.813	0.0317	**0.06**
Clupeidae	Menhaden	*Brevoortia tyrannus*	2,255	8	5432	**7,695**	80.28	1.626	57.378	**60.27**
Mugilidea	Mullet	*Mugil cephalus*	3	--	--	**3**	0.107	--	--	**0.03**
Cyprinodontidae	Mummichog	*Fundulus heteroclitus*	46	3	54	**103**	1.638	0.6098	0.5704	**0.81**
Syngnathidae	Northern Pipefish	*Syngnathus fuscus*	8	6	15	**29**	0.285	1.2195	0.1584	**0.23**
Triglidae	Northern Sea Robin	*Prionotus carolinus*	--	--	1	**1**	--	--	0.0106	**0.01**
Sparidae	Porgy	*Stenotomus chrysops*	4	--	--	**4**	0.142	--	--	**0.04**
Ammodytidae	Sandlance	*Ammodytes americanus*	--	67	--	**67**	--	13.618	--	**0.53**
Cyprinodontidae	Sheepshead Minnow	*Cyprinodon variegates*	3	--	--	**3**	0.107	--	--	**0.03**
Moronidae	Striped Bass	*Morone saxatilis*	--	--	1	**1**	--	--	0.0106	**0.01**
Cyprinodontidae	Striped Killifish	*Fundulus majalis*	65	11	55	**131**	2.314	2.2358	0.581	**1.03**
Gadidae	Tomcod	*Microgadus tomcod*	--	20	1	**21**	--	4.065	0.0106	**0.17**
Sciaenidae	Weakfish	*Cynoscion regalis*	--	--	157	**157**	--	--	1.6584	**1.23**
Bothidae	Windowpane Flounder	*Scophthalmus aquosus*	1	1	--	**2**	0.036	0.2033	--	**0.02**
Pleuronectidae	Winter Flounder	*Pleuronectes americanus*	4	8	20	**32**	0.142	1.626	0.2113	**0.26**
		Total # of Organisms Collected	**2,809**	**492**	**9,467**	**12,768**				**100**
		Total Number of Taxa Collected	**13**	**13**	**15**	**21**				

* Shaded cells indicate Essential Fish Habitat (EFH) designated species.

4.2 ASHAROKEN- FISH SPECIES COMPOSITION AND ABUNDANCE

There were a total of 20 taxa present at the Asharoken transects across all the seasons sampled. However, two species accounted for 84.6% of the 6,407 individuals captured across all seasons (Table 5). Atlantic silverside was the most abundant species, accounting for 45.89% of the total catch, and Menhaden was the second most abundant accounting for 38.71% of the overall catch. Other abundant species include: weakfish, bay anchovy, stripped killifish and mummichog.

4.2.1 Fall 2003 Sampling Event

A total of 11 taxa were collected in the Fall 2003 sampling event at Asharoken, and 2,674 fish were captured (Table 5). Menhaden was the dominant species and represented 84.3% of the catch during this sampling event. Atlantic silverside was the second most abundant species and accounted for 11.78% of the catch. Few other species were captured in high abundance, except for striped killifish and mummichog.

4.2.2 Spring 2004 Sampling Event

A total of 11 taxa were collected in the Spring 2004 sampling event at Asharoken, and 354 fish were captured (Table 5). Bay anchovy was the most abundant species and represented 43.5% of the catch. Sandlance and bluefish were the next most abundant species and accounted for 18.4% and 16.4% of the catch respectively. Other common species included Atlantic silverside.

4.2.3 Summer 2004 Sampling Event

A total of 14 taxa were collected in the Summer 2004 sampling event at Asharoken, and 3,379 fish were captured (Table 5). Atlantic silverside was the dominant species and represented 76.2% of the catch. Menhaden and bluefish were the next most abundant species and accounted for 6.4% and 6.0% of the catch respectively. Other common species included weakfish and blueback herring.

4.2.4 Long Island Sound Versus Bay Transects

A comparison between the species composition and abundance for the bay transects (Bay) and Long Island Sound (Sound) transects was made for Asharoken. However, it is important to emphasize that there was significantly lower sampling efforts made in the Bay (1 transect) than in the Sound (4 transects) during each sampling event, and the results should be interpreted as such.

Overall, abundance on the Sound transects was higher (5,456 individuals) than the Bay (951 individuals) across all seasons (Table 6). There were also 19 taxa captured in the Sound and 9 taxa in the Bay. Menhaden and Atlantic silverside were equally dominant species in the Sound and accounted for 45.45% and 44.46% of the total catch. Atlantic silverside was the most dominant species in the Bay and accounted for 54.05% of the total catch.

Table 5. Fish species composition and abundance at Asharoken by season.

		Total Catch				Percentage of Total Catch			
Common Name	**Scientific Name**	**Fall**	**Spring**	**Summer**	**TOTAL**	**Fall**	**Spring**	**Summer**	**TOTAL**
Atlantic Silverside	*Menidia menidia*	315	50	2,575	**2,940**	11.78	14.124	76.20598	**45.89**
Bay Anchovy	*Anchoa mitchilli*	2	154	2	**158**	0.0748	43.503	0.059189	**2.47**
Blackfish	*Tautoga onitis*	1	--	--	**1**	0.0374	--	--	**--**
Blueback Herring	*Alosa aestivalis*	--	--	108	**108**	--	--	3.196212	**1.71**
Bluefish	*Pomatomus saltatrix*	--	58	204	**262**	--	16.384	6.037289	**4.09**
Cunner	*Tautogolabrus adspersus*	5	1	1	**7**	0.187	0.2825	0.029595	**0.11**
Grubby	*Myoxocephalus aenaeus*	--	--	--	**--**	--	--	--	**--**
Menhaden	*Brevoortia tyrannus*	2,255	8	217	**2,480**	84.331	2.2599	6.422018	**38.71**
Mullet	*Mugil cephalus*	1	--	--	**1**	0.0374	--	--	**0.02**
Mummichog	*Fundulus heteroclitus*	29	1	34	**64**	1.0845	0.2825	1.006215	**1.0**
Northern Pipefish	*Syngnathus fuscus*	--	2	13	**15**	--	0.565	0.384729	**0.24**
Northern Sea Robin	*Prionotus carolinus*	--	--	1	**1**	--	--	0.029595	**0.02**
Porgy	*Stenotomus chrysops*	1	--	--	**1**	0.0374	--	--	**0.02**
Sandlance	*Ammodytes americanus*	--	65	--	**65**	--	18.362	--	**1.02**
Sheepshead Minnow	*Cyprinodon variegatus*	3	--	--	**3**	0.1122	--	--	**0.05**
Striped Bass	*Morone saxatilis*	--	--	1	**1**	--	--	0.029595	**0.02**
Striped Killifish	*Fundulus majalis*	59	--	46	**105**	2.2064	--	1.36135	**1.64**
Tomcod	*Microgadus tomcod*	--	7	1	**8**	--	1.9774	0.029595	**0.13**
Weakfish	*Cynoscion regalis*	--	--	156	**156**	--	--	4.616751	**2.44**
Windowpane Flounder	*Scophthalmus aquosus*	--	1	--	**1**	--	0.2825	--	**0.02**
Winter Flounder	*Pleuronectes americanus*	3	7	20	**30**	0.1122	1.9774	0.591891	**0.47**
	Total # of Organisms Collected	**2,674**	**354**	**3,379**	**6,407**	100	100	100	100
	Total Number of Taxa Collected	**11**	**11**	**14**	**20**				

* Shaded cells indicate Essential Fish Habitat (EFH) designated species.

The Summer 2004 yielded the highest catch abundances for the Sound (51.72% of total catch) beaches at Asharoken (Table 6). It was observed that Atlantic silverside and menhaden were consistently captured throughout all the seasons sampled in the Sound and were the dominant species in the Summer 2004 and Fall 2003 sample events, representing 76.40% and 89.06% of the catch respectively. Sandlance was observed to be the dominant species in the Sound during the Spring 2004, and represented 63.12% of the catch. The Summer 2004 sampling event produced a higher species richness (taxa=13) than either the Spring (taxa= 9) and Fall (taxa= 9) on the Sound beaches of Asharoken.

The Summer 2004 also produced the highest catch abundances in the Bay (58.57% of total catch) at Asharoken (Table 6). Atlantic silverside were also observed to be consistently captured across all seasons at the Asharoken Bay transect, and was the dominant species in the Fall 2003 and Summer 2004, accounting for 43.36% and 75.22% of the catch respectively. Bay anchovy were observed to be the dominant species in the Spring 2004 sampling event at the Bay transect, and accounted for 60.96% of the catch. The Fall 2003 sampling event yielded a higher species richness (taxa= 6) than either the Spring 2004 (taxa= 5) and Summer 2004 (taxa= 5) in the Sound.

4.3 BAYVILLE FISH SPECIES COMPOSITION AND ABUNDANCE

There were a total of 16 taxa present at the Bayville transects across all the seasons sampled. Menhaden was the most abundant species and accounted for 81.99% of the 6,361 individuals captured across all seasons (Table 7). Atlantic silverside was the second most abundant species, and accounted for 11.7% of the total catch. Other species captured included: bluefish, mummichog, striped killifish and tomcod (*Microgadus tomcod*), but they were at much lower abundance than menhaden and silversides.

4.3.1 Fall 2003 Sampling Event

A total of 9 taxa were collected in the Fall 2003 sampling event at Bayville, and 135 fish were captured (Table 7). Atlantic silverside was the dominant species and represented 69.63% of the catch during this sampling event. The second most abundant species was mummichog and accounted for 12.59% of the catch. Few other species were captured in high abundance.

4.3.2 Spring 2004 Sampling Event

A total of 9 taxa were collected in the Spring 2004 sampling event at Bayville, and 138 fish were captured (Table 7). Atlantic silverside was the dominant species and represented 71.73% of the catch during this sampling event. The next most abundant species were striped killifish and tomcod which accounted for 9.4% and 7.97% of the catch. Few other species were captured in significant abundance.

Table 6. Fish species composition and abundance for Asharoken: Long Island Sound versus Bay transects, by season.

		Total Catch (Long Island Sound)					Total Catch (Bay)				
Common Name	**Scientific Name**	**Fall**	**Spring**	**Summer**	**Total**	**Percent (Total)**	**Fall**	**Spring**	**Summer**	**Total**	**Percent (Total)**
Atlantic Silverside	*Menidia menidia*	253	17	2,156	**2,426**	**44.47**	62	33	419	**514**	**54.05**
Bay Anchovy	*Anchoa mitchilli*	2	1	2	**5**	**0.10**	--	153	--	**153**	**16.09**
Blackfish	*Tautoga onitis*	5	--	--	**5**	**0.10**	--	--	--	--	--
Blueback Herring	*Alosa aestivalis*	--	--	108	**108**	**1.98**	--	--	--	--	--
Bluefish	*Pomatomus saltatrix*	--	--	150	**150**	**2.75**	--	58	54	**112**	**11.78**
Cunner	*Tautogolabrus adspersus*	--	1	1	**2**	**0.04**	1	--	--	**1**	**0.11**
Grubby	*Myoxocephalus aenaeus*	--	--	--	--	--	--	--	--	--	--
Menhaden	*Brevoortia tyrannus*	2,254	8	217	**2,479**	**45.44**	1	--	--	**1**	**0.11**
Mullet	*Mugil cephalus*	--	--	--	--	--	1	--	--	**1**	**0.11**
Mummichog	*Fundulus heteroclitus*	1	--	--	**1**	**0.02**	28	1	34	**63**	**6.63**
Northern Pipefish	*Syngnathus fuscus*	--	2	13	**15**	**0.28**	--	--	--	--	--
Northern Sea Robin	*Prionotus carolinus*	--	--	1	**1**	**0.02**	--	--	--	--	--
Porgy	*Stenotomus chrysops*	1	--	--	**1**	**0.02**	--	--	--	--	--
Sandlance	*Ammodytes americanus*	--	65	--	**65**	**1.2**	--	--	--	--	--
Sheepshead Minnow	*Cyprinodon variegatus*	3	--	--	**3**	**0.06**	--	--	--	--	--
Striped Bass	*Morone saxatilis*	--	--	1	**1**	**0.02**	--	--	--	--	--
Striped Killifish	*Fundulus majalis*	9	--	1	**10**	**0.19**	50	--	45	**95**	**9.99**
Tomcod	*Microgadus tomcod*	--	7	1	**8**	**0.15**	--	--	--	--	--
Weakfish	*Cynoscion regalis*	--	--	156	**156**	**2.86**	--	--	--	--	--
Windowpane Flounder	*Scophthalmus aquosus*	--	1	--	**1**	**0.02**	--	--	--	--	--
Winter Flounder	*Pleuronectes americanus*	3	1	15	**19**	**0.47**	--	6	5	**11**	**1.16**
	Total # of Organisms Collected	**2,531**	**103**	**2,822**	**5,456**	**100**	**143**	**251**	**557**	**951**	**100**
	Total Number of Taxa Collected	**9**	**9**	**13**	**19**		**6**	**5**	**5**	**19**	

* Shaded cells indicate Essential Fish Habitat (EFH) designated species.

4.3.3 Summer 2004 Sampling Event

Similar to the Fall and Spring samples, a total of 9 taxa were collected in the Summer 2004 sampling event at Bayville, but the abundance was much greater with 6,088 fish captured (Table 7). Menhaden was the dominant species and represented 85.66% of the catch during this sampling event. Atlantic silverside was the second most abundant species accounting for 9.05% of the catch, and were followed by bluefish at 4.69% of the catch. Other species captured included mummichog and striped killifish, but they were at an order of magnitude less abundant than the top three species.

4.3.4 Long Island Sound Versus Bay Transects

A comparison between the species composition and abundance for the bay transects (Bay) and Long Island Sound (Sound) transects was also made for Bayville. However, it is important to emphasize that there was a significantly lower sampling effort made in the Bay (1 transect) than on the Sound (3 transects) and these results should be interpreted as such.

Overall, abundance in the Sound was lower across all seasons (825 individuals) compared to the Bay (5,536 individuals, Table 8). However, species richness was greater in the Sound (12 taxa) relative to the Bay (9 taxa). Atlantic silverside was the dominant species in the Sound and accounted for 61.09% of the total catch. Menhaden was the most dominant species in the Bay and accounted for 94.20% of the total catch, but was only captured in a single tow in the Summer 2004 sampling event at Bayville.

The Summer 2004 sampling event produced the highest catch abundances in the Sound (85.57% of total catch) at Bayville (Table 8). It was observed that Atlantic silverside were consistently captured throughout all the seasons sampled in the Sound, and were the dominant species for all seasons sampled: Fall= 84.51%, Spring= 58.33% and Summer= 58.92% of the catches. The Fall 2003 sampling event produced a slightly greater species richness (taxa=7) than either the spring (taxa= 5) and summer (taxa= 5) in the Sound at Bayville.

The Summer 2004 also yielded the highest catch abundances in the Bay (58.57% of total catch) at Bayville (Table 8). Atlantic silverside were also observed to be consistently captured across all seasons in the Bay, and was the dominant species in the Fall 2003 and Spring 2004, accounting for 53.13% and 78.89% of the catch respectively. Menhaden were observed to be the dominant species in the Summer 2004 sampling event in the Bay, and accounted for 96.89% of the catch. The Summer 2004 sampling event yielded a higher species richness (taxa=7) in the Bay than either the fall (taxa= 6) and spring (taxa= 5).

Table 7. Fish species composition and abundance at Bayville by season.

Common Name	Scientific Name	Total Catch Fall	Total Catch Spring	Total Catch Summer	TOTAL	Percentage of Total Catch Fall	Percentage of Total Catch Spring	Percentage of Total Catch Summer	Percentage of Total Catch TOTAL
Atlantic Silverside	*Menidia menidia*	94	99	551	**744**	69.63	71.739	9.050591	**11.7**
Bay Anchovy	*Anchoa mitchilli*	--	--	--	--	--	--	--	--
Blackfish	*Tautoga onitis*	--	--	--	--	--	--	--	--
Blueback Herring	*Alosa aestivalis*	--	--	1	**1**	--	--	0.016426	**0.02**
Bluefish	*Pomatomus saltatrix*	--	--	286	**286**	--	--	4.697766	**4.5**
Cunner	*Tautogolabrus adspersus*	3	2	--	**5**	2.2222	1.4493	--	**0.08**
Grubby	*Myoxocephalus aenaeus*	--	4	3	**7**	--	2.8986	0.049277	**0.12**
Menhaden	*Brevoortia tyrannus*	--	--	5,215	**5,215**	--	--	85.66032	**81.99**
Mullet	*Mugil cephalus*	2	--	--	**2**	1.4815	--	--	**0.04**
Mummichog	*Fundulus heteroclitus*	17	2	20	**39**	12.593	1.4493	0.328515	**0.62**
Northern Pipefish	*Syngnathus fuscus*	8	4	2	**14**	5.9259	2.8986	0.032852	**0.23**
Northern Sea Robin	*Prionotus carolinus*	--	--	--	--	--	--	--	--
Porgy	*Stenotomus chrysops*	3	--	--	**3**	2.2222			**0.05**
Sandlance	*Ammodytes americanus*	--	2	--	**2**	--	1.4493	--	**0.04**
Sheepshead Minnow	*Cyprinodon variegatus*	--	--	--	--	--	--	--	--
Striped Bass	*Morone saxatilis*	--	--	--	--	--	--	--	--
Striped Killifish	*Fundulus majalis*	6	11	9	**26**	4.4444	7.971	0.147832	**0.41**
Tomcod	*Microgadus tomcod*	--	13	--	**13**	--	9.4203	--	**0.21**
Weakfish	*Cynoscion regalis*	--	--	1	**1**	--	--	0.016426	**0.02**
Windowpane Flounder	*Scophthalmus aquosus*	1	--	--	**1**	0.7407	--	--	**0.02**
Winter Flounder	*Pleuronectes americanus*	1	1	--	**2**	0.7407	0.7246	--	**0.04**
	Total # of Organisms Collected	**135**	**138**	**6,088**	**6,361**	100	100	100	**100**
	Total Number of Taxa Collected	**9**	**9**	**9**	**16**				

* Shaded cells indicate Essential Fish Habitat (EFH) designated species.

Table 8. Species composition and abundance for Bayville: Long Island Sound versus Bay transects, by season.

		Total Catch (Long Island Sound)					Total Catch (Bay)				
Common Name	**Scientific Name**	**Fall**	**Spring**	**Summer**	**Total**	**Percent**	**Fall**	**Spring**	**Summer**	**Total**	**Percent**
Atlantic Silverside	*Menidia menidia*	60	28	416	**504**	**61.1**	34	71	135	**240**	**4.34**
Bay Anchovy	*Anchoa mitchilli*	--	--	--	--	--	--	--	--	--	--
Blackfish	*Tautoga onitis*	--	--	--	--	--	--	--	--	--	--
Blueback Herring	*Alosa aestivalis*	--	--	1	**1**	**0.13**	--	--	--	--	--
Bluefish	*Pomatomus saltatrix*	--	--	286	**286**	**34.67**	--	--	--	--	--
Cunner	*Tautogolabrus adspersus*	2	1	--	**3**	**0.37**	1	1	--	**2**	**0.04**
Grubby	*Myoxocephalus aenaeus*	--	--	2	**2**	**0.25**	--	4	1	**5**	**0.10**
Menhaden	*Brevoortia tyrannus*	--	--	--	--	--	--	--	5,215	**5,215**	**94.21**
Mullet	*Mugil cephalus*	2	--	--	**2**	**0.25**	--	--	--	--	--
Mummichog	*Fundulus heteroclitus*	1	--	--	**1**	**0.13**	16	13	20	**49**	**0.89**
Northern Pipefish	*Syngnathus fuscus*	2	4	1	**7**	**0.85**	6	--	1	**7**	**0.13**
Northern Sea Robin	*Prionotus carolinus*	--	--	--	--	--	--	--	--	--	--
Porgy	*Stenotomus chrysops*	3	--	--	**3**	**0.37**	--	--	--	--	--
Sandlance	*Ammodytes americanus*	--	2	--	**2**	**0.25**	--	--	--	--	--
Sheepshead Minnow	*Cyprinodon variegates*	--	--	--	--	--	--	--	--	--	--
Striped Bass	*Morone saxatilis*	--	--	--	--	---	--	--	--	--	--
Striped Killifish	*Fundulus majalis*	--	--	--	--	--	6	--	9	**15**	**0.28**
Tomcod	*Microgadus tomcod*	--	13	--	**13**	**1.58**	--	--	--	--	--
Weakfish	*Cynoscion regalis*	--	--	--	--	--	--	--	1	**1**	**0.02**
Windowpane Flounder	*Scophthalmus aquosus*	1	--	--	**1**	**0.13**	--	--	--	--	--
Winter Flounder	*Pleuronectes americanus*	--	--	--	--	--	1	1	--	**2**	**0.04**
	Total # of Organisms Collected	**71**	**48**	**706**	**825**	--	**64**	**90**	**5,382**	**5,536**	--
	Total Number of Taxa Collected	**7**	**5**	**5**	**12**	--	**6**	**5**	**7**	**9**	--

* Shaded cells indicate Essential Fish Habitat (EFH) designated species.

4.4 ESSENTIAL FISH HABITAT SPECIES

For both locations, the same four essential fish habitat (EFH) designated species were observed: bluefish, porgy (*Stenotomus chrysops*), windowpane flounder (*Scopthalmus aquosus*) and winter flounder (*Plueronectes americanus*). The most abundant EFH species collected was bluefish followed by winter flounder. Winter flounder was the only species collected across all seasons sampled. Standard length statistic data of the EFH designated species collected at both locations is presented in Table 9.

4.4.1 Asharoken

Bluefish was the most abundant EFH species at Asharoken and represented 4.09% of the total catch at that location (Table 4). Bluefish were captured in both the Spring and Summer 2004 sampling events, but not in the Fall 2003 samples (Tables 6 & 9). Winter flounder was the second most abundant EFH species and accounted for 0.47% of the catch at this location. They were also captured during each seasonal sampling event and were present at both the Long Island Sound and the Bay transects.

Length statistic data for Asharoken in the Fall 2003 sampling event yielded three (3) winter flounder in the juvenile stage, with the smallest at 4.5 cm, largest at 5.5 cm and an average of 5.0 cm (Table 9). One porgy was also measured at 6.0 cm in length.

In the Spring 2004 sampling event fifty eight (58) young of the year bluefish were captured with a range of length from 5.0 – 7.4 cm and an average of 6.09 cm. Seven (7) juvenile winter flounder were measured and the smallest was 1.7 cm, the largest 4.4 cm and the average was 3.01 cm. One juvenile windowpane flounder was also captured and measured 6.5 cm in length.

During the Summer 2004 sampling event 204 juvenile bluefish had an average length of 9.24 cm and a maximum length of 12 cm and minimum of 1.1 cm. Twenty winter flounder (20) in the juvenile stage were measured with the smallest at 3.8 cm, largest 6.2 cm and an average of 4.6 cm in length.

4.4.2 Bayville

Bluefish was the most abundant EFH species at Bayville and represented 4.5% of the total catch at that location (Table 7). Bluefish were captured only in the Summer 2004 sampling event and were not present in either the Fall 2003 or Spring 2004 samples (Tables 8 & 9). Bluefish were only observed at the Long Island transects for Bayville. Porgy was the second most abundant EFH species present at Bayville, but only 3 were captured which accounted for 0.05% of the catch at this location. Porgy were only captured in the Fall 2003, and only present at the Long Island Sound transects.

Length statistic data for Bayville in the Fall 2003 sampling event yielded three (3) juvenile porgy; the smallest was 4.5 cm, the largest was 6.0 cm and the average length was 5.33 cm (Table 9). One (1) windowpane flounder measuring 23.5 cm and one (1) juvenile winter flounder measuring 3.75 cm in length were also present.

In the Spring 2004 sampling event only (1) winter flounder in the juvenile stage was captured and measured 3.30 cm in length.

During the Summer 2004 sampling event 286 juvenile bluefish were captured, with the smallest at 7.8 cm, the largest at 11.0 cm and an average length of 9.24 cm

Table 9. Standard length statistics for Essential Fish Habitat designated species by location.

Common Name	Scientific Name	Season	N	Mean	Max	Min	SD
Asharoken							
Porgy	*Stenotomus chrysops*	Fall	1	6.00	6.00	6.00	--
Winter Flounder	*Pleuronectes americanus*	Fall	3	5.00	5.50	4.50	0.50
Bluefish	*Pomatomus saltatrix*	Spring	58	6.09	7.40	5.00	0.59
Windowpane Flounder	*Scophthalmus aquosus*	Spring	1	6.50	6.50	6.50	--
Winter Flounder	*Pleuronectes americanus*	Spring	7	3.01	4.40	1.70	0.86
Bluefish	*Pomatomus saltatrix*	Summer	204	9.24	12.00	1.10	1.24
Winter Flounder	*Pleuronectes americanus*	Summer	20	4.60	6.20	3.80	0.61
Bayville							
Porgy	*Stenotomus chrysops*	Fall	3	5.33	6.0	4.5	0.76
Windowpane Flounder	*Scophthalmus aquosus*	Fall	1	23.50	23.50	23.50	--
Winter Flounder	*Pleuronectes Americanus*	Fall	1	3.75	3.75	3.75	--
Winter Flounder	*Pleuronectes americanus*	Spring	1	3.30	3.30	3.30	--
Bluefish	*Pomatomus saltatrix*	Summer	286	9.24	11.00	7.80	0.69

Key:

N = Number captured
Min = Minimum standard length (cm)
Max = Maximum standard length (cm)
Mean = Average standard length (cm)
SD = Standard deviation

5.0 BENTHIC SAMPLING RESULTS

A total of 8 phyla consisting of 47 taxa were collected and identified throughout the study period. Across all seasons and locations, the total benthic macroinvertebrate abundance was 21,595 with a biomass of 19.5 grams (Table 10).

The most commonly abundant phylum was Annelida which represented 18,152 or 84.1% of the total macroinvertebrates encountered. The majority of the Annelids identified were Oligochaetes of various species. The Nematoda phylum was also abundant (9.2%) followed by Mollusca (2.6%) and Nemertinae (2.0%) to lesser degrees (Figure 3). Despite the relatively low abundance of Mollusca, it represented 15.1 grams or 77.3% of the total biomass. This was largely composed of the Gastropods *Crepidula fornicate* and *Ilyanassa obsolete*. Annelida (20.5%) and Arthropoda (1.34%) also significantly contributed to the total biomass (Figure 4).

The benthic macroinvertebrate data can be found in Appendix B.

5.1 SPECIES COMPOSITION AND ABUNDANCE WITH SEASON

5.1.1 Asharoken

At the Asharoken location, samples were collected in the fall 2003, spring 2004, and the summer 2004 (Sound transects only). However, the spring and summer 2004 L.I. Sound transects were inadvertently pooled together during macroinvertebrate identification (Spring/Summer 2004). This pooling was compensated for by averaging for 6 replicates in the 2004 Sound data as opposed to the 3 in other transects to calculate abundances and biomass. The seasons being compared are therefore the Fall 2003 and Spring/Summer 2004.

The Fall 2003 species richness was limited to 5 phyla consisting of 19 taxa (Table 11). The Spring/Summer data was found to be more diverse with macroinvertebrates spanning all 8 phyla consisting of 31 taxa. The macroinvertebrate abundance was significantly lower in Fall 2003 in comparison to Spring/Summer 2004 (695 vs. 2,046). In both the Fall 2003 and Spring/Summer 2004 (Figure 5), Annelids were the most abundant (84.0% and 90.0% respectively) followed by Nematoda (9.3% and 4.3% respectively). The biomass, however, was significantly higher in the Fall 2003 (1.376 vs. 0.633 grams) but this was due to the presence of a small number of heavy gastropods. The Fall 2003 macroinvertebrate biomass (Figure 6) was dominated by Mollusca (75.0%) and was followed by Annelida (22.3%) and Arthropoda (2.4%). Conversely, the spring/summer biomass (Figure 6) was dominated by Annelida (67.3%) followed by Mollusca (25.9%) and Arthropoda (4.15%).

Table 10. Total macroinvertebrate taxa and abundance by season.

Figure 3. Benthic macroinvertebrate abundance: all samples.

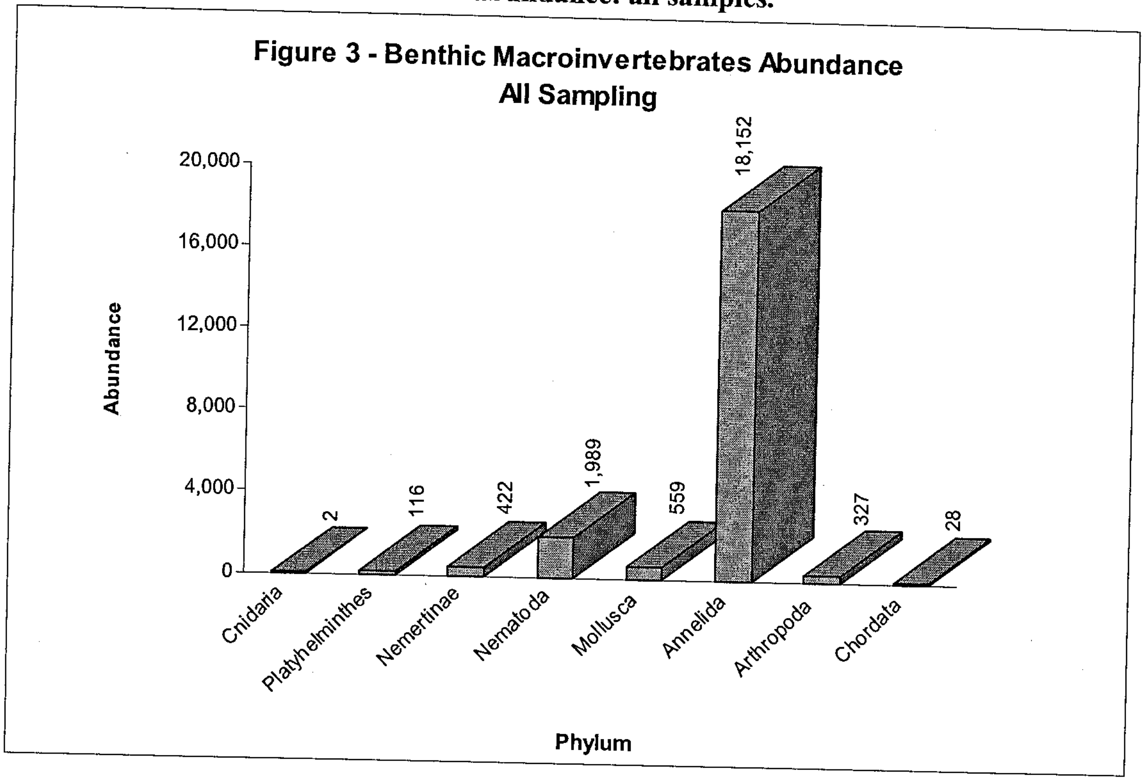


Figure 4. Benthic macroinvertebrate biomass (g): all samples.

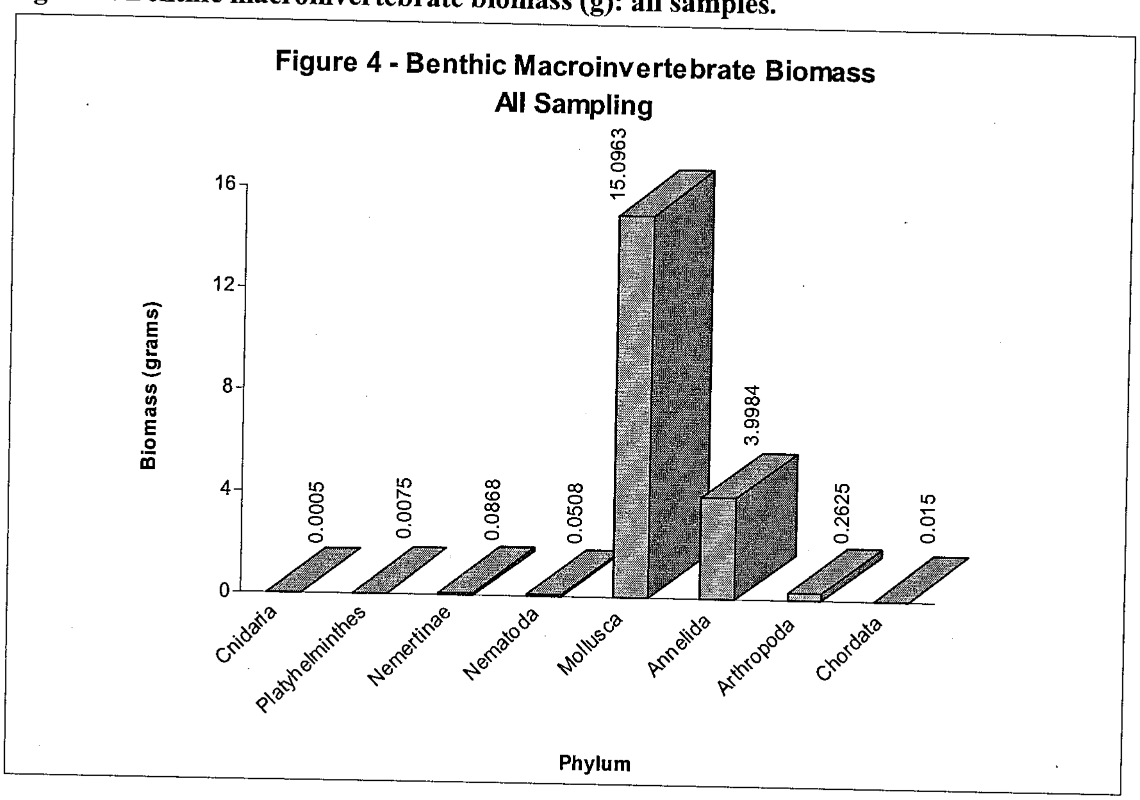


Table 11. Pooled benthic macroinvertebrate taxa at Asharoken: seasonal effect.

Figure 5. Pooled benthic macroinvertebrate abundance: Asharoken

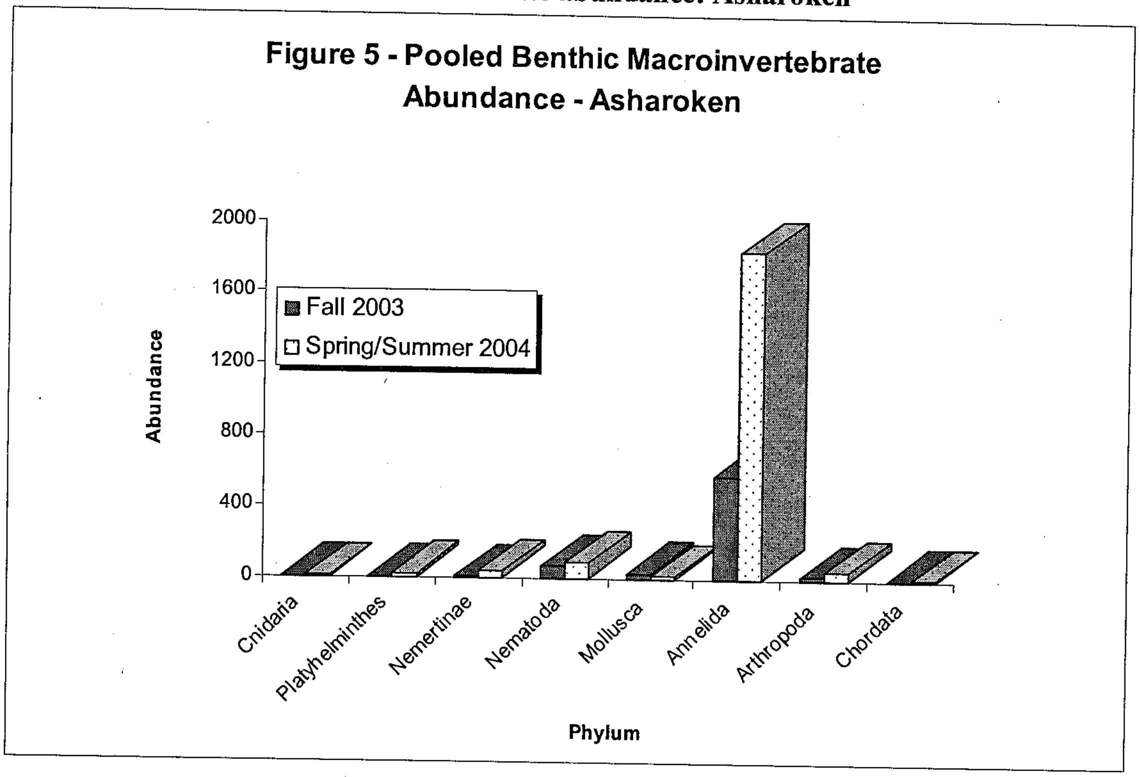


Figure 6. Pooled benthic macroinvertebrate biomass (g)- Asharoken

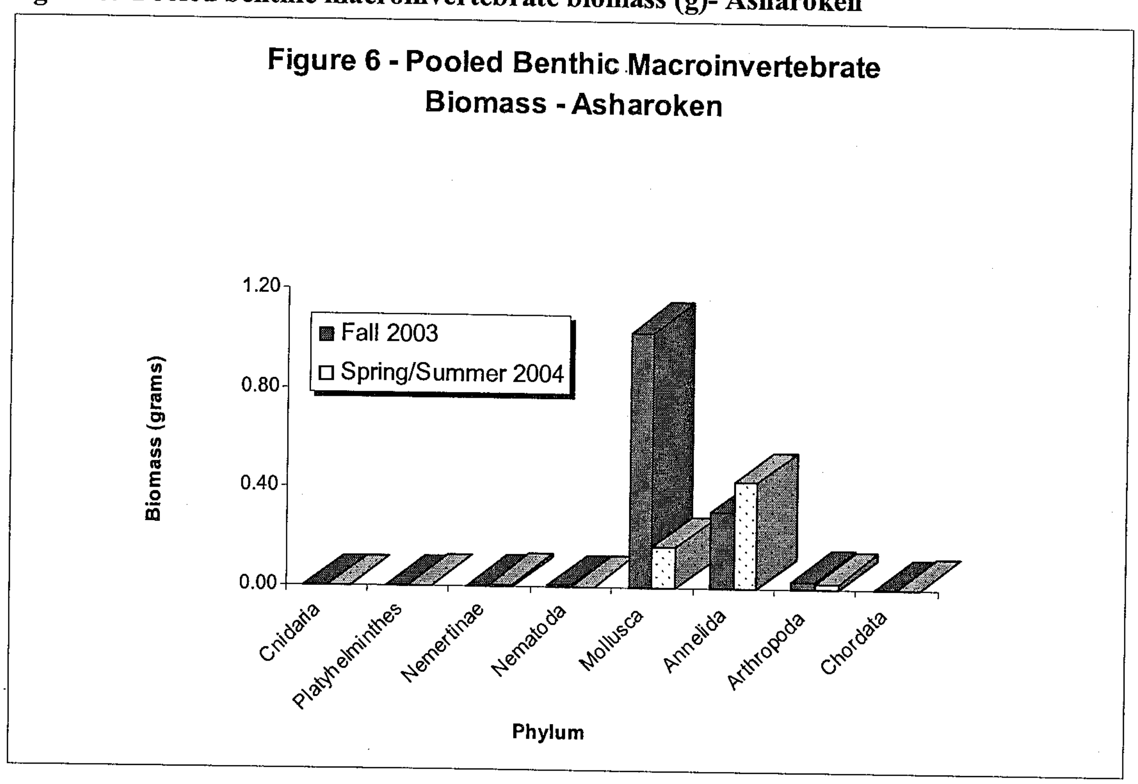


Table 12. Pooled benthic macroinvertebrate taxa at Bayville: seasonal effect.

Figure 7. Pooled benthic macroinvertebrate abundance: Bayville.

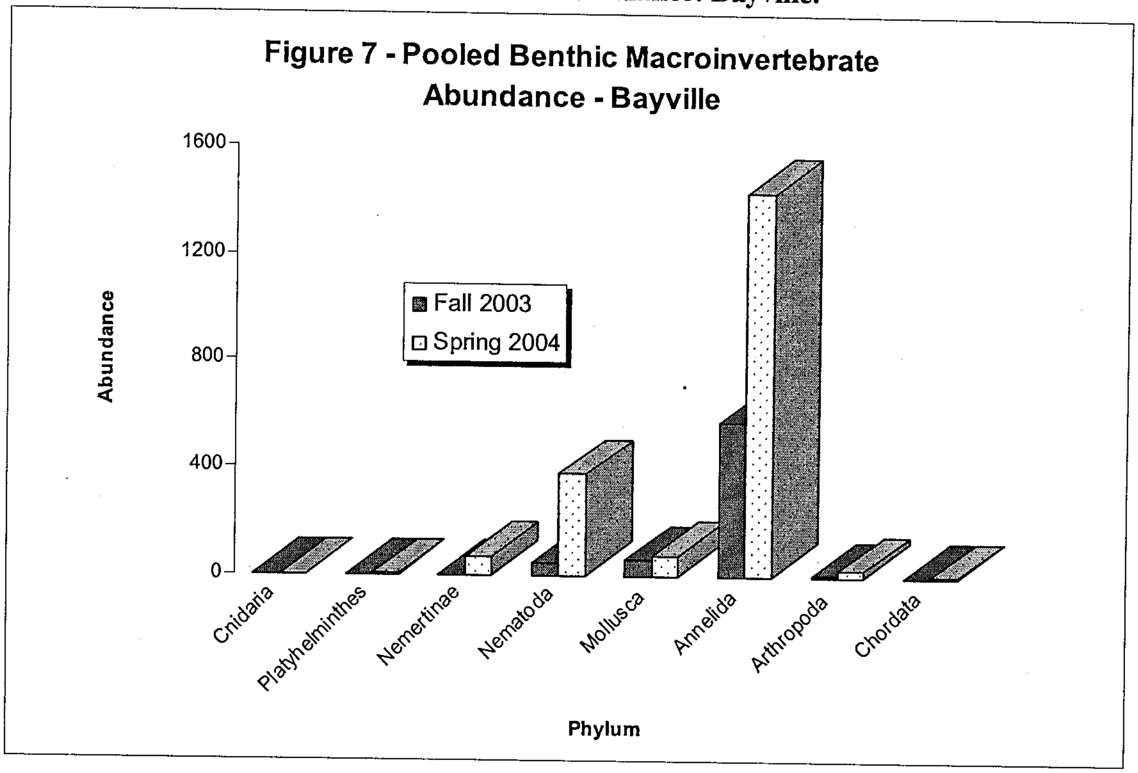
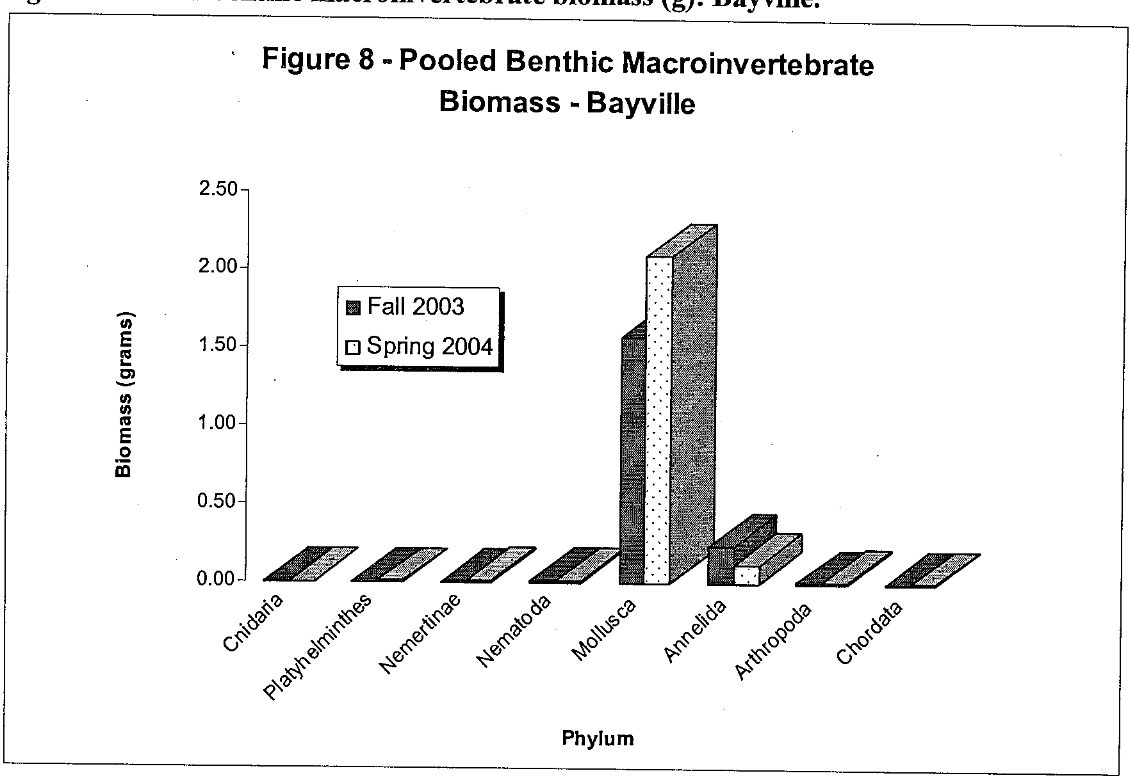


Figure 8. Pooled benthic macroinvertebrate biomass (g): Bayville.



5.1.2 Bayville

At the Bayville location, samples were collected in the Fall 2003 and Spring 2004 only. The Fall 2003 macroinvertebrate species richness was limited to 4 phyla and 18 taxa (Table 12). The Bayville Spring 2004 data was found to be more diverse with 7 phyla consisting of 26 taxa. The macroinvertebrate abundance was significantly lower in the Fall 2003 in comparison to Spring 2004 (679 vs. 1,976). In both the Fall 2003 and spring 2004 (Figure 7), Annelids were the most abundant (77.4% and 72.6% respectively). Other significantly abundant phyla in Fall 2003 were Mollusca (7.5%) and Nematoda (6.4%); and Nematoda (19.1%) for Spring 2004. The Macroinvertebrate biomass was slightly lower in the Fall 2003 in comparison to the Spring 2004 (1.81 vs. 2.23 grams). In both the Fall 2003 and Spring 2004 (Figure 8) the total biomass was dominated by the Mollusca (86.9% and 94.4% respectively) and to a lesser extent by Annelida (12.8% and 5.0% respectively).

5.2 LONG ISLAND SOUND VERSUS BAY TRANSECTS

5.2.1 Asharoken

Asharoken had 4 Sound transects and only 1 Bay transect. In order to make the data sets more comparable, the 4 Sound transects were averaged together. Since seasonal effects were addressed in the previous section (5.1), the data between seasons was also averaged yielding a single abundance and biomass representing a typical Sound or Bay core.

The Asharoken Bay species richness was represented by 5 phyla consisting of 16 taxa (Table 13). The average Asharoken Sound core exhibited greater species richness with all 8 phyla present and consisting of 35 taxa. The average abundance was significantly lower in the Bay as opposed to the Sound (175 versus 299). Both the Bay and Sound (Figure 9) average cores were dominated by Annelida (92.7% and 87.8% respectively). However, the next most abundant phylum for the Bay was Arthropoda (5.3%) while for the Sound it was Nematoda (6.1%). The average benthic macroinvertebrate biomass was similar between the Bays and the Sound (0.21 versus 0.20). However, the majority of the Bays biomass can be attributed to the Annelida (98.2%) while it was spread across the Mollusca (75.2%) and Annelida (20.1%) on the Sound side (Figure 10).

5.2.2 Bayville

Bayville had 3 Sound transects and only 1 Bay transect. In order to make the data sets more comparable, the 3 Sound transects were averaged together prior to any comparisons.

The Bayville Bay beach species richness was represented by 5 phyla consisting of 26 taxa (Table 14). Unlike Asharoken, the average Bayville Sound core exhibited a lower species richness with only 18 taxa within 7 phyla. However, the average benthic macroinvertebrate abundance was significantly lower on the Bay as opposed to the Sound (154 versus 391). The Bay abundance (Figure 11) was mostly represented by Annelida (50.0%) and Mollusca (38.9%) while the Sound abundance was mostly composed by Annelida (79.1%) and Nematoda (17.3%). The average biomass was greater in the Bay as opposed to the Sound (1.84 versus 0.061 grams) due to the presence of a few heavy Mollusca. Consequently, the majority of the biomass in the Bay (Figure 12) can be attributed to

Table 13. Averaged Asharoken benthic macroinvertebrate taxa: Long Island Sound versus Bay

Figure 9. Average benthic macroinvertebrate abundance: Asharoken, Sound vs. Bay.

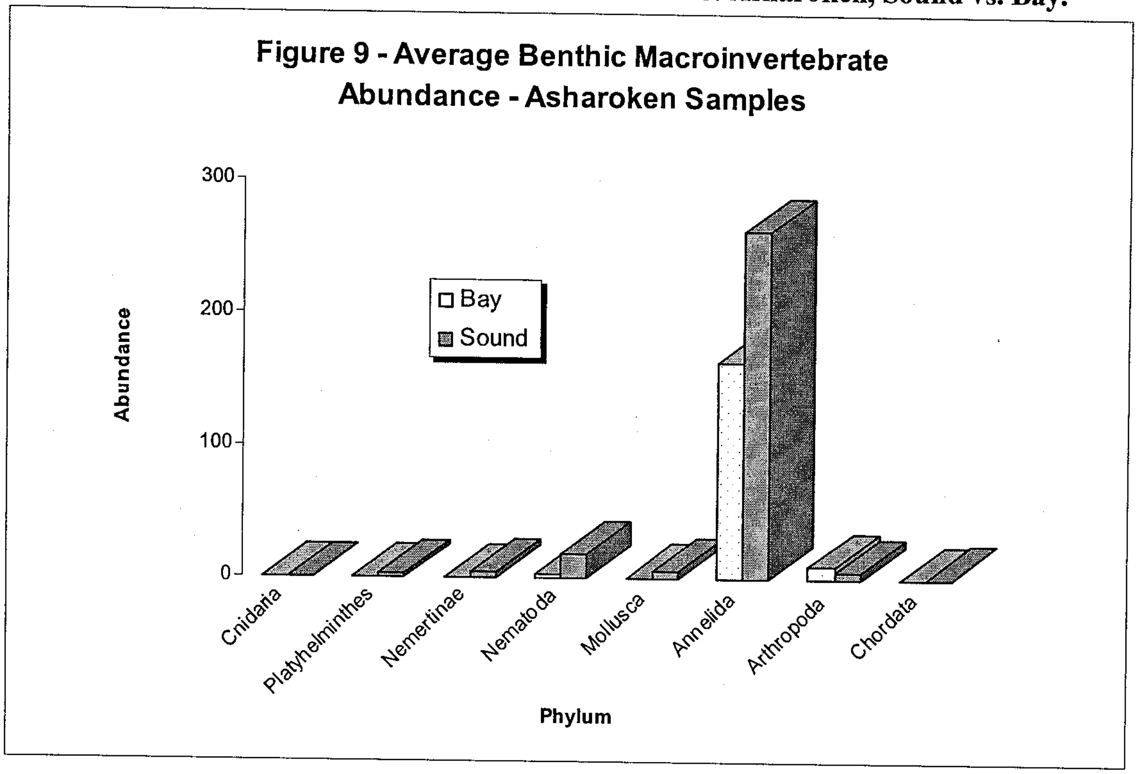


Figure 10. Average benthic macroinvertebrate biomass (g): Asharoken, Sound vs. Bay.

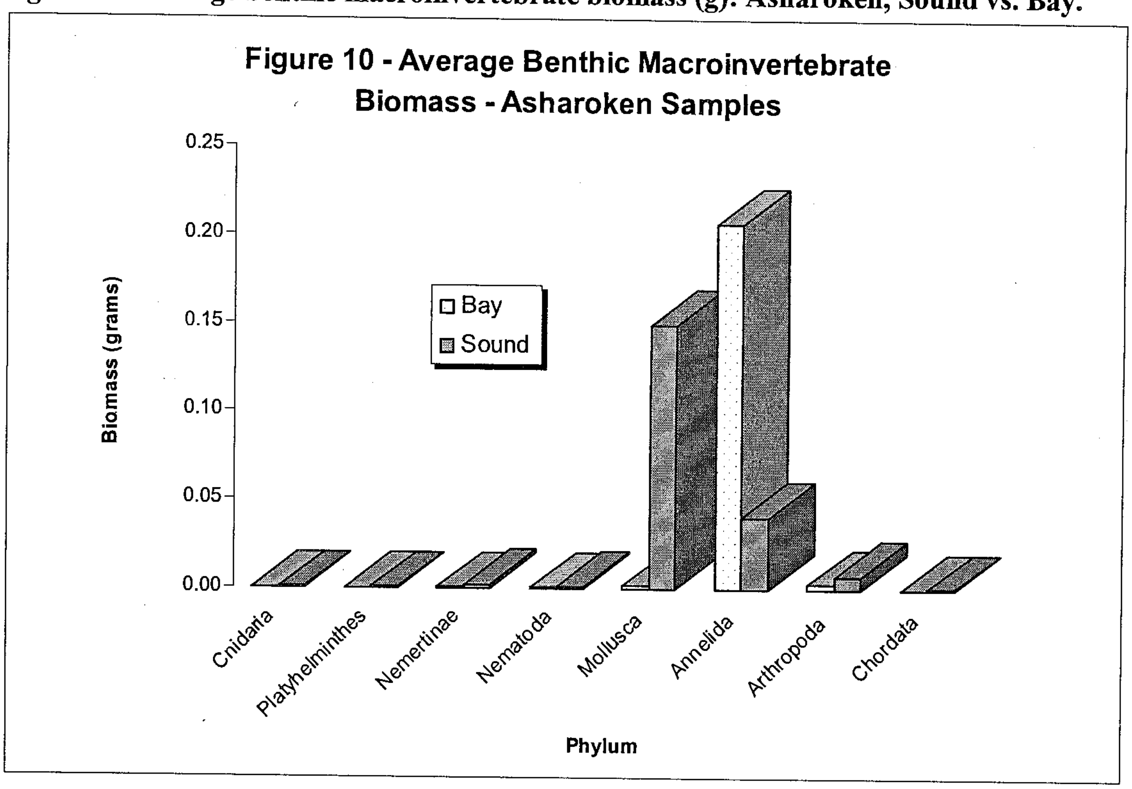


Table 14. Averaged Bayville benthic macroinvertebrate taxa: Long Island Sound versus Bay.

Figure 11. Average benthic macroinvertebrate abundance: Bayville, Sound vs. Bay.

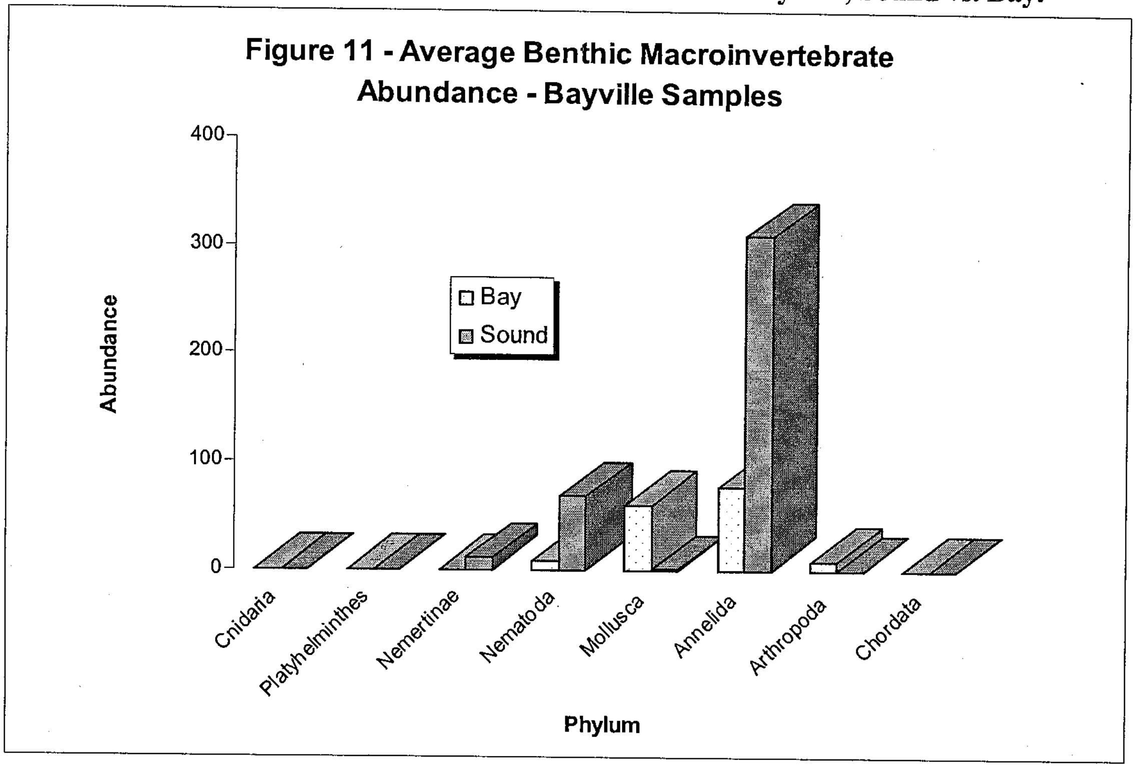
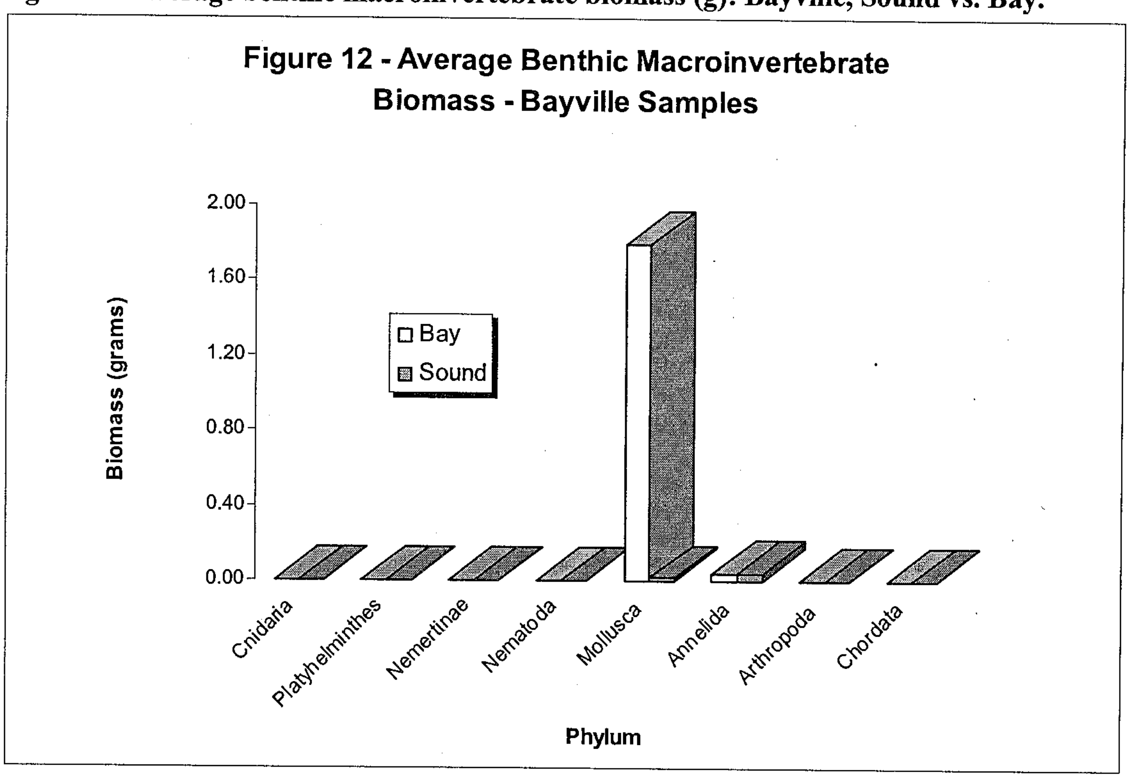


Figure 12. Average benthic macroinvertebrate biomass (g): Bayville, Sound vs. Bay.



Mollusca (97.7%) while the Sound biomass is spread across Annelida (71.7%) and to a lesser extent Mollusca (24.7%).

5.3 GRAIN SIZE ANALYSIS

Results of the grain size analysis are provided in Appendix C.

5.3.1 Asharoken

Gravel and sand were found throughout the Asharoken samples, with sand being the dominant sediment size collected in 13 out of 14 samples (Table 15). In addition, silt and clay were present in all the samples, but in very low quantity (typically less than 2% of the sample). Figure 13 illustrates the averaged grain size distribution of beach material at the Sound transects for Asharoken (A1-A4). As shown in this figure, the sediment samples from transects A1 and A2 are comprised of more sand material (>80% sand) than transects A3 and A4 (< 60%). It should be noted that sand material east of the Keyspan plant and jetty (transect A1) is generally finer sand, and some of this material from the vicinity and inflow/outflow channels is dredged and placed by the Keyspan Northport Power Station on the beach in the vicinity of transect A2. Sand bypassing was a considered design alternative for the District's study, but it was determined that the material was too fine to match the grain size of beach areas to the west that contain more gravel (transects A3 and A4 with gravel > 38%). Other existing condition features have eliminated sand bypassing as an alternative as well.

5.3.2 Bayville

Both gravel and sand were found throughout the Bayville samples, with sand being the dominant sediment size collected in 6 out of the 8 samples (Table 15). Transect B3 displayed a slight dominance of gravel, but sand was still present at a relatively high proportion. Silt and clay were present in all the samples, but were also in very low abundance and typically around 1% of the sediment composition. The sediment composition of the Bay beach had the highest sand composition for all of the Bayville samples.

6.0 WATER CHEMISTRY

Basic water quality measurements were collected at each of the fish sampling events and are shown in Tables 16 and 17. The sampling events at Asharoken yielded the following (Table 16): water temperature ranged from 12.3 to 24.5 degrees Celsius (˚C) (mean = 18.74˚C), salinity ranged from 24.30 to 27.50 parts per thousand (ppt) (mean = 26.38 ppt), dissolved oxygen ranged from 3.98 to 8.15 milligrams per liter (mg/l) (mean = 6.40 mg/l) and pH ranged from 6.97 to 8.20 (mean = 7.70).

The Bayville sampling events produced the following general water quality measures (Table 17): water temperature ranged from 13.2 to 23.7˚C (mean = 19.19˚C), salinity ranged from 24.9 to 26.7 ppt (mean = 25.88 ppt), dissolved oxygen ranged from 4.11 to 9.96 milligrams per liter (mg/l) (mean = 6.78 mg/l) and pH ranged from 7.04 to 8.23 (mean = 7.74).

During the individual sampling events there were very little variation seen amongst the water quality parameters that were measured. However, seasonal variation was observed where temperature peaked during the summer months and declined in the fall and were coolest in the spring. Dissolved oxygen levels also showed a negative correlation with temperature, where the amount of dissolved oxygen decreased with increased temperatures.

The water quality and chemical analyses for Bayville during both the storm/post-rainfall condition and the non-storm/rain condition did not yield any significant results for pesticides or volatile organic compounds (EPA 8260/608). With the exception of nutrients, all measures were below the limits of laboratory detection (See Appendix D). The basic water quality measures taken during the wet and dry weather sampling are also shown in Table 18.

Table 15. Grain size analysis (percent composition).

Date	Transect	Gravel (%)	Sand (%)	Silt/Clay (%)
9/30/2003	A1	0.5	96.5	3
7/19/2004	A1	39.1	59.2	1.7
5/25/2004	A1	13.7	84.7	1.6
9/30/2003	A2	12.8	85.6	1.6
5/25/2004	A2	0.4	97.7	1.9
7/19/2004	A2	6.3	92.3	1.4
9/30/2003	A3	20.1	75.5	4.4
5/25/2004	A3	59.9	40	0.1
7/19/2004	A3	35.7	63.9	0.4
9/30/2003	A4	48.9	49.7	1.4
5/25/2004	A4	48.6	51.3	0.1
7/19/2004	A4	47.8	52.1	0.1
9/30/2003	A5	15.7	82.3	2
5/25/2004	A5	20.4	78.7	0.9
9/29/2003	B1	9.8	85.6	4.6
5/24/2004	B1	26.6	72.3	1.1
9/29/2003	B2	19.7	79.2	1.1
5/24/2004	B2	33.8	65.5	0.7
9/29/2003	B3	53.5	46	0.5
5/24/2004	B3	53.7	45.7	0.6
9/29/2003	B4	44.3	54.5	1.2
5/24/2004	B4	43.1	56.4	0.5

Figure 13. Percent grain size (average per transect) for Asharoken Long Island Sound Transects.

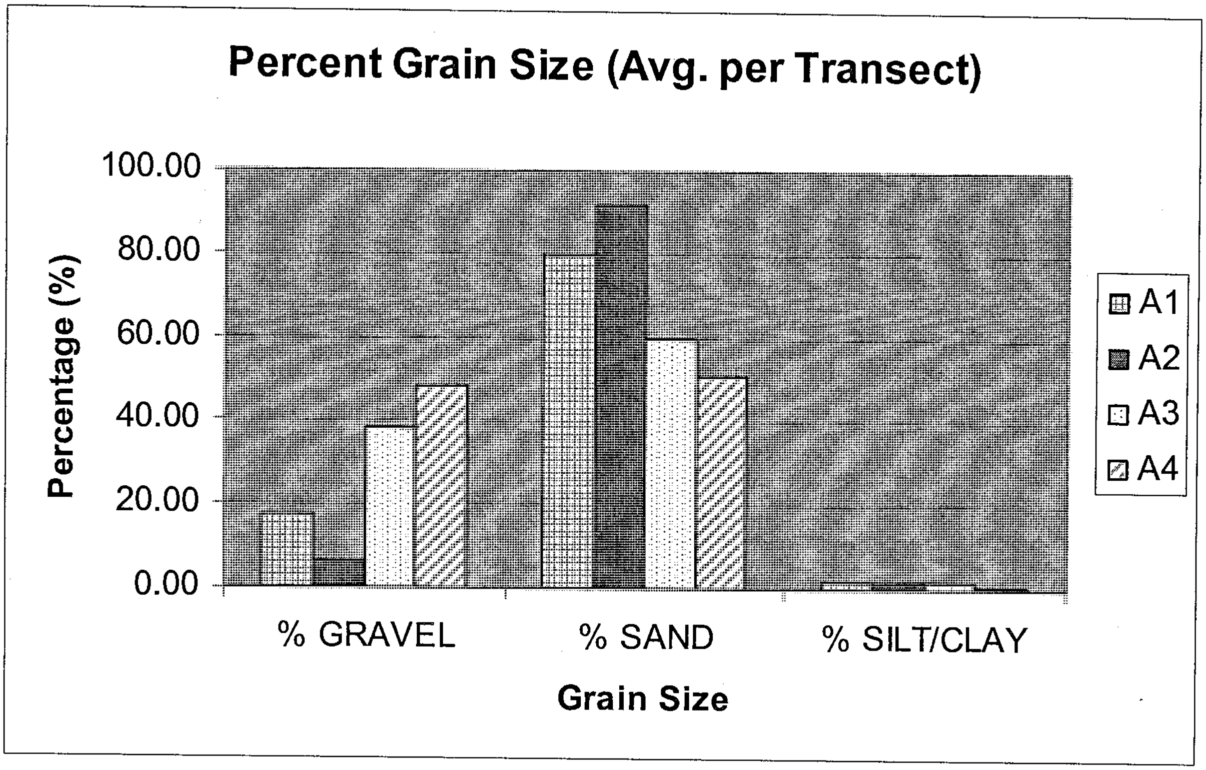


Table 16: Basic water quality collected during fish sampling events at Asharoken *(* indicates sampling equipment failure).*

Date	Transect	Wind (mph)	Wind Direction	Wave Height (ft)	Air Temp (F)	Water Temp (C)	Salinity (ppt)	Cond	D.O. (mg/l)	Turbidity (FTU)	PH
9/30/03	A1	9.00	NW	1.50	57.60	23.80	27.40	41.58	5.38	5.00	7.97
10/30/03	A1	7.70	W-SW	0.75	*	19.90	27.40	38.44	6.85	8.00	8.14
5/25/04	A1		N-NE	0.25	64.90	13.70	26.20	32.18	6.61	8.00	7.70
6/14/04	A1	7.40	S-SW	2.00	73.40	16.40	25.50	33.65	6.10	5.00	7.86
7/19/04	A1	2.30	S-SE	0.80	70.70	24.50	25.10	38.59	3.98	53.00*	6.97
7/26/04	A1	5.50	N-NE	1.00	69.90	21.00	25.80	37.17	5.58	48.00*	7.02
9/30/03	A2	9.00	NW	1.50	57.60	18.10	27.40	36.94	6.16	6.00	8.04
10/30/03	A2	1.20	N-NW	4.00	*	13.00	27.20	32.80	7.43	10.00	8.20
5/25/04	A2	1.50	N-NE	0.25	*	13.90	26.20	32.25	7.40	0.00	7.89
6/14/04	A2	4.20	S-SW	2.00	*	16.60	25.00	34.51	6.55	7.00	7.89
7/19/04	A2	4.60	SW	1.00	69.10	21.60	26.90	39.11	4.90	5.00	7.27
7/26/04	A2	7.00	NNE	1.00	70.10	21.70	27.10	39.33	6.01	9.00	7.26
9/30/03	A3	1.40	W	0.00	67.50	19.90	27.40	38.38	6.57	2.00	8.07
10/30/03	A3	4.30	SW	0.00	*	14.60	27.50	34.15	6.64	6.00	8.12
5/25/04	A3	3.20	N	0.80	60.90	15.80	26.20	33.73	8.15	7.00	7.79
6/14/04	A3	2.40	S-SW	1.00	85.10	17.30	25.90	34.49	7.92	0.00	8.01
7/19/04	A3	1.2	SE	1.00	80.1	22.13	26.80	39.20	5.35	6.00	7.20
7/26/04	A3	7.30	N-NE	2.00	70.20	22.10	26.90	39.61	6.15	16.00	7.20
9/30/03	A4	1.40	W	0.00	67.50	19.00	27.40	37.64	6.32	2.00	8.03
10/30/03	A4	1.50	N-NW	0.00	*	14.10	27.40	33.75	6.70	5.00	8.16
5/25/04	A4	2.90	N-NE	0.50	71.30	16.20	26.10	33.88	7.35	6.00	7.76
6/14/04	A4	2.10	W	1.00	78.30	17.70	25.80	34.85	8.01	4.00	8.03
7/19/04	A4	0.60	SE	1.00	83.20	22.10	26.80	39.20	5.40	22.00	7.25
7/26/04	A4	2.20	N-NE	1-3"	78.40	22.90	26.40	39.26	5.12	3.00	6.99
9/30/03	A5	3.00	W	0.00	62.60	18.90	25.70	35.39	6.50	8.00	7.96
10/30/03	A5	4.20	W-SW	0.75	*	12.30	24.30	29.08	7.46	9.00	8.06
5/25/04	A5	4.60	N-NE	0.00	64.90	17.40	25.50	34.04	5.86	12.00	7.73
6/14/04	A5	5.40	S-SW	1.00	79.30	21.60	25.10	36.03	8.11	11.00	8.10
7/19/04	A5	0.60	S	0.00	83.00	22.20	26.50	39.27	5.44	5.00	7.14
7/26/04	A5	6.00	N-NE	1-2'	68.90	21.70	26.90	39.15	5.92	29.00	7.27
Mean		**3.90**		**0.86**	71.19	**18.74**	**26.38**	**36.26**	**6.40**	**10.53**	**7.70**
SD		**2.59**		**0.89**	**8.14**	**3.51**	**0.88**	**2.99**	**1.03**	**12.42**	**0.42**
Max		**9.00**		**4.00**	**85.10**	**24.50**	**27.50**	**41.58**	**8.15**	**53.00**	**8.20**
Min		**0.60**		**0.00**	**57.60**	**12.30**	**24.30**	**29.08**	**3.98**	**0.00**	**6.97**

Table 17. Basic water quality collected during fish sampling events at Bayville.

Date	Transect	Wind (Avg) mph	Wind Direction	Wave Height (ft)	Air Temp (F)	Water Temp (C)	Salinity (ppt)	Cond	D.O. (mg/l)	Turbidity (FTU)	PH
9/29/03	B1	2.90	NW	0.00	60.30	20.40	26.30	37.36	4.11	8.00	7.76
10/29/03	B1	12.00	NNW	0.00	*	13.20	25.80	31.32	6.70	3.00	8.03
5/24/04	B1	5.00	N-NE	0.00	*	17.90	25.30	34.22	7.13	11.00	7.82
6/15/04	B1	5.80	wsw	2.00	84.70	23.70	24.90	37.36	6.19	14.00	7.77
7/20/04	B1	2.80	wsw	0.00	75.80	23.60	25.90	38.90	5.66	9.00	7.04
7/27/04	B1	5.30	N-NE	0.30	70.00	23.40	25.90	39.27	6.42	5.00	7.18
9/29/03	B2	2.70	N	0.50	64.60	19.80	26.70	37.40	5.67	7.00	7.92
10/29/03	B2	10.70	NNE	3.50	*	14.50	26.10	32.31	7.35	14.00	8.13
5/24/04	B2	6.50	NE	1.50	*	15.60	25.50	32.74	7.72	5.00	7.99
6/15/04	B2	6.40	ssw	1.00	89.00	20.40	25.30	35.87	9.22	4.00	8.13
7/20/04	B2	2.30	sw	0.50	74.30	21.70	26.30	38.21	6.72	5.00	7.32
7/27/04	B2	1.20	N-NE	2.30	70.30	20.80	26.50	37.97	6.55	6.00	7.40
9/29/03	B3	3.00	N	0.50	63.00	20.40	26.60	37.89	5.63	4.00	7.88
10/29/03	B3	10.70	NE	2.00	*	14.50	26.50	32.93	7.38	11.00	8.12
5/24/04	B3	9.00	NE	1.50	*	15.40	25.40	32.45	8.54	14.00	7.98
6/15/04	B3	3.50	wsw	1.00	89.50	20.30	25.20	36.06	7.80	2.00	8.08
7/20/04	B3	1.90	W-SW	0.50	79.90	21.00	26.40	38.02	5.49	0.00	7.19
7/27/04	B3	7.40	N-NE	2.30	71.20	20.90	26.40	37.87	6.35	3.00	7.31
9/29/03	B4	4.40	NW	0.50	58.50	19.60	26.70	37.37	5.01	4.00	7.89
10/29/03	B4	10.70	NE	2.00	*	14.50	25.40	31.74	7.65	16.00	8.11
5/24/04	B4	9.00	NE	1.00	*	15.30	24.90	31.38	6.90	14.00	7.89
6/15/04	B4	6.70	wsw	1.00	89.00	21.30	25.10	36.57	9.96	0.00	8.23
7/20/04	B4	3.50	W-SW	0.50	*	21.30	25.90	37.66	6.13	2.00	7.32
7/27/04	B4	9.00	N-NE	1.50	69.50	21.00	26.20	38.85	6.38	6.00	7.23
Mean		**5.93**		**1.08**	**73.97**	**19.19**	**25.88**	**35.91**	**6.78**	**6.96**	**7.74**
SD		**3.24**		**0.91**	**10.48**	**3.21**	**0.59**	**2.71**	**1.31**	**4.82**	**0.38**
Max		**12.00**		**3.50**	**89.50**	**23.70**	**26.70**	**39.27**	**9.96**	**16.00**	**8.23**
Min		**1.20**		**0.00**	**58.50**	**13.20**	**24.90**	**31.32**	**4.11**	**0.00**	**7.04**

(indicates sampling equipment failure).*

Table 18. Basic water quality parameters measured at the time of water chemistry collections (Wet vs. Dry weather) for Asharoken and Bayville.

Date	Location	Transect	Avg Wind (mph)	Wind Direction	Air Temp (F)	Water Temp (C)	Salinity (ppt)	Conductivty	D.O. (mg/l)	Turbidity (FTU)	PH
10/1/03	Bayville	BWQ1	6.1	W-NW	57.0	18.5	26.4	36.17	5.67	7	7.83
10/1/03	Bayville	BWQ2	4.0	N-NW	56.4	18.6	25.6	35.18	4.66	5	7.74
10/10/03	Asharoken	AWQ1	7.6	SE	65.0	16.6	12.4	17.52	5.92	3	8.10
10/10/03	Asharoken	AWQ2	7.4	SE	65.0	16.9	26.6	34.98	4.22	5	8.08
10/27/03	Bayville	BWQ1	10.0	S-SE	65.0	13.3	25.5	31.14	7.36	2	8.05
10/27/03	Bayville	BWQ2	4.5	W-SW	65.2	13.5	25.7	31.39	6.86	1	8.02
10/28/03	Asharoken	AWQ1	0.7	E-NE	*	13.2	26.1	31.69	9.55	1	8.11
10/28/03	Asharoken	AWQ2	0.7	NE	*	13.9	25.8	31.84	6.94	0	8

(indicates sampling equipment failure)*

7.0 DISCUSSION

This investigation characterized the presence/absence of finfish and benthic macroinvertebrates in the nearshore areas of Asharoken and Bayville during the Fall 2003, Spring 2004 and Summer 2004 sampling periods. The investigation also characterized the baseline water quality conditions in the nearshore area during sampling events. Lastly, grain size distribution analysis for Asharoken and Bayville beach materials was determined as a result of this investigation.

The data discussed herein provides a baseline of the biological resources that are present in these two locations at different seasons of the year. The information will aid in the District's National Environmental Policy Act, Essential Fish Habitat, Endangered Species, and Fish and Wildlife Coordination Act evaluations of potential impacts for considered beach nourishment and other structural alternatives in the nearshore environment. The data will also serve as a guide for future monitoring of finfish and benthic macroinvertebrates during and after any potential storm damage reduction measures are implemented. More specifically, the results of this nearshore investigation provide the species composition and abundance for finfish and benthic invertebrates, their size distributions, biomass, and the abundance of Essential Fish Habitat (EFH) species at three different times of the year at Bayville and Asharoken.

Overall, the species richness of finfish was greatest in the Summer 2004 sampling event with 15 out of a total of 21 taxa collected. Of the 21 finfish species collected, four were identified as Essential Fish Habitat species and included: bluefish, porgy, windowpane flounder and winter flounder. The Summer 2004 sampling event also yielded the highest abundances of finfish as well, with menhaden and Atlantic silverside being the dominant fish species. Only eight (8) of the 21 fish species were consistently captured during all seasons; and included menhaden and Atlantic silversides, as well as other baitfish species such as striped killifish and mummichog. Of those eight species captured across all seasons, winter flounder was the only EFH species, and it had an abundance that was lower than all, but two of the seven other species. All of the winter flounder were in the juvenile stage and were in greatest abundance in the Summer 2004 sample.

While there was some shift in the finfish species composition with the seasonal changes, the changes were not dramatic as reflected by our beach seines. Several migratory (i.e. typically move to deeper offshore water or southward as the water cools) species appeared in our Spring 2004 and Summer 2004 sampling events as recently recruited juveniles and included: weakfish, winter flounder, tomcod, bluefish, menhaden, bay anchovy and sandlance. The Long Island Sound has been recognized as an important recruitment habitat for these species and has been designated as essential fish habitat areas for winter flounder and bluefish.

At Asharoken finfish samples were highest in abundance in the Summer 2004 sampling event and were also dominated by menhaden and Atlantic silversides. Species richness was highest in the Summer 2004 sampling event, but by only 3 more species than in the Fall 2003 and Spring 2004 sampling events. Four EFH species were present at Asharoken, but only winter flounder and bluefish were in high abundances. In addition, almost 40% of the catch of winter flounder and bluefish at Asharoken were at the Bay station, which had only a single transect. Shallow embayment are known to be important recruitment habitats for the juveniles of many finfish species such as bluefish and winter flounder (Bigelow and Schroeder 2002).

As a comparison, nekton data is available from a 1972 survey conducted in the vicinity of the Asharoken Beach area. Otter trawls, mid-water trawls and seining with a 100' seine were sample methods used during that survey effort. Winter species surveyed included winter flounder, silversides, white perch (*Morone americanus*), and hake (*Urophycis Spp.*). The spring species composition consisted predominantly of migrant fish including windowpane flounder, menhaden, anchovy and blueback herring. Summer species included blackfish (*Tautoga Onitis*), hogchoker (*Trinectes maculatus*), sea robin (*Prionotus evolans*), toadfish (*Ospanus tau*), and also menhaden, anchovies and eel (*Anguilla rostrata*) in less abundance than during spring (Austin *et. al.* 1973). As with our findings, the summer species composition appears to be more diverse.

Finfish samples taken at Bayville exhibited similar trends as Asharoken with greatest abundance in the Summer 2004 sampling, with menhaden being the dominant species. Although the species composition changed with the seasons, overall species richness did not, as the Fall 2003, Spring 2004 and Summer 2004 all had 9 taxa present. It is also of interest to note that even though the overall abundance of finfish at Bayville was similar to Asharoken, the species richness was lower overall, as well as within a given season. Although the same four EFH species were found at Bayville as in Asharoken; only juvenile bluefish were captured in high abundance. Furthermore, with the exception of the single large menhaden catch at the Bay transect in Summer 2004, the abundance and species diversities for the Bay and the Long Island Sound transects were quite similar. The New York State Department of State has identified Oyster Bay Harbor as a significant nursing and feeding habitat for 8 species including: striped bass, scup, summer flounder, bluefish, Atlantic silverside, menhaden, winter flounder, and blackfish during the months of April through November (NYSDOS 1987). We captured 5 of those species in this study.

The invertebrate populations of the benthos are important foraging sources for many species of marine fish (Bigelow and Schroeder 2002). In addition, invertebrates of the swash zone, and those found within the abundant wrack material may provide a valuable food source to shorebirds. In the current study a total of 8 phyla consisting of 47 taxa were collected and identified with Annelida being by far the most abundant. The phylum which had the greatest influence on biomass however, was Mollusca, where a few heavy organisms were able to significantly impact the total benthic macroinvertebrate biomass.

The benthic macroinvertebrate data was examined per separate season for each of the study beaches. At Asharoken, the Spring/Summer 2004 collection was found to have a greater species richness as well as macroinvertebrate abundance in comparison to the Fall 2003 data. However, the biomass was higher in Fall 2003 collection due to the presence of a few large Mollusca. For the Bayville location, Fall 2003 collection was found to have a lower species richness, lower abundance, and slightly lower biomass in comparison to the Summer 2004 data.

Benthic macroinvertebrate data was also analyzed to compare Long Island Sound transect data versus Bay transect samples. At Asharoken, cores taken from the Sound side were found to have a greater species richness and greater abundance, but a similar biomass in comparison to the Bay beaches. At the Bayville location, cores taken from the Sound were found to be less diverse, but had a greater benthic macroinvertebrate abundance.

At both sampling locations, little variation was seen amongst the measured water quality parameters. With respect to seasonal variation the temperatures peaked during the summer months, declined in the fall, and were lowest in the spring. As expected, the DO levels showed a negative correlation with temperature, where the DO level decreased with increased temperatures. However, the levels did not seem to drop to a point where it was suspected to adversely impact the catch, species richness, or abundance. In addition, there were no measurable differences in the water quality and chemical analyses for Bayville between the non-storm/rain condition and the storm/post-rain event. Since there was very limited chemical analyses conducted (there were only 2 stations and 2 sampling events), the lack of differences between the sampling events should be interpreted with caution.

In summary, data collected from this investigation characterizes existing fish and benthic macroinvertebrate communities that utilize the intertidal and nearshore areas of Asharoken and Bayville beaches. It was determined that both the fish species richness and abundance was greatest in the Summer 2004 season. In addition, the abundance of EFH species collected was greatest in the same season. Similarly, for both locations the benthic invertebrates were found to have the greatest species richness and abundance in the Summer 2004 sampling event.

Reference List

Austin, H.M., Dickinson J, and C. Hickey. 1973 An ecological study of the icthyofauna at the Northport Power Station Long Island New York New York Ocean Science Lab, Montauk, NY, May 14, 1973. Prepared for LILCO.

Bigelow, H.B. and W.C. Schroeder. 2002. Fishes of the Gulf of Maine. Third Edition. Eds. Collette B.B. and G. Kliein-MacPhee. Smithsonian Institution Press, Washington, 748 pp.

New York State Department of State (NYSDOS). 1987. "Significant Coastal Fish and Wildlife Habitat: Project Description, Oyster Bay Harbor."

New York State Department of State (NYSDOS), New York State Department of Environmental Conservation, U.S. Fish and Wildlife Service, Towns of Oyster Bay and Huntington, Villages of Centre Island, Bayville, Lattingtown, Mill Neck, Matinecock, Upper Brookville, Oyster Bay Cove, Cove Neck, Laurel Hollow and Lloyd Harbor. 1997. "Draft Oyster Bay-Cold Spring Harbor Resource Management Plan." March 31,1997.

Weiss, H.M. 1995. Marine Animals of Southern New England and New York. Identification keys to common nearshore and shallow water macrofauna. State Geological and Natural History Survey of Connecticut, CT.

Appendix A

Fish Data Organized by Season

Appendix B

Benthic Macroinvertebrate Data Organized by Season

Appendix C

Grain Size Data

Appendix D

Water Quality Chemical Analysis

Appendix C

National Marine Fisheries Service Endangered Species Act Coordination

U.S. ARMY CORPS OF ENGINEERS
NEW YORK DISTRICT

DRAFT DETERMINATION OF EFFECTS FOR THE POTENTIAL IMPACTS TO FEDERAL ENDANGERED AND THREATENED SPECIES FROM THE ASHAROKEN BEACH, ASHAROKEN, NY COASTAL RISK MANAGEMENT PROJECT

October 2015

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1.0 INTRODUCTION

This Biological Assessment (BA) is submitted to the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) by the U.S. Army Corps of Engineers (USACE)-New York District (District) as part of the formal consultation process under Section 7 of the Endangered Species Act (ESA), as amended November 10, 1978. As a result of the severe impacts of Hurricane Sandy (October 29, 2012) in the District's Area of Responsibility (AOR), Congressional funding was provided to several authorized but unconstructed projects, leading to accelerated schedules of many projects. This BA assesses the potential impacts to threatened and endangered species associated with the Coastal Storm Risk Management Project Asharoken.

The project proposes to nourish the beach using sand from the Asharoken Offshore Borrow Area (AOBA) located in Long Island Sound approximately ½ mile north west of the Asharoken Beach project site. NY. The project also proposes to construct 3 tapered western groins along the shoreline, and ultimately aims to reduce damages from storm events as well as long term erosion. This project is a congressionally authorized Federal project lead by the District and co-sponsored by the New York State Department of Environmental Conservation (NYSDEC).

Section 7 of the ESA requires that a BA be prepared for all major Federal actions when a federally listed or proposed endangered or threatened species may be affected. In 1995, a BA for whales and sea turtles was completed for similar beach nourishment projects on the South Shore of Long Island and the northern New Jersey (NJ) shore, including Long Beach. The purpose of this BA is to: address potential impacts to the Atlantic sturgeon, which was recently listed under the ESA (Federal Register Vol 77, No. 24, Monday February 6, 2012; 50 CFR Part 224); to update the existing beach nourishment consultation to include the Asharoken project for listed sea turtles and whales; including the change to the listing of loggerhead sea turtles[1].

2.0 PROJECT BACKGROUND AND GENERAL DESCRIPTION OF THE PROJECT

Since the 1950's, USACE has been involved in the construction of shore protection projects (USACE-ERDC 2007). The impacts of Hurricane Sandy resulted in severe damage to the coastline, including the area covered by the project discussed in this BA, thereby increasing the risks and vulnerability of the shore communities from future storm events (ASA 2013). In response and with the aid of the Disaster Relief Appropriations Act of 2013 (DRAA), the USACE has accelerated the schedules of many authorized coastal storm risk management projects, including Asharoken. This north shore of Long Island, New York, study was authorized by the Committee of Public Works and Transportation, United States House of Representatives, adopted 13 May 1993. To wit:

> *Resolved by the Committee on Public Works and Transportation of the United States House of Representatives, That, the Secretary of the Army, acting through the Chief of Engineers, is requested to review the report of the Chief of Engineers on the North Shore of Long Island, Suffolk, County, New York, published as House Document 198, Ninety-second Congress, Second Session, and other pertinent reports to determine whether modifications of the recommendations contained therein are advisable at the present time, in the interest of beach erosion control,*

[1] *On March 16, 2010, NOAA published a proposed rule to list two distinct population segments (DPS) of loggerhead sea turtles as threatened and seven distinct population segments of loggerhead sea turtles as endangered (75 FR 12598). On September 16, 2011, a final listing determination was made designating the Northwest Atlantic Ocean DPS, South Atlantic Ocean DPS, Southeast Indo-Pacific Ocean DPS, and the Southwest Indian Ocean DPS as threatened. The Northeast Atlantic Ocean DPS, Mediterranean Sea DPS, North Indian Ocean DPS, North Pacific Ocean DPS, and South Pacific Ocean DPS have been designated as endangered (76 FR 58868). The listing became effective October 24, 2011, at which time, the species of loggerhead likely to be present in the action area went from globally listed threatened loggerhead, to the threatened Northwest Atlantic distinct population segment of loggerhead.*

storm damage reduction and related purposes, on the North Shore of Long Island, New York, particularly in and adjacent to the communities.

2.1 Asharoken, NY

The U.S. Army Corps of Engineers (USACE) New York District (NYD) proposes to provide long-term storm damage protection for Asharoken Avenue and adjoining properties by depositing beachfill, installing 3 rock groins, and providing periodic sand nourishment to reduce the effects of erosion at Asharoken Beach, Village of Asharoken, Town of Huntington, Suffolk County, New York. Asharoken Beach is located along the north shore of Long Island N.Y., from Eaton's Neck Point to the northwest and Long Island Lighting Company (LILCO) Northport Power Station to the southeast (Figure 1) The study area is a narrow section of land and developed shorefront with Long Island Sound to the northeast and Northport Bay to the southwest extending approximately 2.4 miles along Asharoken Avenue from its intersection with Bevin Road in the west to the Northport Basin/ Northport Power Station the cooling water intake lagoon in the east. The beach width to mean low water (MLW) varies along this section of beach from less than 10 feet at the northwestern section near Bevin Road to approximately 100 feet (ft) at the southeastern limit near the power plant (Figure 2a).

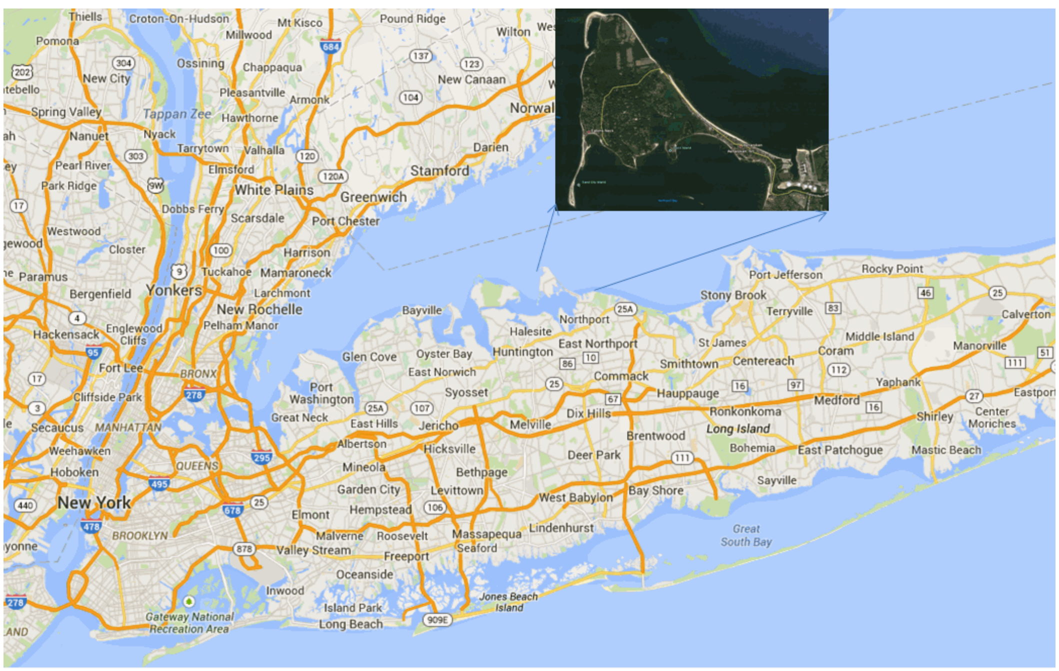


Figure 1: Location of Asharoken Beach Project

Figure 2a. Detail of Asharoken Project Site

Problem Identification. The critical problem for the project area is the constant beach erosion threatening Asharoken Avenue and adjacent properties along the beach. This erosion threatens vital access and egress to Eatons Neck. Closure of Asharoken Avenue, as occurred during the December 1992 northeaster, stranded the residents of Eatons Neck for about 2 days. The loss of access creates a safety hazard as Eatons Neck is cut off from emergency services including fire, police and ambulance. While Asharoken Avenue was blocked following the December 1992 storm, two residents of Eatons Neck had to be evacuated by helicopter for medical treatment. Continued erosion has left this roadway exposed to a potential for catastrophic failure requiring evacuation of the isolated community of Eatons Neck.

An emergency roadway protection feature for the most critical northwestern 900 feet of Asharoken Avenue was constructed in 1997 by the Corps of Engineers under Section 103 of the River and Harbor Act of 1962. The roadway protection design included a steel sheet pile bulkhead with riprap toe protection on the exposed (Long Island Sound) side and sand backfill on the landside. The steel sheet pile and dune backfill elevation was set at +12.5 ft NGVD (+11.5 ft NAVD). The 800 pound riprap toe protection had a 1v: 3.5h side slope and was covered by sand fill with the same side slope. A 20 ft wide dune stabilized with geotextile mat and dune grass was included seaward of the riprap. The roadway protection was constructed for a 15-year design life. Since the 1997 emergency repair, there were two more similar repairs due to storm damage, the most recent one in year 2010. The shoreline located southeast of the roadway protection is fronted by a narrow dune and is subject to continued erosion and threat of storm-induced road damage and closures.

There is also a severe erosion problem along the southeastern portion of Asharoken Beach. The beach width narrows towards the south and residents have constructed a nearly continuous line of private bulkheads to protect their homes (Figure 2b). These bulkheads vary in height, construction material and condition. Consequently, the level of protection provided by these structures is uncertain. Failure of these bulkheads would result in significant damages.

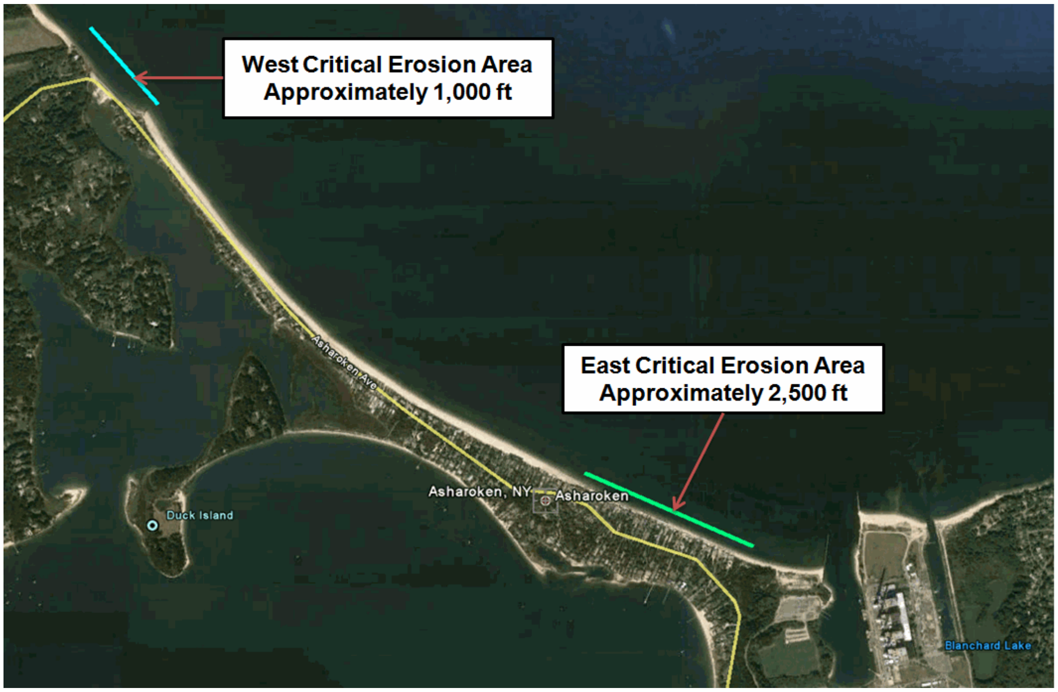


Figure 2b

Continuation of the trend in beach erosion will increase the potential for economic losses and threat to human health and safety. Based on initial recommendations from USFWS and the NYSDEC, construction activities would be restricted to October through NYSDEC to avoid direct adverse impacts to Federally listed shorebirds, and species of finfish designated by the State as those “summer spawners”.

Construction Feature	Total Number/ Total Volume	Area Construction to Take Place
Beach fill material (for creation of beach berm, sand barrier and a dune)	12,672 linear feet	Typical Scenario: Pumping of sand into swash zone; Spreading of sand mainly on land
Borrow area sand removal (i.e., total sandfill quantity, excluding 5-year renourishments)	600,000 cubic yards	Dredging to occur in water at the borrow area; transport of material via pipeline shoreline
Dune plantings	6.25 Acres	On land
Dune walkovers (gravel surface)	0	On land
Timber non-ADA walkovers	3	On land
5-yr renourishment over 50 years	80,000 cubic yards every 5 years	Mainly beach and some intertidal
Rehab existing bulkheads or 103?	NO	
New groins	3 proposed	Beach intertidal and littoral (most in water)

Table 1: Proposed Construction Features of the Asharoken Storm and Erosion Protection Project

The study shoreline is approximately 2.4 miles in length with relatively mild offshore slope, steep foreshore slope and low sloping berm. Average foreshore beach widths range from 50 to 100 ft backed with dune or bulkhead. The project shoreline is divided into four typical reaches based on beach profile types and the waterfront structural characteristics. The 4 Asharoken reaches run west to east and are characterized in Table 2 and followed by sample cross sections below.

	General Location (ft NGVD) (ft NGVD) (ft) (x V on y H) (x V on y H) BEACH PROFILE	Approx Length Ft	Dune Elevation (ft NGVD)	Berm Elevation	Dry Beach Width to MHW ft	Fore Slope xV/xY	Off-shore Slope xV/xY
1 a (2006	Bevin Road (0+00) to *Rock* Groin (9+00	900	12.5 bulkhead	+6	0-20	1 on 8	1 on 100
1 b 2001	Rock Groin (9+00) to (2001) Duck Island ln (62+00	5,300	+15.5 bulkhead	+4 - +12	80	1 on 8	1 on 100
2a 2001	Duck Island Lane (62+00) to 1,200' West of West Jetty (112+00)	5,000	+14 bulkhead	+4 - +12	0 on 120	1 on 8	1 on 100
2200 1	1,200' West of West Jetty (112+00) to West Jetty (124+00)	1,200	+15 (Dune app.1,000 ft) +17	+8	40 to 60	1 on 8	1 on 100

Table 2. Landform Dimensions

Figure 3a Typical Profile Reach 1a

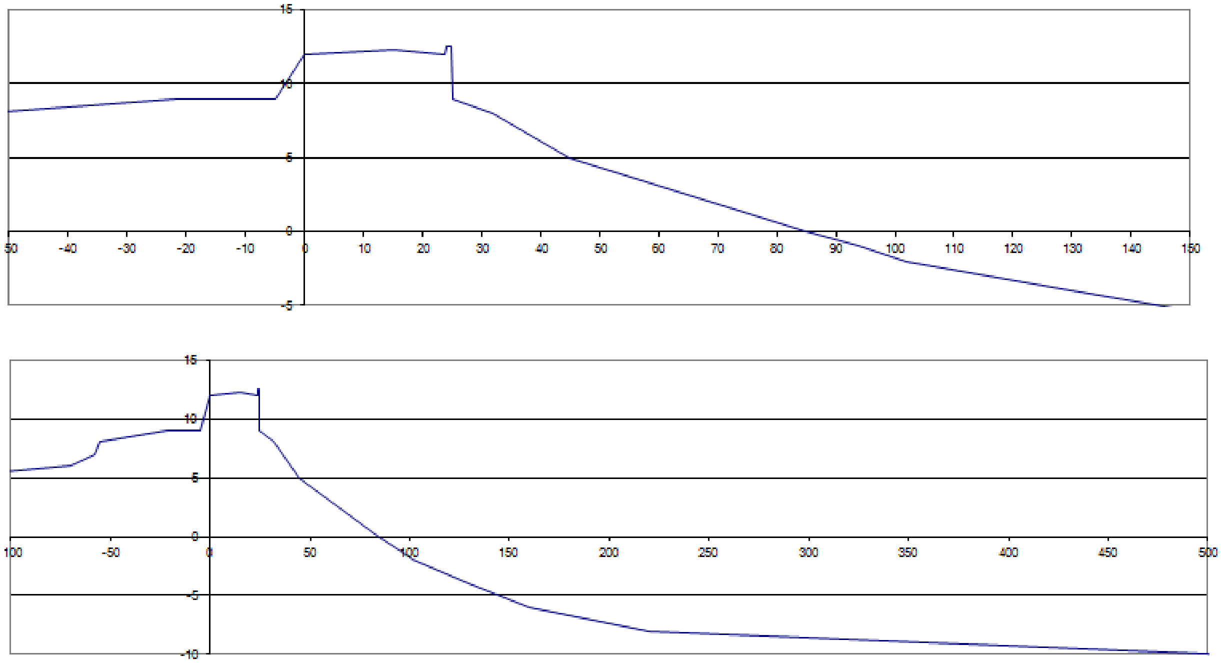


Figure 3b Typical Profile Reach 1b

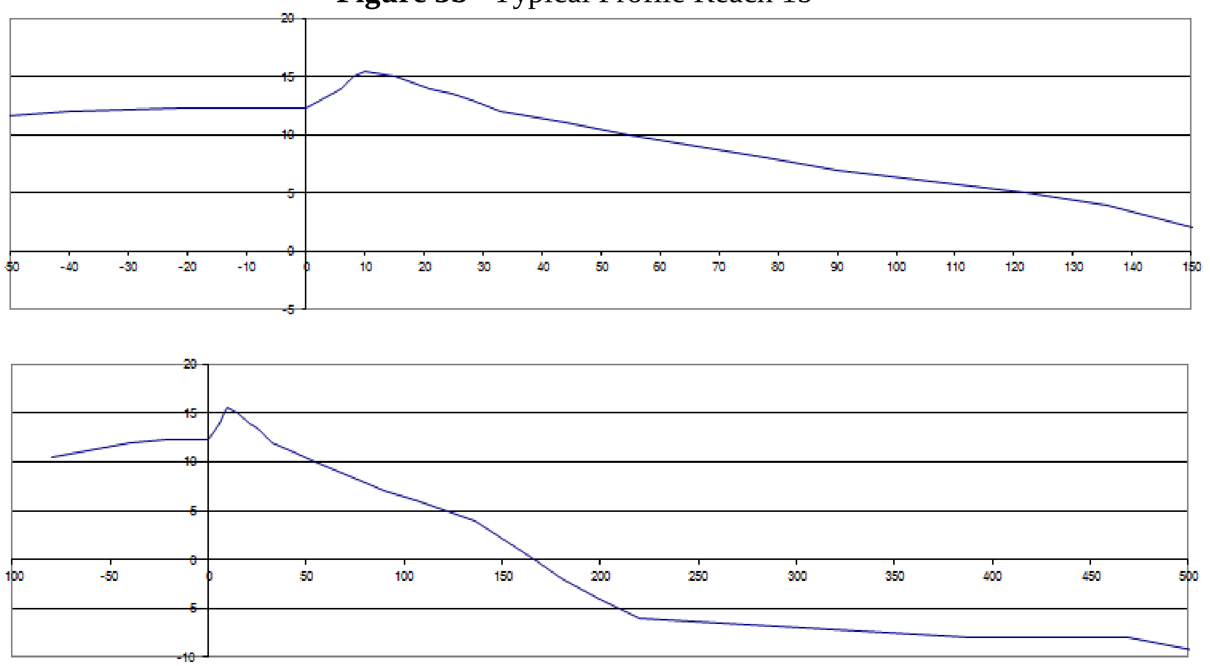


Figure 3c Typical Profile Reach 2a

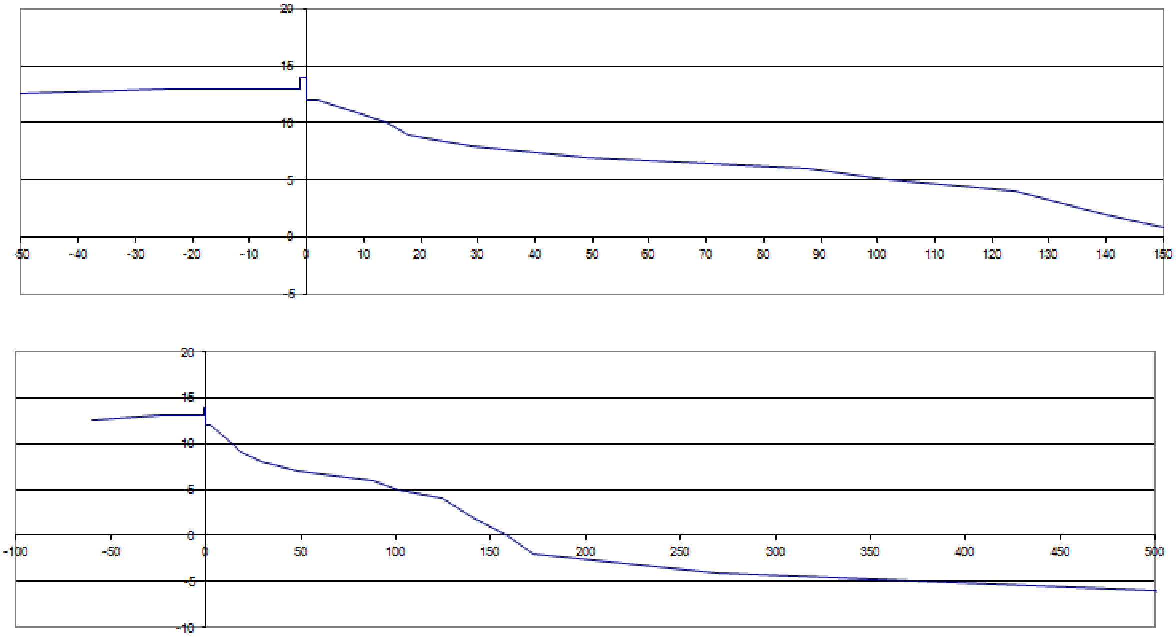
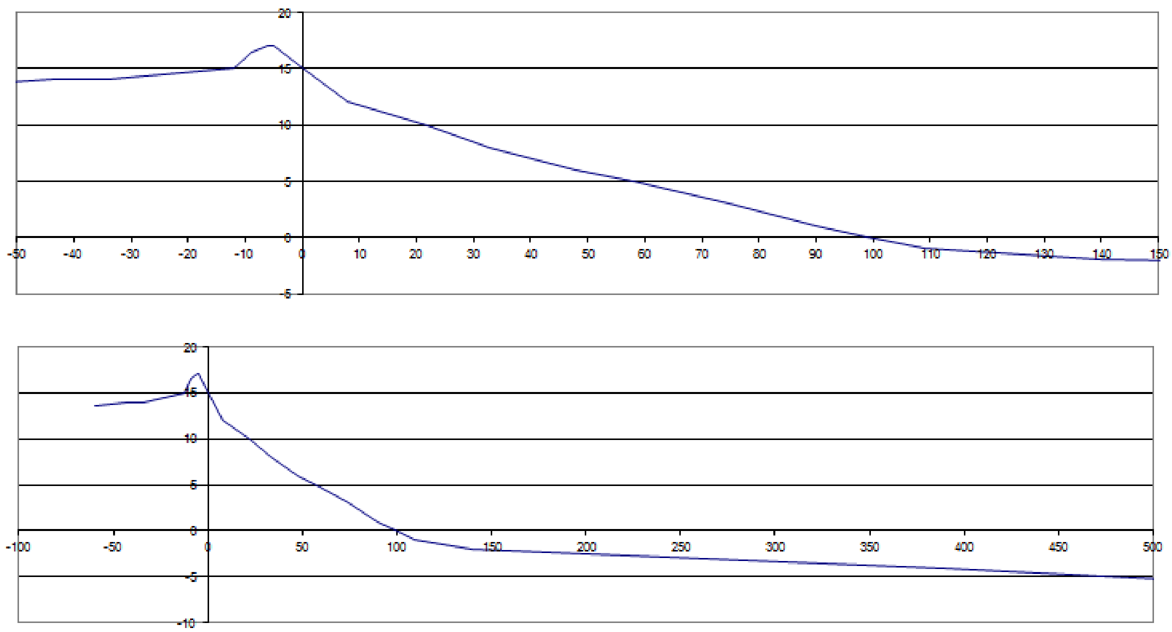


Figure 3d Typical Profile Reach 2b



The following construction features from Table 1 have the potential to impact marine based endangered species and are discussed in more detail.

- Dredging

  The dredge will remove sand from the Sound bottom and pump it from the borrow area onto the shoreline via a pipeline, @600,000 CY will be dredged. It is most likely that a suction type dredge will be utilized for this work either a cutterhead pipeline dredge or a hopper dredge. While the dredge is operating the vessel will move at about 2-3 mph (1.7-2.6 knots). The footprint of the borrow area to be impacted by dredging is approximately 55 acres, with an average of about 10' of material being removed. Because the sand is being removed from a ridge, the dredging activity is not expected to leave a significant depression in relation to the ambient bathymetry. The average depth at the removal site is anticipated to increase from 35' to 45'. (MHW)

  Potential Impacts: Contact injuries, entrainment, and temporary of loss of prey, minor localized turbidity, disturbance and displacement of various mobile marine species.

- Beach Fill

  Approximately 600,000 CY of sand will be excavated via (cutterhead?) dredge from an offshore borrow area (A) located approximately ½ mile north of the project area. 600,000 CY of sand will be placed along approximately 12,400 ft of beach. The acreage of beach, intertidal and littoral surfaces covered will be approximately 75 acres at mean high tide. Re-grading of sand after placement on the beach would occur with equipment such as bulldozers and front loaders. This equipment may work in the surf zone, having some contact with the water.

  Potential Impacts: Temporary increase turbidity, temporary loss of prey items buried, respiratory stress, disturbance and displacement of species.

- Groin Construction

  A total of 3 (western terminal) tapered groins are proposed for construction (Figure 4). Groin construction will begin from the landward side. Typically equipment will initially be placed on land and then on top of the groin to continue building the structure seaward. Potential equipment include cranes, front end loaders, barge, tugboat or dozers. If constructed from the water, a crane mounted barge and excavator with a tugboat could be used to reposition the existing armor and place new stones. Since the stones have to be placed in a precise manner, and to avoid fracturing the rock, the speed of equipment (tugboat/barge, and equipment used to place the stones from land or water) is very slow.

  Potential Impacts: Because of the shallow nature of the in water construction area, as well as the slow moving equipment, any contact related impacts to ESA species are deemed extremely unlikely. There will be a permanent loss (coverage) of typical intertidal and littoral habitat and its sediment bound benthic invertebrates, resulting in a relatively small area that will no longer exist as this type of habitat. Sediment related benthic habitat will be replaced with a 3-dimensional rock structure that will develop a much more diverse reef ecosystem limited to structure and its immediate vicinity. Eventually these reefs/groins may provide more benefits to any sturgeon or sea turtle that happened into the nearshore area than the former habitat they cover. Minor localized turbidity will result during the construction of the groins.

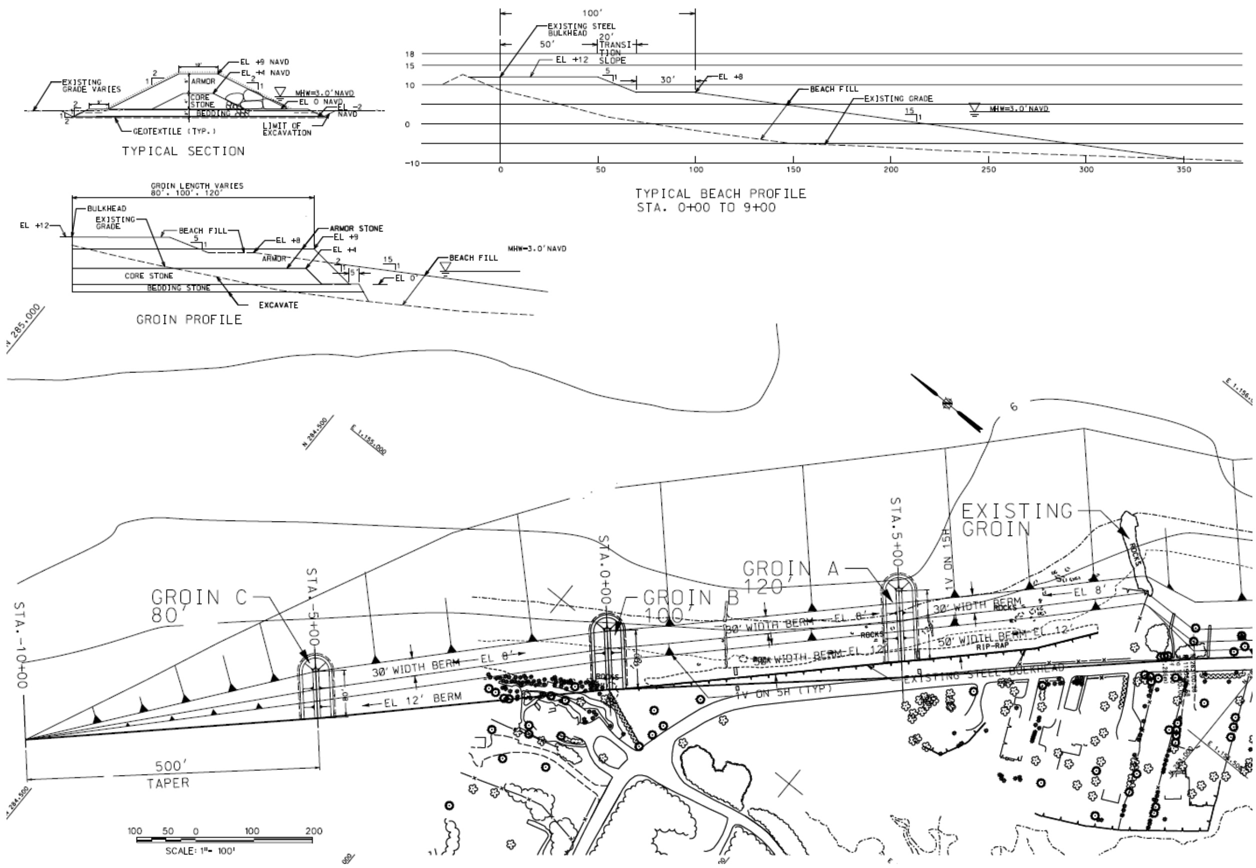


Figure 4 Western Groin Field (3)

- <u>Renourishment cycles</u>:

  Sand will be trucked into the project site from fully permitted upland site. It is anticipated that 80,000 CY of sand would be needed every 5 years over a 50 year period. Sand fill for re-nourishment cycles will be trucked in from an outside source. Additionally post storm nourishment is anticipated at 25,000 CY every 5 years. Another (ongoing) re-nourishment source will be approximately 10,000 CY of sand dredged from the LILCO power station inlet to the east and “by passed” to the project site, annually.

3.0 FEDERAL SPECIES OF CONCERN (Endangered/Threatened)

3.1 General Information for Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)

NMFS has determined that Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) is comprised of five distinct population segments (DPSs) that qualify as listed species under the ESA: Gulf of Maine (GOM), NY Bight (NYB), Chesapeake Bay (CB), Carolina, and South Atlantic. The Northeast Region of NMFS has listed the GOM DPS as threatened, and the NYB and CB DPSs as endangered. The proposed shore protection project covered in this BA falls within the boundaries of the NYB population, although the marine range for all DPSs extends from Canada to Florida and it is therefore possible that any DPS may be present in/around the project area.

The 2012 HDP BO (NMFS 2012A) contains a detailed outline of known Atlantic sturgeon life history characteristics and is incorporated by reference in this BA. A summary of the most relevant information to the proposed project is provided in this document.

Atlantic sturgeon are anadromous, spending the majority of their adult phase in marine waters, migrating up rivers to spawn in fresh water and migrating to brackish waters in the juvenile growth phases (Bain 1997).The NYB DPS includes all Atlantic sturgeon whose range occurs in watersheds that drain into coastal waters, including Long Island Sound, the NYB, and Delaware Bay, from Chatham, MA to the Delaware-Maryland border on Fenwick Island. Within this range, Atlantic sturgeon have been documented from the Hudson and Delaware Rivers, at the mouth of the Connecticut and Taunton Rivers, and throughout Long Island Sound, (ASSRT 2007, as cited by USACE-NAP 2011).

There is little information on the behavior of the sturgeon in marine waters (Bain 1997). More recently, attention is being focused on understanding how oceanic habitat is used by migrant Atlantic sturgeon (Dunton et al. 2010, Erickson et al. 2011). By examining five fishery-independent surveys of Atlantic sturgeon, Dunton et al. (2010) determined potential coastal migration pathways for northerly summer and southerly winter migrations. Although Atlantic sturgeon are highly migratory, primary juvenile habitat and migrations are limited to narrow corridors in waters less than 20 m deep (Dunton et al., 2010). A hotspot of juvenile Atlantic sturgeon captures was found in waters less than 20 m along the eastern side of Sandy Hook, NJ and off of Rockaway, NY. The authors suggest that depth restricts movements, aggregations are related to food availability, and movement is triggered by temperature cues.

The Hudson River population of Atlantic sturgeon is one of two U.S. populations for which there is an abundance estimate (approximately 870 spawning adults/year, 600 males and 270 females; Kahnle et al. 2007) and it is considered one of the healthiest populations in the U.S. (ASSRT 2007). The Hudson River is the most significant spawning system within the NYB DPS (Erickson et al. 2011).

Adult females migrate to spawning grounds, which are deep, channel or off-channel habitats within the Hudson River Estuary starting in mid-May (Dovel and Berggren 1983), spawn from May through July or possibly August, and return to marine habitat the following fall (Dovel and

Berggren 1983, Van Eenennaam et al. 1996). Mature males are present in the Hudson River from April to November (Dovel and Berggren 1983) and appear at spawning sites in association with females, suggesting they search for females while moving about in the river (Van Eenennaam et al. 1996).

3.2 Regional Distribution of Atlantic Sturgeon in Regard to the Project Area: New York District Atlantic Coast and Connecticut DEP Long Island Sound Surveys

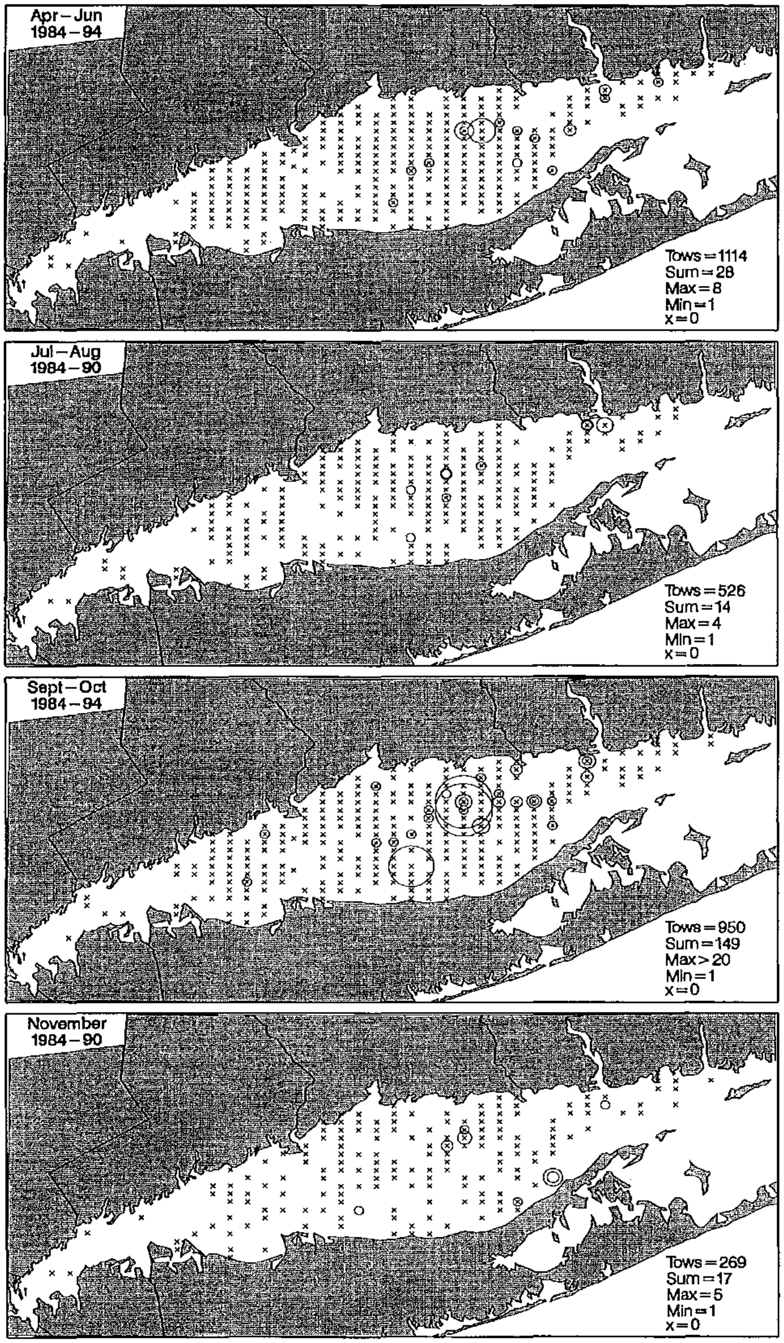
Atlantic sturgeon (*Acipenser oxyrinchus*) Atlantic sturgeon taken in the CTDEEP Survey ranged from 72 to 141 cm (Fig. LF-6), and were probably juveniles (size at 50% maturity = 200 cm; NMFS, 1995). Although Atlantic sturgeon were not often observed—percent occurrence ranged from 0% in April to 4.1% in October—they were taken in all months from May through November (Fig. IN-7D). Most Atlantic sturgeon were found in the eastern half of the Sound, especially from the mouth of the Connecticut River on sand bottom in depths less than 9 m to deeper sand and transitional areas in the Eastern Basin and Mattituck Sill, and further south into a 27+ m mud area in the Central Basin (Fig. DM-10). Sturgeon were also taken in an 18–27 m transitional bottom area near Mattituck. The largest sturgeon concentrations were observed in September (the three largest catches of 15, 46, and 47 sturgeon occurred in three consecutive years during the same week in September) in two areas: south of Guilford on transitional bottom in depths greater than 27 m, and in the 27+ m mud area in the Central Basin. Overall, the greatest number of sturgeon were taken on transitional bottom in depths greater than 27m (158 of the 208 sturgeon captured).

Although Atlantic Sturgeon have been shown to be present within Long Island Sound year round, they do not appear to remain in the Sound in relative abundance and this seems to be especially true for the western most areas of the Sound as can be seen from the CTDEEP capture data where there are 3-4 stations within the proximity of the potential borrow area but no sturgeon were captured over the 10 year span of the survey. Additionally no sturgeon were ever captured during the survey at any of the stations in the westernmost portion of the survey grid including those stations closest to the estuary. As the project site is relatively close to the Sound’s connection to the Hudson estuary this may indicate that there is not a large movement to or from the estuary via this route. If this pathway is commonly used, even seasonally, the lack of captures may signify that these fish quickly by-pass this area as they move east.

3.3 Sturgeon Feeding Habits

Overall, sturgeon appear to feed indiscriminately throughout their lives (Bigelow and Schroeder 1953, Vladykov and Greeley 1963, Murawski and Pacheco 1977, van den Avyle 1984, as cited by Gilbert 1989) and are generally characterized as bottom feeding carnivores (Bain 1997). Adult Atlantic sturgeon feed on polychaetes, oligochaetes, amphipods, isopods, mollusks, shrimp, gastropods, and fish (Johnson et al. 1997, Haley 1998, Bigelow and Schroeder 1953, Vladykov and Greeley 1963, Smith 1985b, as cited in Gilbert 1989).

Figure 5
Atlantic sturgeon seasonal distribution LIS 1984-1994.



Circles indicate captures, largest circles shown represent > 20 sturgeon per tow.
208 sturgeon taken in 2,859 tows

4.0 GENERAL FACTORS THAT MAY AFFECT ATLANTIC STURGEON

As described in Section 3.1, five Distinct Populations Segments (DPS) of Atlantic sturgeon were listed as threatened or endangered under the Endangered Species Act, including a NYB DPS. Known spawning populations for the NYB DPS exist in two rivers: the Hudson and Delaware Rivers. However, since the marine range for all DPSs extends from Canada to Florida, this assessment is applicable to all DPSs. In the Hudson River estuary, spawning, rearing, and overwintering habitats were reported to be intact by Bain (1997), supporting the largest remaining Atlantic sturgeon stock in the U.S., however, a population decline from overfishing has also been observed for this area (Bain 1997, Bain 2001, Peterson et al. 2000). ***This section describes the general factors that may affect Atlantic sturgeon, many of which are not relevant to the project assessed in this BA. However, this section is included to demonstrate the variety of threats to Atlantic sturgeon.***

Like all anadromous fish, Atlantic sturgeon are vulnerable to various impacts because of their wide-ranging use of rivers, estuaries, bays, and the ocean throughout the phases of their life. General factors that may affect Atlantic sturgeon include: dam construction and operation; dredging and disposal; and water quality modifications such as changes in levels of dissolved oxygen (DO), water temperature and contaminants (ASSRT, 2007, as cited by USACE-NAP 2011). Atlantic sturgeon also exhibit life history characteristics that make them particularly vulnerable to population collapse from overfishing (Boreman 1997, as cited by Bain 1997), including: "advanced age and large size at maturity, eggs that are numerous and small in relation to body size, and spawning that is episodic and seasonal" (Winemiller and Rose 1992, as cited by Bain 1997). Other threats to the species include vessel strikes.

Dredging in riverine, nearshore and offshore areas has the potential to impact aquatic ecosystems by removal/burial of benthic organisms, increased turbidity, alterations to the hydrodynamic regime and the loss of shallow water or riparian. Hydraulic dredges can directly impact sturgeon and other fish by entrainment in the dredge (ASSRT 2007, as cited by USACE-NAP 2011). Indirect impacts to sturgeon from either mechanical or hydraulic dredging include the potential disturbance and loss of benthic feeding areas, disruption of spawning migration, or potential detrimental physiological effects related to resuspension of sediments, most notably in spawning areas.

Atlantic sturgeon have been harvested for years. Many authors have cited commercial over-harvesting as the single greatest cause of the decline in abundance of Atlantic sturgeon (Ryder 1890, Vladykov and Greely 1963, Hoff 1980, ASMFC 1990, and Smith and Clugston 1997, as cited in ASSRT 2007 and USACE-NAP 2011). Even though the fishery has been closed coast-wide since 1995, poaching of Atlantic sturgeon continues and is a potentially significant threat to the species, but the magnitude of the impact is unknown (ASSRT 2007, as cited by USACE-NAP 2011).

Although little is known about natural predators of Atlantic sturgeon, there are several documented fish and mammal predators, striped bass, common carp, minnow, smallmouth bass, walleye, grey seal, and fallfish (ASSRT 2007). Atlantic sturgeon may compete with other bottom feeding species for food, although there is "no evidence of abnormally elevated interspecific competition" (ASSRT 2007), and it has been suggested by van den Avyle (1984, as cited by Gilbert 1989) that "non-selective feeding of juvenile and adult sturgeons may reduce the potential for competition with other fish species”.

5.0 POTENTIAL PROJECT IMPACTS TO ATLANTIC STURGEON

5.1 Potential Physical Injury and Behavioral Impacts at the Asharoken Offshore Borrow Area

Direct potential impacts linked to dredging at the AOBA include physical injury or mortality of adult or sub-adult Atlantic sturgeon due to drag head strikes, entrainment or vessel strikes. Other direct impacts may include avoidance behavior due to noise disturbance or impacts associated with increased turbidity from re-suspension of sediments. Re-suspension of sediments has the potential to cause respiratory impacts including gill abrasion. There would be no dredging related impacts to spawning activities since the closest known spawning site is in the Hudson River.

It is possible for Atlantic sturgeon to be entrained in a dredge by being sucked up along with the sand and other benthic materials. In order for this to happen a sturgeon would have to be overrun by the draghead or, be close enough to the drag head to be unable to escape the force of the suction. The second scenario may only occur if the drag head is lifted off the bottom while the pumps are on. The majority of the interactions have occurred via hopper dredge: sixteen takes with a Hopper dredge; five takes with a cutterhead dredge; and three takes with a mechanical dredge. Fifteen of the sturgeons were reported as mortalities, eight as alive, and one as unknown. These documented takes occurred during dredging operations in rivers and harbors, mainly in waterways along the eastern coast that, from the map in the report, appear to be more narrow than the wide pathways available to Atlantic sturgeon in large bodies of open water such as the Sound or the Atlantic Ocean. However, some degree of the risk still exists for Atlantic sturgeon to become entrained in a hopper at the AOBA.

Vessel strikes (prop or hull) to sturgeon are another (remote) possibility at the AOBA and the general in-water work area. Strikes could come from the dredge or other working craft. Vessel strikes to sturgeon at the borrow area are not expected as this species is highly demersal in nature rarely coming to depths that would allow it to come into contact with the bottom of a vessel or its propeller.

Noise from the dredge and related vessels has the potential to cause disturbance impact to Atlantic sturgeon near the project site. However, a noisy underwater environment does not seem to significantly impact spawning populations in the Hudson estuary where dredging activities have been ongoing for over 100 years (e.g., for shore protection, and deepening and maintenance of navigation channels), and constant large vessel ship traffic to and from the NY/NJ Harbor is part of the ambient conditions. Despite a noisy aquatic environment (even greater in the harbor), the Hudson River population of Atlantic sturgeon is considered one of the healthiest populations in the U.S. (ASSRT 2007). Therefore, it would appear that Atlantic sturgeon are still finding and utilizing pathways through the NYB, including the Lower Bay off the coast of Long Beach to reach spawning grounds in the Hudson River. This is likely because the waterways available for migration extending from the mouth of the Hudson River to the marine environment are sufficiently deep enough and wide enough to permit Atlantic sturgeon to avoid potential dredging-related disturbances, including active dredges and any associated noise, and that long-term impacts to their habitat and food source are not adversely affecting the population.

5.2 POTENTIAL HABITAT IMPACTS AT THE AOBA

The affects of dredging on Atlantic sturgeon habitat will include indirect impacts such as temporary loss of prey together with an associated change in depth whereas the potential for disturbance of water quality including localized turbidity would qualify as a direct impact to sturgeon. Potential water quality changes at the AOBA may include those previously discussed associated with increases in localized turbidity. Significant changes in turbidity due to dredging, such as sediment plumes, have only been observed with mechanical dredges working in areas that contain a majority of fine particles such as muds and clays. Hydraulic dredges removing coarse sands, as is the case for the Asharoken Beach project, have not been shown to create significant turbidity increases. Similarly, benthic disturbances that can lead to decreases in dissolved oxygen due to increases microbial respiration/metabolism are related to decay of re-suspended organic materials associated with fine sediments not course sands. Again, this not expected to occur at this beach nourishment site.

By definition, beach fill sediment must contain less than 10% fine particles (USACE-NYD 2011), therefore making the dredged sediment a majority of coarser material (sand). Also, hopper dredges draw in sand via suction while in contact with the sea floor, consequently there is very little re-suspended sediment or creation of turbidity related to the sediment removal process. An insignificant amount of very localized and temporary turbidity may be created by the mechanical action of the drag head running across the sand. However, re-suspension of sediment would not disperse to any degree. Any localized turbidity is not anticipated to impact Atlantic sturgeon since they are highly mobile and the areas in question are not restrictive in nature, providing much space within which to avoid a plume by moving away from the source. Even if Atlantic sturgeon movement is altered, it is unlikely that any temporary and localized suspended sediment would have a long term and adverse impact on Atlantic sturgeon migration to/from spawning grounds. Riverine spawning and nursery areas such as the Hudson estuary are known to maintain significantly higher ambient turbidity and Total Suspended Sediments loads, especially during spring, in comparison to western Long Island Sound. These conditions are common to sturgeon breeding areas and the localized increases in turbidity in the project area are not expected to significantly affect Atlantic sturgeon if any occur at or near the project site.

5.3 POTENTIAL IMPACTS TO FOOD RESOURCES AT THE AOBA

Atlantic sturgeon are primarily benthic feeders and changes in bottom habitat that alter the benthic faunal community could result in a subsequent temporary loss of, or change in, prey resources. Sturgeon generally feed when the water temperature is greater than 10ºC (Dadswell 1979, and Marchette and Smiley 1982, as cited by USACE-NAP 2011) and in general, feeding is heavy immediately after spawning in the spring and during the summer and fall, and lighter in the winter. Haley and Bain (1997, as cited in ASSRT 2007) retrieved primarily polychaetes and isopods from Atlantic sturgeon in the Hudson River. The AOBA represents a very small area compared with the surrounding area in which additional resources are available for feeding; therefore, adverse significant impacts are not anticipated.

From 2004 through 2005, the District conducted an investigation to characterize the infauna and epifauna resources at the AOBA. Results revealed a diversity of species including those types considered primary prey species for Atlantic sturgeon. Extensive studies of borrow areas on the Atlantic coast (NY and NJ) analyzed impacts of dredging on recovery times of the impacted habitat. The study concluded that in terms of abundance, diversity and biomass, the infauna resources are expected to recover and recolonize to pre-dredge condition in approximately 8 months, except for sand dollars biomass, which takes about 2 to 2.5 years to recover. As this program studied data from the Atlantic Ocean direct comparisons are not possible at this time. However, USACE anticipates that recover times will be similar, and data will be collected post construction to illuminate this data gap.

In general, the changes in the benthic community observed between pre- and post-dredging time periods is typical of benthic responses to disturbance in which larger, longer-lived species are initially replaced by smaller, opportunistic taxa prior to full recovery. These studies have also shown that borrow area habitats and the regions that surround them support abundant and diverse communities of typical sturgeon prey species. Because these habitats supporting sturgeon prey exist on a regional scale temporary impacts to localized portions of the AOBA over the duration of the projects describe would not significantly reduce the availability of prey resources of resident or migratory Atlantic sturgeon.

5.4. POTENTIAL HABITAT IMPACTS DURING SHORELINE CONSTRUCTION

There is a very low potential for Atlantic sturgeon to be affected by beach building activities or construction of groins. Each one of these construction actions will involve inwater use of equipment especially groin construction. Generally speaking these activities move at a slow pace and they occur in very shallow nearshore waters. It is highly unlikely that a sturgeon would not be able to avoid contact with the types of equipment used (bull dozer, front loader, crane) however the possibility does exist as well as the unlikely scenario of being struck by a stone being placed.

During placement of fill the near littoral and intertidal will experience increases in turbidity due to the slurry carrying winnowed sediments into the nearshore. Extensive monitoring of fill activities has shown that the zone of increased turbidiy is localize to a few hundred meters of the outfall pipe outflow. Any sturgeon experiencing a disturbance from such activity is expected to move off to undisturbed waters without any significant affects.

Results of the area wide and site intensive beach nourishment placement TSS monitoring (Sea Bright to Manasquan, N.J. USACE 1994-2000) yielded the following results with respect to temporal and spatial scales of sediment dispersal along ocean beaches. Placement operations resulted in short-term increases in turbidity/TSS conditions limited to a relatively localized area (less than 500 m) from the discharge point. Sediment dispersal was strongly influenced by prevailing surf and turbulence conditions, as well as by long shore currents. Long shore currents in the vicinity of Sandy Hook run predominantly to the north. Dispersal of suspended sediments was prominent in the swash zone in the immediate vicinity of the discharge operations. Observed elevated concentrations decline rapidly with dispersal through the surf zone. Another mitigating factor is the relatively low fractions of silts and clays of the sediments excavated from the borrow areas, generally less than 10 percent by weight. Slightly elevated turbidities/TSS (from ambient) extended into the surf zone along a narrow swath of beach, and into the near shore bottom portion of the water column.

The maximum TSS values measured near the fill operations were not outside the range that organisms would be exposed to during periods of high wave energies. With the exception of swash zone samples, the magnitude of elevation above ambient TSS conditions appears to be negligible. Measured TSS concentrations outside the swash zone seldom exceeded 25 mg/l, which can be considered the low end of the range of ambient TSS concentrations that many marine/estuarine species of the northern New Jersey shore, including Atlantic sturgeon, experience in estuaries including the Hudson-Raritan estuary. Ranges of ambient TSS within the Hudson estuary range from 20 to 60 mg/L (USACE Kate and PJ etc). Atlantic sturgeon within the Hudson/Raritan estuary experience ambient TSS/turbidity conditions generally much greater than those measured during fill activities along the Atlantic coast of NJ, except for the within the surf/swash zone. It is expected that the mobile behavior of the sturgeon would serve to limit the duration of exposure to any exceptionally elevated levels of TSS/turbidity.

Monitoring of NJ beaches, including both re-nourished beaches and reference beaches during strong storms revealed elevated TSS levels that extended well past the near shore zone to an extent much greater than the dispersal distances measured during placement activities. During storms, elevated TSS levels were often an order of magnitude greater than levels measured during placement activities, and, unlike the much localized affects seen during fill operations, these higher concentrations occurred over *regional coastal areas*.

In summary, the spatial scales of elevated turbidity/TSS associated with beach fill operations are relatively small. Likewise, the increment of suspended sediment concentrations above ambient attributable to fill operations is relatively small once sediments have dispersed outside the swash zone. No adverse affects to dissolved oxygen were observed in the surf or near shore zones during TSS and water quality monitoring during fill activities. TSS samples collected during or immediately after storm events showed that even mildly strong storms or wind events produce much greater impacts related to TSS or turbidity increases relative to beach fill operations.

5.5 POTENTIAL IMPACTS TO FOOD RESOURCES DURING SHORELINE CONSTRUCTION

Loss of the benthic community is anticipated to occur within the foot print of the fill, which would include intertidal areas and the nearshore littoral immediately adjacent. However, the area's temporary loss of benthic organisms is mitigated by the fact that this is a small percentage of available, comparable shore line environment and, sturgeon are not known to frequent or forage in this extremely shallow and energetic ocean environment. Recovery of nearshore and intertidal areas is expected to be relatively rapid as these areas are high energy regimes constantly experiencing strong wave activity and sediment movement highly conducive to abundant recruitment.

6.0 OTHER SPECIES OF CONCERN

The remaining federally listed species that may occur in the project area consist of: the endangered Northwest Atlantic Ocean DPS of the loggerhead turtle (*Caretta caretta*); the endangered Kemp's ridley turtle (*Lepidochelys kempi*); the endangered green turtle (*Chelonia mydas*); the endangered leatherback turtle (*Dermochelys coriacea*); the endangered North Atlantic right whale (*Eubalaena glacialis*); the endangered humpback whale (*Megaptera novaeangliae*); and the endangered fin whale (*Balaenoptera physalus*).

NMFS issued a Biological Opinion (BO) to the District in 1995 to address the impacts of beach nourishment projects along the South Shore of Long Island and the Northern NJ Shore Sandy Hook to Manasquan) for sea turtles and whales. The biological information presented in the BA as it applies to these species, their life histories and the potential for impacts from the various aspects of the Asharoken project construction is still relevant, and application of this data for the analysis of project impacts within Long Island Sound is a valid premise.

6.1 SEA TURTLES

6.1.1 General Sea Turtle Information

In general, listed sea turtles are seasonally distributed in coastal US Atlantic waters, including Long Island Sound, migrating to and from habitats extending from Florida to New England, with overwintering concentrations in southern waters.

As water temperatures rise in the spring, some of these turtles begin to move northward and reside in relatively shallow inshore waters of the north east to take advantage of abundant forage. As temperatures begin to decline rapidly in the fall, turtles in the north east Atlantic begin to migrate back to southern waters. Sea turtles can be expected to be in the vicinity of the AOBA when the water temperature surpasses 15 C (60 F) which generally coincides with June 1. However, the window of residence for the 4 listed species is considered to be May1 through November 30. Southern migration begins when the water drops below 15 C. Turtles are migrating out of the NYB by the beginning of November. Future warming ocean trends may cause this window to be expanded.

Life history descriptions for each of the 4 listed sea turtle species were described in the NYD 1995 BA and the 1999 Harbor Deepening BA and are incorporated here by reference. There have been no significant changes to the distribution, population size, and food availability requirements etc. of any of the species since that time. However, since the 1995 consultation, a change in the listing of loggerhead turtles has occurred, as described in Footnote 1 of Section 1.

6.1.2 Potential Dredging Impacts at the AOBA

Direct entrainment of sea turtles during hopper dredging at the AOBA is a possibility during the season in which they are present in NY waters (May through November). However, the likelihood of a foraging or migrating turtle being impacted by a hopper dredge is remote due to the low abundance of turtles and the mandatory use of a turtle deflector attached to the draghead of the dredge. Only one take has been documented since monitoring procedures have been established in the NY District marine waters (1993). Since 1993 (Table 3), approximately 23.45 million CY of material has been dredged from the navigation channels and borrow sites.

Loggerhead and Kemp's ridley turtles, which normally spend much time at or near the bottom feeding on benthic invertebrates, may be most vulnerable to contact with a draghead as their presence in the Sound is has be correlated to the Sound's abundance of benthic forage. Green turtles, which are the least common turtles in the north east, forage on submerged aquatic vegetation (SAV), especially sea grasses which do not occur within the project site. Other forms of SAV are very sparse. Generally speaking successful foraging by green turtles is only likely to occur in very shallow areas of the Sound where light reaches the bottom and can support photosynthesis. These conditions do not occur in the western but may increase as one moves to the eastern most areas of the Sound where light attenuation is reduced due to much better water quality resulting from direct Oceanic flushing. Leatherback turtles are fast swimming pelagic organisms and the least likely to be found in near shore coastal waters, especially in the Sound. As these species primarily feed on jellyfish in the water column they are also the sea turtle species least likely to spend most of its foraging time at the bottom.

Together with entrainment by the dredge, sea turtles can also be susceptible to vessel and/or prop strikes. In fact, most documented injuries to sea turtles in this region are attributed to the abundance of fast moving recreational boats that have struck turtles which have come to the surface to breath or rest. This type of impact to sea turtles would be unlikely due to the relatively slow speed of the vessels concerned in conjunction with the observers which will be on board as lookouts when the dredges are moving during the turtle "window". The magnitude of risk to any of the populations of loggerhead, leatherback, green, and Kemp's ridley sea turtles is very small and it is unlikely to jeopardize the continued existence of the populations of sea turtles that seasonally inhabit NY coastal waters. Best management practices under the guidance of NMFS including lookout duties and examination of inflow screening would be implemented to assure minimization of direct risk as well as direct observation of any takes to sea turtles during construction of these projects.

Dredging sand from the AOBA would temporarily remove all non-mobile benthic fauna and many of the slower mover invertebrates within the dredging footprint. Swimming crabs such as the blue claw *Callinectes sapidus* and possibly the lady crab *Ovalipes occletus* are capable of avoiding the draghead. Slower moving crabs including spider crabs, hermit crabs and rock crabs may be entrained or crushed. Bivalves, other infauna and non mobile epi-fauna would be lost. Crabs, both swimming and walking and many bivalve species are important proponents of the diets of the loggerhead and Kemp's ridley turtles. These young turtles are known to have migrated into the sound to utilize this northern estuary as a productive foraging habitat. Finding prey during or after project construction would only be a matter of foraging elsewhere outside the project area. The AOBA makes up a very small portion of the overall habitat available for foraging. General benthic studies have shown that the abundance and diversity of turtle prey items (crabs and mollusks) which can be found throughout AOBA.

6.1.3 Potential Impacts during Beach Fill and Groin Construction Activity

In the event that a loggerhead or Kemp's ridley sea turtle would forage close to shore during placement of sand, there is little probability that direct contact impacts would arise from construction methods including equipment utilized for placement, and/or the potential from burial with sand during placement. Reasons for this are similar to those predicted for sturgeon, including extreme shallowness and relatively slow movement of equipment. Studies in the north east have shown that turtles spend almost all of their time in waters greater than 15' which would put them well out of harm's way at the Asharoken project site. Generally speaking a healthy turtle (in the northeast where nesting does not take place) would not be in the surf zone, which is the only area where it might come in contact with placement machinery or the filling process. It is possible that a sea turtle may encounter a zone of increased turbidity along the shore during placement, especially if surf conditions were rough. Direct impacts form increased turbidity (or noise) may cause turtles to move away from the turbidity or noise source but this disturbance behavior would be considered an insignificant impact. Because sea turtles are not expected to forage in the shallow waters where fill sand will bury the intertidal and nearshore littoral benthos, would not be considered a significant loss of foraging habitat.

In regard to potential impacts to sea turtles form groin construction as was true for sturgeon construction methods, depth of water, sea turtle mobility and behavior leads to similar expectations that no significant impacts either direct or indirect will occur. Turtles are not likely to be found in these shallow areas but in the unlikely case that they are, they would be able to avoid any direct impacts under almost any circumstance accept in the highly unlikely scenario that a turtle was struck by a stone being placed. Even this is not very probably because the rock is not dropped, but placed very carefully.

6.2 Whales

6.2.1 Potential Impacts to Whales in the Project Area

As described in the 1995 NY and NJ beach nourishment BO and 2012 HDP BO, several species of whales may occur in the NYB:

- Right whales in the NYB are primarily transiting the area on their way to more northerly feeding and concentration areas. During late winter and early spring, they begin moving north along the coast past Cape Hatteras and near the Long Island Coast. Individuals have been sighted along the south shore of Long Island, Block Island Sound, Gardiners Bay and south shore inlets and bays. They are most likely to occur around the project areas from November 1 – April 30.
- Humpback whale presence in the northwestern Atlantic is variable and probably a response to the changing distribution of preferred food sources. For the most part, humpbacks are in transit through the NY area from June through September on their northward migration to summering areas in the Gulf of Maine.
- Finback whales occupy both deep and shallow waters and are probably the most abundant large cetacean in NY waters. They are most abundant in spring and summer, but do have some presence during the winter months.

Where whales and dredging co-exist the greatest potential for impacts relates to collisions during movement during transit of hopper or cutter head dredging or movement of associated support vessels. When working both types of dredges move at extremely slow speeds and it is highly unlikely that a collision would occur under that scenario. Whales may also be affected, disturbed or possibly attracted to noise produced dredges.

Large whales are generally not encountered in Long Island Sound proper, and to find one in western Long Island Sound would be considered and extremely rare event. Since these species are not expected to occur anywhere near the project site, impacts to endangered whales from project construction is not expected to be an issue, and no further dialogue of this matter will be discussed in this BA.

7.0 CUMULATIVE EFFECTS

Because the potential for large whales in the vicinity of the project site is almost non-existent, no cumulative impacts related to those species were incorporated into this BA. However, cumulative sources of human-induced mortality, injury, and/or harassment of Atlantic sturgeon and sea turtles' resulting from State, local, or private actions area (recent, present and future) in the general area of the project site are discussed below.

In general, ongoing and future activities that may affect both sea turtles and Atlantic sturgeon include incidental takes in state-regulated commercial and recreational fishing, pollution, dredging and vessel collision. Turtles much less likely to be affected by recreational fishery activities than sturgeon.

By-catch from salt water commercial fisheries is considered one of the most significant causes of death and serious injury for sea turtles. However this related southern waters and generally correlated to shrimp fisheries. Mortalities related to this industry has been greatly decreased with use of Turtle Excluder Devices (TEDS). Bottom trawl fishing gear in or near project waters is not known to be a significant source of turtle impact, because of the relative low abundance of sea turtles low level of fishing activity. What risk there is expected to be greater for sturgeon due to the likelihood of a greater abundance in the Sound. Other commercial fishing methods such as traps/pot gear, pound nets, and fykes, have been known to capture/entangle turtles in shallow inshore waters that may include WLIS. In general, Atlantic sturgeon are much more likely to be affected by all types of fishing gear.

Impacts via vessel strikes will remain a potential source of impacts to sea turtles and Atlantic sturgeon. Within the project site vicinity, sturgeon are likely to be more abundant (year round) than sea turtles even during the turtle window of residence. However, sturgeon are less likely to be struck by vessels due to their mostly demersal nature. In contrast, recreational boat (prop) strikes are thought to be the most common significant impact within the entire NY Bight region.

Human activities and related sources of contamination in the action area include atmospheric loading of pollutants, stormwater runoff coastal development, groundwater discharges, surface runoff, residential hazardous materials and pollutants from recreational and commercial vessels that which affects surface runoff in the action area as well atmospheric, infrastructure and vessel pollution inputs are expected to continue in the future, however, the level of impacts to sea turtles and sturgeon cannot be projected.

The only project that has occurred in the past and is expected to reoccur on a regular basis is the maintenance dredging of the Northport power plant channel. This dredging is not done with a hopper dredge therefore significant direct impacts to sea turtles or sturgeon are not expected to occur. Indirect impacts for localized resuspended sediments or noise could be a cause of disturbance and the anticipated result would be that the turtle or sturgeon would simply be displaced to another area.

8.0 DISCUSSION/CONCLUSION

From reviewing the best available information on the life history and behavior of the threatened and endangered species that may be present in and around the proposed project area, the following species may be affected:

- Atlantic sturgeon: may be present in the vicinity of the project area in three major capacities: as adults primarily while migrating between spawning grounds in the Hudson River and oceanic environments; migrating throughout their marine range as adults of any DPS; and as juveniles in waters less than 20 m.
- Sea Turtles: due to the feeding behavior of green and leatherback turtles, it is unlikely that either species would be encountered during construction of the proposed project. However, foraging loggerhead and Kemp's Ridley turtles may be present within the project area during May through November.

8.1 Atlantic Sturgeon

Based on the information contained in this BA, several direct and indirect impacts to the Atlantic sturgeon from the proposed beach nourishment project were identified. However, as summarized below, the threats are not likely to jeopardize the continued existence and recovery of the species.

As the dredge entrains sand at AOBA it could encounter a sturgeon. It is anticipated that the combination of the slow moving drag head and the use of the turtle/sturgeon deflector will significantly decrease the potential for contact injuries or entrainment. Other factors that will decrease the likelihood of dredge related impacts to Atlantic sturgeon are the environmental specifications which require all draghead components to be sealed with openings no bigger than 4", pumps only be turned when the draghead is in firm contact with the bottom and pumps will be turned off before the draghead is raised off the bottom. And finally, weekly tests will be performed to ensure the draghead is operating in the proper orientation in relations to the benthic surface. Therefore, it is unlikely that injury or entrainment would occur.

A temporary and short-term loss and/or shift in the benthic communities within a localized area of AOBA and at the sand placement site the project area would occur. Given the nature of the impact, the availability of resources surrounding the area of impact and that Atlantic sturgeon are mobile indiscriminate feeders, the impact of dredging on benthic resources is unlikely to have an adverse impact on the species.

Impacts to water quality from dredging activities at the AOBA and at the sand placement site are not anticipated to impact Atlantic sturgeon. Re-suspension of sediment (e.g., sand) would not disperse to any degree. Any localized turbidity that might be encountered by a sturgeon in the offshore borrow area could be avoided since they are highly mobile and capable of avoiding the tiny amount of re-suspended sediment that might form from dredging coarse sand. Impacts at the near shore placement sites are unlikely as sturgeon do not typically utilize the intertidal and very shallow nearshore waters.

Direct impacts to Atlantic sturgeon during construction of groins is unlikely since they do not normally frequent such a shallow and high energy zone, equipment is largely confined to upland or intertidal portions of the placement site, and most equipment is stationary or would operate at slow speeds (see Section 2.1) including the setting of stone It is anticipated that Atlantic sturgeon would avoid any equipment, structures, or sand that is being moved to make any contact unlikely.

Additionally, USACE has been required to use NMFS-approved sea turtle observers to monitor for sea turtle take onboard hopper dredges. Since UXO screens would not be required for this project, observers would be an effective method for monitoring take of both sea turtles and Atlantic sturgeon.

In regard to Atlantic sturgeon the proposed actions may affect, but are not likely to adversely affect or jeopardize the continued existence of any population of this species.

****Special Note: Shortnose Sturgeon ****

Shortnose sturgeon (Acipenser brevirostrum), another federally listed sturgeon species, occur in rivers and estuaries along the East Coast of the U.S. and Canada including the Hudson and Connecticut river systems. In general, they have not been included in N.Y. District coastal BAs because of their well documented riverine/upper estuary life history. However, some recent data has come to light that indicates that shortnose sturgeon occasionally move between river systems.

There are 19 documented populations of shortnose sturgeon ranging from the St. Johns River, Florida (possibly extirpated from this system) to the Saint John River in New Brunswick, Canada. Shortnose sturgeon are a large, long lived, benthic fish species that mainly occupy the deep channel sections of large rivers, but will forage where food is accessible. They feed on a variety of benthic and epibenthic invertebrates including mollusks, crustaceans (e.g., amphipods, isopods), and oligochaete worms in soft-sediment habitat (Dadswell 1979 in NMFS 1998).

In some areas, including the Gulf of Maine, nearshore coastal migrations and movements between river systems have been documented. For example, approximately 70% of shortnose sturgeon tagged in the Penobscot River made regular seasonal movements out of the river, with some fish spending up to a year outside of the river (Zydlewski et al. 2011).

Only a few of these types of nearshore coastal movements have been documented in the New York Bight. Three shortnose sturgeon adults tagged in the Hudson River have been recaptured in the Connecticut River and one Hudson River origin shortnose sturgeon was captured in both the Connecticut and Housatonic rivers (Savoy 2004 in SSSRT 2010). In fall 2014, a shortnose sturgeon was caught in the Merrimack River (MA) carrying a tag implanted in the Connecticut River in 2001 (pers. comm. Savoy, 2014). Genetic information is not yet available so we do not know the river of origin of this fish. At this time, the available tagging and tracking information is too limited to determine if Hudson River and Connecticut River shortnose sturgeon are making regular movements outside of their natal rivers. The documented movements of very few Hudson River fish outside of the river since the mid-1990s is thought to be a reflection of the rarity of these types of movements. However, the documented occurrence of Hudson River shortnose sturgeon in the Connecticut River, the capture of a shortnose sturgeon in the Housatonic River, and the movement of a shortnose sturgeon from the Connecticut River to the Merrimack River, indicate that occasional shortnose sturgeon may be present in nearshore coastal waters and rivers between the Hudson and Connecticut rivers.

No shortnose sturgeon have been captured or detected on telemetry arrays along the south coast of Long Island. Based on known movement patterns, shortnose sturgeon move between the Hudson River and the Connecticut River by traveling through the East River and in the nearshore coastal waters of northern Long Island Sound with occasional movements into small coastal rivers and estuaries. The range of shortnose sturgeon in this area is expected to include nearshore waters, accessible estuaries, and small rivers on the northern coast of Long Island Sound between the East River and the Connecticut River. No significant direct or indirect impacts to shortnose sturgeon are anticipated from the implementation of the Asharoken project which is situated along the southern shore of Long Island Sound, isolated from any river system.

8.2 Sea Turtles

Based on the information contained in this BA, direct and indirect impacts to the leatherback and green turtles from the proposed beach nourishment project is unlikely. The more pelagic offshore nature and water column feeding habits of the leatherback and the lack of vegetative forage at the project site required by green turtles all but remove these two species from the vicinity of the project site. Also, disruption of the existing benthic habitat would not affect the foraging of these two species as it does not provide them with a significant food source (insignificant indirect impact). Thus, the proposed actions are not likely to jeopardize the continued existence of these sea turtle populations.

Direct and indirect impacts to Kemp's ridley and the Northwest Atlantic DPS of loggerhead sea turtles during dredging at AOBA are possible, but limited to a very low risk of entrainment by hopper dredge or collision with a support vessel. The potential for indirect impacts also exist via a temporary loss and/or shift in benthic community abundance, diversity, or habitat within the dredging footprint; however, these impacts are offset by the abundance of prey in the surrounding areas and relatively quick re-colonization times.

Based on the many years of documented sea turtle observer data (1993-2013), there was only one observed loggerhead turtle take out of approximately 23.45 million CY of dredged material in NY, NJ and New England. The overwhelming majority of turtle takes has been in the Gulf (208 takes) and South Atlantic Regions (481 takes) where sea turtles exist in much higher abundance than in the northeast (May through November). Turtles in southern waters may cluster in channels to over winter, or gather nearshore during nesting season. These behaviors do not occur in NYD marine waters Based on this information, observed take appears to be a rare occurrence within the District and should be an indication that sea turtle occurrence is rare in the District project areas.

Impacts from direct contact with equipment utilized for placement at the project area, construction/modification of groins, and/or potential burial or displacement related to deposition of sand is unlikely since turtles have the ability to avoid these project elements and are unlikely to be in very shallow water where much of the construction activity would occur. Consequently, significant adverse impacts are not anticipated.

The District acknowledges that even though the probability of negatively impacting a sea turtle is rare, the possibility still exists and some level of protection is warranted. Regulations require that turtle deflectors be used, explicit dredge operation protocols be implemented and sea turtle observers be on board to watch for turtles at the surface and inspect the inflow baskets after every load. The proposed actions may affect but are not likely to adversely affect or jeopardize the continued existence of Kemp's ridley and Northwest Atlantic Ocean distinct population segment of loggerhead sea turtles.

REFERENCES

Assistant Secretary of the Army for Civil Works. 2013. Second interim report: Disaster Relief Appropriations Act.

Atlantic States Marine Fisheries Commission (ASMFC). 1990. Interstate fishery 116 management plan for Atlantic sturgeon. Fisheries Management Report No. 17. Atlantic States Marine Fisheries Commission, Washington, D.C. 73 pp.

Atlantic Sturgeon Status Review Team (ASSRT). 2007. Status review of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Report to National Marine Fisheries Service, Northeast Regional Office. 174 pp.

Bain, M.B. 1997. Atlantic and shortnose sturgeons of the Hudson River: common and divergent life history attributes. Environmental Biology of Fishes 48:347-358.

Bain, M. B. 2001. Sturgeon of the Hudson River ecology of juveniles. Final Report for The Hudson River Foundation , 40 West 20th St., 9th Floor, New York, NY 10011. 10pp.

Bigelow, H. B., and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. U.S. Fish Wildl. Serv. Fish. Bull. 74. 557 pp.

Boreman, J. 1997. Sensitivity of North American sturgeons and paddlefish to fishing mortality. Env. Biol. Fish. 48.

Brown, J.J., J. Perillo, T.J. Kwak, and R.J. Horwitz. 2005. Implications of *Plyodictis olivaris* (Flathead Catfish) introduction into the Delaware and Susquehanna drainages. Northeastern Naturalist. 12: 473-484.

Brown, J. and G.W. Murphy, 2010. Atlantic sturgeon vessel-strike mortalities in the Delaware Estuary. Fisheries. Vol. 35, no. 2. 83 p.

Dadswell, M.J. 1979. Biology and population characteristics of the shortnose sturgeon, *Acipenser brevirostrum* LeSueur, 1818 *(Osteichthyes: Acipenseridae),* in the Saint John River estuary, New Brunswick, Canada. Canadian Journal of Zoology 57:2186-2210.

Dickerson, D. 2006. Observed takes of sturgeon and turtles from dredging operations along the Atlantic Coast. Supplemental data provided by U.S. Army Engineer R&D Center Environmental Laboratory, Vicksburg, Mississippi.

Dovel, W.L. and T.J. Berggren. 1983. Atlantic sturgeon of the Hudson estuary, *New Y*ork. New York Fish and Game Journal 30(2):140-172.

Dovel, W.L., A.W. Pekovitch, and T.J. Berggren. 1992. Biology of the shortnose sturgeon

(*Acipenser brevirostrum* Leseur, 1818) in the Hudson River estuary, New York. Pp 187-216. In: C.L. Smith (ed) Estuarine Research in the 1980s, State Univ. New York Press, Albany.

Dunton, K. J., A. Jordaan, K. A. McKown, D. O. Conover, and M. G. Frisk. 2010. Abundance and distribution of Atlantic sturgeon (*Acipenser oyxrinchus*) within the Northwest Atlantic Ocean, determined from five fishery-independent surveys. Fishery Bulletin 108:450-465.

Erickson, D. L., A. Kahnle, M. J. Millard, E. A. Mora, M. Bryja, A. Higgs, J. Mohler, M. DuFour, G. Kenney, J. Sweka, and E. K. Pikitch. 2011. Use of pop-up satellite archival tags to identify oceanic-migratory patterns for adult Atlantic Sturgeon, *Acipenser oxyrinchus oxyrinchus* Mitchell, 1815. Journal of Applied Ichthyology 27:356-365.

Gadomski, D.M. and M.J. Parsley. 2005. Laboratory studies on the vulnerability of young white sturgeon to predation. North American Journal of Fisheries Management. 25: 667-674.

Gilbert, C.R. 1989. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Mid-Atlantic Bight)--Atlantic and shortnose sturgeons. U.S. Fish and Wildl. Serv. Biol. Rep. 82(11.122). U.S. Army Corps of Engineers, TR EL-82-4. 28 pp.

Haley, N., and M. Bain. 1997. Habitat and food partitioning between two co-occurring sturgeons in the Hudson River estuary. Paper presentation at the Estuarine Research Federation Meeting, Providence, Rhode Island, October 14, 1997.

Haley, N. 1998. A gastric lavage technique for characterizing diets of sturgeons. North American Journal of Fisheries Management 18:978-981.

Hoff, J. G. 1980. Review of the present status of the stocks of the Atlantic sturgeon *Acipenser oxyrhynchus,* Mitchill. Prepared for the National Marine Fisheries Service, Northeast Region, Gloucester, Massachusetts.

Johnson, J.H., D.S. Dropkin, B.E. Warkentine, J.W. Rachlin, and W.D. Andrews. 1997. Food habits of Atlantic sturgeon off the central New Jersey coast. Transactions of the American Fisheries Society 126:166-170.

Kahnle, A. W., K.A. Hattala, K.A. McKown. 2007. Status of Atlantic Sturgeon of the Hudson River estuary, New York, USA. Pages 347-363 in J. Munro, D. Hatin, J.E. Hightower, K.A. McKown, K.J. Sulak, A.W. Kahnle, and F. Caron, editors. Anadromous sturgeons: habitats, threats and management. American Fisheries Society, Symposium 56, Bethesda, Maryland.

Marchette, D.E. and R. Smiley. 1982. Biology and life history of incidentally captured shortnose sturgeon, *Acipenser brevirostrum*, in South Carolina. South Carolina Wild. Mar. Res. Inst. 57 pp.

Murawski, S. A. and A. L. Pacheco. 1977. Biological and fisheries data on Atlantic Sturgeon, *Acipenser oxyrhynchus* (Mitchill). National Marine Fisheries Service Technical Series Report 10: 1-69.

National Marine Fisheries Service (NMFS). 1993. Letter regarding special concern species, dated June 1993 from Richard Roe, Regional Director of NMFS to Bruce Bergmann, Chief of Planning Division, USACE, New York District.

National Marine Fisheries Service (NMFS). 1995. Biological opinion for beach nourishment projects – South Shore of Long Island and Northern New Jersey Shore, Sandy Hook to Manasquan. Sea Turtles and Whales.

National Marine Fisheries Service (NMFS). 2000. Biological opinion on the effects of the Army Corps of Engineers' (ACOE) proposed New York and New Jersey Harbor navigation project on threatened and endangered species. Sea turtles (F/NER/2000/00596).

National Marine Fisheries Service (NMFS). 2010. Species of Concern, Atlantic Sturgeon, *Acipenser oxyrinchus oxyrinchus.* www.nmfs.noaa.gov/pr/pdfs/species/atlanticsturgeon_detailed.pdf.

National Marine Fisheries Service (NMFS). 2012A. Biological opinion on the effects of the US Army Corps of Engineers' continued operation of the New York and New Jersey Harbor Deepening Project on Threatened and Endangered Species. Atlantic Sturgeon, Sea Turtles and Whales. (F/NER/2012/02358).

National Marine Fisheries Service (NMFS). 2012B. Incidental harassment authorization for ocean renewable power company Maine, LLC in Cobscook Bay.

Peterson, D. L., M. B. Bain, and N. Haley. 2000. Evidence of declining recruitment of Atlantic sturgeon in the Hudson River. North American Journal of Fisheries Management 20: 231-238.

Ray, G.L. 2010. A comparison of infaunal assemblages and their utilization by higher trophic levels at the Sea Bright and Belmar borrow areas (New Jersey).

Ryder, J.A. 1890. The sturgeon and sturgeon industries of the eastern coast of the United States, with an account of experiments bearing upon sturgeon culture. Bulletin of the U.S. Fish Commission (1888)8:231-328.

Smith, T.I.J. 1985. The fishery, biology, and management of Atlantic sturgeon, *Acipenser oxyrhynchus*, in North America. Environmental Biology of Fishers 14(1):61-72.

Smith, T.I.J., and J.P. Clugston. 1997. Status and management of Atlantic sturgeon, *Acipenser oxyrinchus*, in North America. Environmental Biology of Fishes 48:335-346.

U.S. Army Corps of Engineers (USACE), Waterways Experiment Station (WES). 1996. Pilot study to characterize ordnance contamination within the Sea Bright, New Jersey, Sand Borrow Site.

U.S. Army Corps of Engineers (USACE), New York District (NYD). 1995. NY District Biological Assessment for Marine Turtles and Whales in Atlantic Coastal Waters of New York and New Jersey.

U.S. Army Corps of Engineers (USACE), Engineer Research and Development Center (ERDC), Coastal and Hydraulics Laboratory. 2007. Shore protection assessment: How beach nourishment projects work.

United States Army Corps of Engineers (USACE), New York District (NYD). 1998. Final Feasibility Report and Environmental Impact Statement, Atlantic Coast of Long Island, New York: Jones Inlet to East Rockaway Inlet, Long Beach Island, New York. USACE, New York District, North Atlantic Division, March 1998.

U.S. Army Corps of Engineers (USACE), New York District (NYD). 1999a. Interim report for the Army Corps of Engineers Biological Monitoring Program: Atlantic Coast of New Jersey, Asbury Park to Manasquan Inlet Section Beach Erosion Project.

U.S. Army Corps of Engineers (USACE), New York District (NYD). 1999b. Draft Biological Assessment for sea turtles New York and New Jersey Harbor Complex.

U.S. Army Corps of Engineers (USACE), New York District. 2000. Raritan Bay and Sandy Hook Bay, New Jersey Feasibility Report for Hurricane and Storm Damage Reduction Port Monmouth, NJ: Final Feasibility Report and Environmental Impact Statement.

U.S. Army Corps of Engineers (USACE), New York District (NYD). 2001A. Renourishment and offshore borrowing in the Raritan Bay Ecosystem: A Biological Assessment for Sea Turtles.

U.S. Army Corps of Engineers (USACE), New York District (NYD). 2001B. The New York District's Biological Monitoring Program for the Atlantic Coast of New Jersey, Asbury Park to Manasquan Section Beach Erosion Control Project.

U.S. Army Corps of Engineers (USACE), New York District (NYD) and the New Jersey Department of Environmental Protection (NJDEP). 2003. Union Beach, NJ: Final Feasibility Report and Final Environmental Impact Statement.

United States Army Corps of Engineers (USACE), New York District (NYD). 2004. Draft Limited Re-evaluation Report, Long Beach Island, New York, Storm Damage Reduction Project. USACE, New York District, North Atlantic Division, July 2004.

U.S. Army Corps of Engineers (USACE), New York District (NYD). 2006. Y-Long Branch beach renourishment project market survey. Solicitation number W912DS-06-SSAPL-174-01. Accessed on the World Wide Web on 072413. https://www.fbo.gov/index?s=opportunity&mode=form&id=93d8f176ab6a15bc16cbd02fdb170e47&tab=core&_cview=1.

U.S. Army Corps of Engineers (USACE), New York District (NYD). Draft Report September 2007. New York/New Jersey Harbor Deepening Project 2006 migratory finfish report.

U.S. Army Corps of Engineers (USACE), New York District (NYD). 2011. Supplemental letter of coordination to Ms. Mary Colligan, NMFS, regarding the current beach re-nourishment

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
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NOV 18 2015

Peter Weppler
Chief, Environmental Analysis Branch
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New York District, Corps of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0090

Dear Mr. Weppler,

We have completed our consultation under section 7 of the Endangered Species Act (ESA) in response to a letter received October 13, 2015, regarding the Beach Erosion Control and Storm Damage Reduction Project, Asharoken, New York, North Shore of Long Island. We concur with your determination that the proposed project may affect, but is not likely to adversely affect, any species listed by us as threatened or endangered under the ESA of 1973, as amended. Our supporting analysis is provided below.

Proposed Project

The U. S. Army Corps of Engineers (ACOE) is proposing to provide long-term storm damage protection for Asharoken Beach, located in the Village of Asharoken, Town of Huntington, Suffolk County, NY. Asharoken Beach is located along the north shore of Long Island, from Eaton's Neck Point to the northwest and Long Island Lighting Company Northport Power Station to the southeast. The proposed project will consist of the renourishment of approximately 2.4 miles of beach along Long Island Sound shoreline. The project will involve the use of a hopper dredge and a cutterhead dredge. The proposed project will extract sand from the Asharoken Offshore Borrow Area (AOBA), which is located approximately 1.5 miles northwest of Asharoken Beach, NY, as the source of beach nourishment sediments. Approximately 600,000 cubic yards (cy) will be removed from the AOBA and deposited onto the beach via a pipeline connected to the dredge. The footprint of the AOBA to be impacted by dredging is approximately 55 acres, with an average of 10 feet of material being removed from the AOBA. The average depths in the AOBA are anticipated to increase from 35 feet to 45 feet. Additionally, 80,000 cy of sand will be trucked in from an upland site every five years, for 50 years, and placed on Asharoken Beach for renourishment.

Three stone groins will also be constructed along the shoreline of Asharoken Beach. Groin construction will begin with the equipment placed on land and then will move on top of the groin to continue building the structure seaward. If constructed from the water, a crane aboard a barge will be used. All activities of the proposed project could occur at any time of the year.

Common to all hopper dredging activities are:

- Speed of the hopper dredge while dredging at the borrow area will be 2.6 knots.
- All dredges will be equipped with turtle/sturgeon deflectors that have been properly installed in front of the draghead and will be used at all times.
- Starting immediately upon project commencement, all project vessels will have an on deck observer to monitor for Atlantic sturgeon, sea turtles, and whales. Monitoring requirements include checking for turtles or sturgeon (whole or parts) impinged on the draghead, in the hopper, and swimming/present at or near the surface. If the observer on board observes a whale in the vicinity of the vessel during transit throughout the project area, maximum vessel speeds will be limited to 10 knots. If a right whale is observed, the vessel will maintain a 500 yard buffer from the whale. For all other whale species, a 100 yard buffer will be maintained.
- The draghead will remain on the bottom at all times during a pumping action except when: the dredge is not in pumping operation, or, the pumps are completely shut off; the dredge is being re-oriented to the next dredge line during dredging activities; or the vessel's safety is at risk.
- Upon completion of the dredge track line, the drag tender will throttle back on the RPMs of the suction pump engine to idle speed prior to raising the draghead off the bottom so that no flow of material is coming through the pipe into the hopper. Prior to raising the draghead, no suction will remain in the draghead or the dragarm in order to prevent impingement during the dragarm lifting phase. Prior to actual lifting of the dragarm from the bottom, the draghead will be held firmly on the bottom for 10 to 15 seconds (with no suction) then lifted rapidly to midwater to further reduce the potential for an interaction with an ESA-listed species. The dredge will then be re-oriented quickly to the next dredge line and the draghead will be firmly repositioned on the bottom before bringing the suction pump up to pumping speed.

Description of the Action Area

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR§402.02). For this project, the action area includes the offshore borrow area, the vessel transit route within the borrow area, the area of the pipeline from the dredge to the beach nourishment sites, and the underwater areas where the effects of rock placement (i.e. construction of three groins), dredging and fill placement (i.e., increases in suspended sediment) will be experienced. Analyses of hydraulic cutterhead dredging indicate that the maximum distance of increased suspended sediment is likely to be a distance of 1,000 feet from the dredge (USACE 1983). We expect sediment plume concentrations from hopper dredging operations to return to background levels within approximately 2,400 feet of the dredge (USACE 1983). We anticipate elevated total suspended sediment (TSS) concentrations associated with the active beach nourishment site to be limited to a narrow area of the swash zone (defined as the area of the nearshore that is intermittently covered and uncovered by waves) up to 1,640 feet down current from the discharge pipe (Burlas *et al.* 2001).

Based on this information, the action area consists of the route traveled by the dredge vessel, dredge footprint, the area of where the pipeline will be, the marine footprint of the three groins, areas within a 2,400-foot radius from hopper dredging operations, areas within a 1,000-foot radius of cutterhead dredging operations, as well as the area 1,640 feet down current from the beach where sediments would be deposited. These areas are expected to encompass all of the direct and indirect effects of the proposed projects.

The sediments in the areas to be dredged consist of mostly sand and gravel (90% sand). Benthic resources at the borrow area is limited, but does include a diversity of species including those types considered primary prey species for sturgeon and sea turtles (crustaceans and mollusks). There are no sea grasses and only very sparse SAV at the borrow areas.

NMFS Listed Species in the Project Area

Whales

Federally endangered North Atlantic right, humpback, and fin whales, are seasonally present in the waters off New York. These species use the nearshore, coastal waters of the Atlantic Ocean as they migrate to and from calving and foraging grounds. Humpback and fin whales primarily occur in the waters of New York during the spring, summer and fall months, while the North Atlantic right whale primarily occurs in these waters from November 1 through April 30, although transient right whales can be present outside of this time frame. Although humpback, right, fin whales are not expected to occur in the portions of the action area located in the shallow nearshore waters of New York where sand will be placed, ESA listed species of whales may occur in the portion of the action area located in the AOBA (i.e., the Atlantic Ocean).

Sea Turtles

Four species of federally listed threatened or endangered sea turtles under our jurisdiction are found seasonally in New York waters: the threatened Northwest Atlantic Ocean distinct population segment (DPS) of loggerhead sea turtle (*Caretta caretta*), and the endangered Kemp's ridley (*Lepidochelys kempi*), green (*Chelonia mydas*) and leatherback (*Dermochelys coriacea*) sea turtles. In general, listed sea turtles are seasonally distributed in coastal U.S. Atlantic waters, migrating to and from habitats extending from Florida to New England, with overwintering concentrations in southern waters. As water temperatures rise in the spring, these turtles begin to migrate northward. As temperatures decline rapidly in the fall, turtles in northern waters begin their southward migration. Sea turtles are expected to be in New York waters in warmer months, typically in the months of May through November, with the highest concentration of sea turtles present in New York waters from June through October (Morreale 1999; Morreale 2003; Morreale and Standora 2005; Shoop and Kenney 1992).

Studies of sea turtles in the waters of Long Island, NY have shown that the species typically occur in waters with depths between 16 and 49 feet deep and in areas where the waters are slow-moving or still (e.g., less than 2 knots) (Ruben and Morreale 1999). This depth was not interpreted to be an upper physiological depth limit for turtles, but rather a natural limiting depth where light and food are most suitable for foraging turtles (Morreale and Standora 1998). Leatherback sea turtles feed almost exclusively on jellyfish in offshore marine environments, whereas green sea turtles tend to frequent seagrass beds. Loggerhead and Kemp's ridley sea turtles feed on mollusks and crustaceans in a variety of habitats. Much of the action area falls within 16-49 foot depth range. However, limited forage for sea turtles exists in the action area; therefore, we expect occasional sea turtles to travel through the action area between May and November opportunistically foraging during their migration or to reach areas with more abundant foraging opportunities.

Atlantic Sturgeon

There are five DPSs of Atlantic sturgeon listed as threatened or endangered. Atlantic sturgeon originating from the New York Bight, Chesapeake Bay, South Atlantic, and Carolina DPSs are listed as endangered, while the Gulf of Maine DPS is listed as threatened. The marine range of all five DPSs extends along the Atlantic coast from Canada to Cape Canaveral, Florida (Damon-Randall *et al.* 2013); however, it is likely that the majority of Atlantic sturgeon in the area would be from the New York Bight population.

Atlantic sturgeon spawn in freshwater portions of their natal river, and early life stages are not tolerant of salinity (ASSRT 2007); therefore, no eggs or larvae will occur in any part of the action area, and thus, will not be exposed to the direct and indirect effects of the proposed action. At around three years of age, subadults exceeding 70 centimeters in total length begin to migrate to marine waters (Bain *et al.* 2000). After emigration from the natal river/estuary, subadult and adult Atlantic sturgeon travel within the marine environment, typically in waters less than 164 feet in depth, using coastal bays, sounds, and ocean waters (ASSRT 2007). In rivers and estuaries, Atlantic sturgeon typically use the deepest waters available; however, Atlantic sturgeon also occur over shallow (8 feet), tidally influenced flats and mud, sand, and mixed cobble substrates (Savoy and Pacileo 2003). Occurrence in these shallow waters is thought to be tied to the presence of benthic resources for foraging.

Tagging and genetic data indicate that subadult and adult Atlantic sturgeon travel widely once they emigrate from rivers. Subadult Atlantic sturgeon wander among coastal and estuarine habitats, including Long Island Sound, undergoing rapid growth. These migratory subadults, as well as adult sturgeon, are normally captured in marine waters (32 - 164 feet) dominated by gravel and sand substrate (ASSRT 2010). Based on the above information, adult and subadult Atlantic sturgeon from any of the five DPSs could occur within the Long Island Sound. As young remain in their natal river/estuary until approximately age 2, and early life stages are not tolerant of saline waters, no eggs, larvae, or juvenile Atlantic sturgeon will occur within the waters of the Long Island Sound.

Based on the above information, adult and subadult Atlantic sturgeon from any of five DPSs may occur in the action area area; however, as Atlantic sturgeon spawn in freshwater portions of large rivers and early life stages are not tolerant of salinity, no eggs, larvae or juvenile Atlantic sturgeon occur in the action area. As limited forage for sturgeon exists in the action area, we expect occasional sturgeon to travel through the action area opportunistically foraging during their migration or to reach areas with more abundant foraging opportunities.

Shortnose Sturgeon

Shortnose sturgeon occur in rivers and estuaries along the East Coast of the U.S. and Canada (SSSRT 2010). There are 19 documented populations of shortnose sturgeon ranging from the St.

Johns River, Florida (possibly extirpated from this system) to the Saint John River in New Brunswick, Canada. Shortnose sturgeon also occur in the Hudson and Connecticut Rivers. In some areas, including the Gulf of Maine, nearshore coastal migrations and movements between river systems have been documented. For example, approximately 70% of shortnose sturgeon tagged in the Penobscot River made regular seasonal movements out of the river, with some fish spending up to a year outside of the river (Zydlewski *et al.* 2011). Movements of these fish have been limited to the Gulf of Maine with the furthest extent of movements documented between the Merrimack River (MA) and Penobscot River (ME).

Only a few of these types of nearshore coastal movements have been documented in the New York Bight. Three shortnose sturgeon adults tagged in the Hudson River have been recaptured in the Connecticut River and one Hudson River origin shortnose sturgeon was captured in both the Connecticut and Housatonic rivers (Savoy 2004 in SSSRT 2010). In fall 2014, a shortnose sturgeon was caught in the Merrimack River (MA) carrying a tag implanted in the Connecticut River in 2001 (pers. comm. Kieffer and Savoy, 2014). Genetic information is not yet available so we do not know the river of origin of this fish. At this time, the available tagging and tracking information is too limited to determine if Hudson River and Connecticut River shortnose sturgeon are making regular movements outside of their natal rivers. The documented movements of very few Hudson River fish outside of the river since the mid-1990s and the genetic differentiation between these populations is thought to be a reflection of the rarity of these types of movements. However, the documented occurrence of Hudson River shortnose sturgeon in the Connecticut River, the capture of a shortnose sturgeon in the Housatonic River, and the information related to other movements of shortnose sturgeon between river systems, indicate that occasional shortnose sturgeon may be present in nearshore coastal waters and rivers between the Hudson and Connecticut rivers.

The lack of captures of shortnose sturgeon in the Long Island Sound Trawl Survey, which largely operates in central Long Island Sound, and the lack of captures of shortnose sturgeon in any embayments along northern Long Island, suggests that the presence of shortnose sturgeon in Long Island Sound between the Hudson and Connecticut rivers is limited to the nearshore coastal waters of northern Long Island Sound with occasional movements into small coastal rivers and estuaries (e.g., Housatonic and Quinnipiac). Tracking information from the Gulf of Maine indicates that sturgeon in small coastal rivers and estuaries are likely to be transient and present in these waters for only short time periods (i.e., less than 48 hours; Zydlewski *et al.* 2011). No shortnose sturgeon have been captured or detected on telemetry arrays along the south coast of Long Island. Therefore, we expect any sturgeon moving between the Hudson and Connecticut rivers would travel through the East River, which is also the shortest route between the rivers.

Based on the above information, shortnose sturgeon may occur in the action area; however, as shortnose sturgeon spawn in freshwater portions of large rivers and early life stages are not tolerant of salinity, no eggs, larvae or juvenile shortnose sturgeon occur in the action area. As limited forage for sturgeon exists in the action area, we expect occasional sturgeon to travel through the action area opportunistically foraging during their migration or to reach areas with more abundant foraging opportunities.

Effects of the Action

Dredged material is raised by dredge pumps through dragarms connected to drags in contact with the channel bottom and discharged into hoppers built in the vessel. Hopper dredges are equipped with large centrifugal pumps similar to those employed by other hydraulic dredges. Suction pipes (dragarms) are hinged on each side of the vessel with the intake (drag) extending downward toward the stern of the vessel. The drag is moved along the bottom as the vessel moves forward at speeds up to three mph. The dredged material is sucked up the pipe and deposited and stored in the hoppers of the vessel.

Most sea turtles and sturgeon are able to escape from the oncoming draghead due to the slow speed that the draghead advances (up to 3 mph or 4.4 feet/second). Interactions with a hopper dredge result primarily from crushing when the draghead is placed on the bottom, or when an animal is unable to escape from the suction of the dredge and becomes stuck on the draghead (i.e., impingement). Entrainment occurs when organisms are sucked through the draghead into the hopper. Mortality most often occurs when animals are sucked into the dredge draghead, pumped through the intake pipe and then killed as they cycle through the centrifugal pump and into the hopper.

Interactions with the draghead can also occur if the suction is turned on while the draghead is in the water column (i.e., not seated on the bottom). USACE implements procedures to minimize the operation of suction when the draghead is not properly seated on the bottom sediments which reduces the risk of these types of interactions. Cutterhead dredge heads are placed within the sediment at the dredge site, and sturgeon and sea turtles are able to avoid interaction with the dredge because of the low intake velocity of the machinery.

The pipeline connecting the dredge to the shore will float on the surface of the water or will be laid on the substrate, presenting no possibility of impingement or entrainment. The pipe openings will be on land or onboard the dredge. Additionally, the pipeline and will not present a barrier to ESA-listed species as it will be floating or resting on the bottom allowing species to pass through the water column. The pipeline operations that deliver the sand from the dredge to the beach will have no effect on ESA-listed species and will not be discussed further in this consultation.

Hopper Dredging: Impingement / Entrainment

Whales

Whales are too large to be vulnerable to impingement or entrainment in hopper dredges. There are no reports of interactions between dredging equipment and marine mammals. Based on this information, no effects between hopper dredges and whales will occur.

Sea Turtles

Loggerhead, Kemp's ridley, and green sea turtles are known to be vulnerable to entrainment and/or impingement in hopper dredges.[1] Factors that are believed to contribute to the likelihood of sea turtle entrainment include: 1) dredge duration (e.g., greater number of interactions associated with longer duration dredging); 2) Hydraulic pump operation (i.e., interactions rates

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[1] Due to the large size of leatherback sea turtles, leatherback sea turtles are not vulnerable to entrainment in hopper dredges. To date, this species has never been documented entrained in any dredge operation along the U.S. Atlantic Coast (USACE Sea Turtle Warehouse, 2013).

increase with hydraulic pumps operating during the placement/removal of draghead); 3) the location, habitat, and geography of the project site (e.g., open estuarine environment versus confined channel areas); and, 4) the species' use of, and behavior within, the affected location (e.g., foraging, brumating, breeding, resting, transiting).

As the draghead of a hopper dredge operates on the bottom, interactions with sea turtles primarily occur when a sea turtle is foraging or resting on the bottom; these interactions occur more frequently in areas where sea turtle forage is abundant, and thus, sea turtle densities are high. Habitat conditions in the AOBA are not consistent with the areas where brumation has been documented; therefore, we do not anticipate that brumating sea turtles are present in the project area. Sea turtles are not known to concentrate in, or use the waters of the AOBA affected by dredging operations as an essential foraging or resting ground; instead it is believed that they use these waters to transit to other waterways of New York. Although sea turtle foraging items do exist within the waters of the Atlantic Ocean (e.g., crabs, mollusks, submerged aquatic vegetation (SAV)), within the portion of the AOBA affected by the sand mining operations, foraging habitat is limited. Based on the best available information, sea turtle species are not expected to be foraging or resting in this portion of the project area and thus, are not expected to be on the benthos where the draghead of the hopper dredge will be operating. Instead, within the project area, these species of sea turtles are expected to be found in the water column, migrating to and from foraging, breeding, or resting grounds found in nearshore coastal bays and estuaries located outside of the dredging area (e.g., Long Island bays and estuaries). As sea turtles are not expected to occur within the vicinity of the draghead, an interaction between a sea turtle and the dredge head is extremely unlikely.

In addition to the habitat characteristics of the project area, the location and geography of a project may also affect the likelihood of entrainment. The risk of entrainment is believed to be highest in areas where the movements of animals are restricted (e.g., rivers, narrow confined channels) and therefore, where the animal has limited opportunity to move away from the dredge. If these restricted areas also occur within sites in which species are known to concentrate, the likelihood of an interaction further increases. These characteristics; however, are not present within the project area. The AOBA is situated within the nearshore waters of the Atlantic Ocean, an area we consider an open environment; that is, an unconfined body of water in which the shorelines of the surrounding land masses do not encroach on the body of water to an extent that narrow waterways are created. The distance from the project site to the nearest shoreline is approximately 1.5 mile to the southeast (Asharoken Beach). As dredging operations will occur in an open environment, sea turtle movements will be unrestricted, with ample space surrounding the dredging area for sea turtles to move and avoid the dredge or dredge site and continue normal behaviors in other waterways of Long Island Sound. Further, because sea turtles are only expected to transit the project area, and not congregate, the density of sea turtles in any portion of the project area is expected to be low. Based on this information, combined with the fact that sea turtles are not expected to occur on the benthos to forage or rest, the potential for an interaction with a dredge is further reduced.

Based on the information above, and the following factors, we conclude that the risk factors that increase the likelihood for sea turtle entrainment are not present. First, hydraulic pumps will be only turned on once the draghead is on the bottom; thereby, directing and maintaining the suction velocity to the benthos of AOBA, and thus, within an area where sea turtles are not expected to occur. Second, prior to the actual lifting of the dragarm from the bottom, the draghead will be held firmly on the bottom for 10 to 15 seconds (with no suction) then lifted rapidly to midwater. Third, a turtle deflector draghead will be properly installed in front of the draghead and used at all times. Based on this information, it is extremely unlikely that there will be any impingement or entrainment of sea turtles. Effects of hopper dredging on sea turtles are discountable.

Sturgeon
Sturgeon are vulnerable to interactions with hopper dredges. The risk of interactions is related to both the amount of time sturgeon spend on the bottom and the behavior the fish are engaged in (i.e., whether the fish are overwintering, foraging, resting or migrating), as well as the intake velocity and swimming abilities of sturgeon in the area (Clarke 2011). Intake velocities at a typical large self-propelled hopper dredge are 11 feet per second. Exposure to the suction of the draghead intake is minimized by not turning on the suction until the draghead is properly seated on the bottom sediments and by maintaining contact between the draghead and the bottom.

In general, entrainment of large mobile animals, such as the sturgeon, is relatively rare. Several factors are thought to contribute to the likelihood of entrainment. One factor influencing potential entrainment is the swimming stamina and size of the individual fish at risk (Boysen and Hoover 2009). Swimming stamina is positively correlated with total fish length. Entrainment of larger sturgeon, such as the subadults and adults that may occur in the action area, is less likely due to the increased swimming performance and the relatively small size of the draghead opening (standard UXO grating size is four inches by four inches). The estimated minimum size for sturgeon that out-migrate from their natal river is greater than 70cm; therefore, that is the minimum size of sturgeon anticipated in the action area.

In areas where animals are present in high density, the risk of an interaction is greater because more animals are exposed to the potential for entrainment. The hopper dredge draghead operates on the bottom and is typically at least partially buried in the sediment. Sturgeon are benthic feeders and are often found at or near the bottom while foraging or while moving within rivers. Sturgeon at or near the bottom could be vulnerable to entrainment if they were unable to swim away from the draghead. Information suggests that sturgeon migrating in the marine environment do not move along the bottom, but move further up in the water column. If sturgeon are up off the bottom while in marine areas, such as the dredge site, with limited forage habitat, the potential for interactions with the dredge are further reduced. Furthermore, hydraulic pumps will only be turned on once the draghead is on the bottom, thereby, directing and maintaining the suction velocity to the benthos, and thus, within an area where sturgeon are not expected to occur. We expect the occurrence of sturgeon in the area to be limited to rare transients. Given the limited forage habitat in the dredge site footprints and the precautionary measures ensuring that suction of the draghead is only on when in contact with the benthos, an interaction of a sturgeon with a hopper dredge in the action area is extremely unlikely. Therefore, direct effects of hopper dredge operations on sturgeon are discountable.

Cutterhead Dredging: Impingement / Entrainment
Whales

Whales are too large to be vulnerable to impingement or entrainment in cutterhead dredges. There are no reports of interactions between dredging equipment and marine mammals. Based on this information, no effects between cutterhead dredges and whales will occur.

Sea Turtles

Sea turtles are not known to be vulnerable to entrainment in cutterhead dredges, presumably because they are able to avoid the relatively small intake and low intake velocity. Thus, if a sea turtle were to be present at the dredge site, it would be extremely unlikely to be injured or killed as a result of dredging operations carried out by a hydraulic cutterhead dredge. Based on this information, effects to sea turtles from the hydraulic cutterhead dredge are discountable.

Sturgeon

Impingement or entrainment in hydraulic cutterhead dredges may kill or injure sturgeon. In order for sturgeon to be impinged or entrained in the cutterhead dredge, sturgeon would have to be on the bottom. Sturgeon do occur on the bottom, especially while foraging; however, studies indicate that small, juvenile sturgeon (less than 0.6 ft. fork length) need to be within 4.9 ft. to 6.6 ft. of the cutterhead for there to be any potential entrainment (Boysen and Hoover 2009). Sturgeon in the action area are considerably bigger (subadults and adults), and as they are stronger swimmers, are even less vulnerable to being overcome by the suction of the dredge and becoming entrained. Because the dredge moves slowly and sturgeon are highly mobile, it is likely that sturgeon would easily be able to avoid the dredge. This assumption is supported by recent monitoring work completed in the James River (Virginia) and the Delaware River (New Jersey) (Reine *et al.* 2014; ERC 2012). During these two studies, while the movements of tagged sturgeon were traced near a dredge, there were no interactions between tagged sturgeon and the dredge. Furthermore, in the Reine *et al.* (2014) study, none of the tagged sturgeon showed evidence of avoidance behavior, remaining in close proximity to the dredge for as long as 21.5 hours before moving away. Likewise, no strong evidence of attraction was observed, as sturgeon moved within the channel past the operating dredge on several occasions.

While entrainment of smaller sturgeon in cutterhead dredges has been observed (as evidenced by the presence of a few individual shortnose sturgeon at disposal sites), these instances are rare and have been limited to dredging events that occur near sturgeon overwintering areas where sturgeon are known to form dense aggregations. The density of sturgeon in these overwintering areas by itself increases the risk of interaction with dredge equipment. This risk is further increased at overwintering areas because evidence suggests that sturgeon may be less responsive to stimuli while overwintering, which may make it less likely that sturgeon would avoid a dredge during this time period. However, as mentioned above, the action area is not an overwintering area for sturgeon. The risk of entrainment is also higher for small fish, including early life stages and small juveniles. Because these life stages are not present in the action area and the smallest sturgeon present would be at least 2.3 ft. (the size at which we expect them to begin migrations from their natal river), this risk factor does not exist in the action area. These increased risk factors (i.e., small fish, overwintering area) are not present in the action area. Therefore, it is extremely unlikely that any sturgeon would be impinged or entrained in a cutterhead dredge operating within the project site; effects to sturgeon from the proposed hydraulic dredging operations are discountable.

Water Quality Effects: Beach Nourishment, Stone Fill Placement, (Groin Construction) and Dredging

Beach Nourishment

Beach nourishment operations require the placement of large quantities of sand below the mean high water mark of a shoreline. The placement of dredged material along beaches or shorelines cause an increase in localized turbidity in the nearshore environment. Nearshore turbidity impacts from fill placement are directly related to the quantity of fines (silt and clay) in the nourishment material. As the material from the borrow areas consists of beach quality sand of similar grain size and composition as indigenous beach sands, we expect short suspension time and containment of sediment during and after placement activities. As such, turbidity impacts would be short-term (*i.e.*, turbidity impacts will dissipate completely within several hours of the cessation of operations (Greene 2002)) and will be spatially limited to the vicinity of the dredge outfall pipe, the pump out buoy/mooring station, and dredge anchor points.

The Atlantic States Marine Fisheries Commission (Greene 2002) review of the biological and physical impacts of beach nourishment cites several studies that report that the turbidity plume and elevated total suspended solids (TSS) levels drop off rapidly seaward of the sand placement operations. Wilber *et al.* (2006) evaluated the effects of a beach nourishment project along the coast of northern New Jersey and reported that maximum bottom surf zone and nearshore TSS concentrations related to nourishment activities were 64.0 mg/L and 34.0 mg/L, which were only slightly higher than background maximum bottom TSS concentrations in the surf and nearshore zones on unnourished portions of the beach (i.e., less than 20.0 mg/L). Additionally, Wilber *et al.* (2006) reported that elevated TSS concentrations associated with the active beach nourishment site were limited to within 1,312 feet of the discharge pipe in the swash zone (defined as the area of the nearshore that is intermittently covered and uncovered by waves), while other studies found that the turbidity plume and elevated TSS levels are expected to be limited to a narrow area of the swash zone up to 1,640 feet down current from the discharge pipe (Burlas *et al.* 2001). Based on this and the best available information, turbidity levels created by beach nourishment operations along the shoreline are expected to be between 34.0 to 64.0 mg/l; limited to an area approximately 1,640 feet down current from the area of sand placement; and, are expected to be short term, only lasting several hours.

Whales

We do not expect whales to occur in the near shore shallow waters of the action area 1,640 feet down current of the discharge pipe; therefore, there will be no effects to whales from increased turbidity associated with the placement of dredged material on the Village of Quogue shoreline.

Sea Turtles

No information is available on the effects of TSS on juvenile and adult sea turtles; however, elevated TSS levels could affect sea turtles if a plume causes a barrier to normal behaviors. As sea turtles are highly mobile, they will be able to avoid any sediment plume they encounter with minor movements to alter their course out of the sediment plume. Thus, any effect on sea turtle movements is likely to be immeasurable and therefore insignificant.

Sturgeon
The life stages of sturgeon most vulnerable to increased sediment are eggs and non-mobile larvae which are subject to burial and suffocation. As noted above, neither sturgeon eggs nor larvae will be present in the action area. Sturgeon in the action area during disposal would likely be capable of avoiding any sediment plume by swimming around it. The TSS levels expected (up to 64.0 mg/L) are well below those shown to have an adverse effect on fish (580.0 mg/L for the most sensitive species, with 1,000.0 mg/L more typical (Burton 1993)). Based on this information, the impacts of suspended sediment resulting from dredging activities on sturgeon will be immeasurable; therefore, effects to sturgeon from turbidity related to dredging activities are insignificant.

Stone Fill Placement
The placement of stone fill for the groin construction will be done at depths of up to 10 feet and will disturb shoreline sediments and may cause a temporary increase in suspended sediment in the nearshore area. However, suspended sediment is expected to settle out of the water column within a few hours and any increase in turbidity will be short term. Turbidity levels associated with any sediment plume are expected to be only slightly elevated above background levels. The stone will placed into position at slow speeds which will allow any ESA-listed species to avoid being directly struck by the placement of fill. Based on this information, effects of stone placement to ESA-listed species are extremely unlikely, and therefore, discountable.

Dredging
Dredging operations cause sediment to be suspended in the water column. This results in a sediment plume in the water, typically radiating from the dredge site and decreasing in concentration as sediment falls out of the water column as distance increases from the dredge site. The nature, degree, and extent of sediment suspension around a dredging operation are controlled by many factors including: the particle size distribution, solids concentration, and composition of the dredged material; the dredge type and size, discharge/cutter configuration, discharge rate, and solids concentration of the slurry; operational procedures used; and the characteristics of the hydraulic regime in the vicinity of the operation, including water composition, temperature and hydrodynamic forces (i.e., waves, currents, etc.) causing vertical and horizontal mixing (ACOE 1983).

For cutterhead dredge activity, based on a conservative (i.e., low) total suspended solids (TSS) background concentration of 5.0 mg/L, modeling results indicated that elevated TSS concentrations (i.e., above background levels) would be present at the bottom 6.0 feet of the water column for a distance of approximately 1,000 feet (ACOE 1983). Based on these analyses, elevated suspended sediment levels are expected to be present only within a 1,000 foot radius of the location of the cutterhead. Turbidity levels associated with cutterhead dredge sediment plumes typically range from 11.5 to 282.0 mg/L with the highest levels detected adjacent to the cutterhead and concentrations decreasing with greater distance from the dredge (Nightingale and Simenstad 2001).

In the vicinity of hopper dredge operations, a near-bottom turbidity plume of resuspended bottom material may extend 2,300 to 2,400 feet down current from the dredge (USACE 1983). In the immediate vicinity of the dredge, a well-defined upper plume is generated by the overflow process. Approximately 1,000 feet behind the dredge, the two plumes merge into a single plume

(USACE 1983). Suspended solid concentrations may be as high as several tens of parts per thousand (ppt; grams per liter) near the discharge port and as high as a few parts per thousand near the draghead. In a study done by Anchor Environmental (2003), nearfield concentrations ranged from 80.0-475.0 mg/l. Turbidity levels in the near-surface plume appear to decrease exponentially with increasing distance from the dredge due to settling and dispersion, quickly reaching concentrations less than 1 ppt. Studies also indicate that in almost all cases, the vast majority of resuspended sediments resettle close to the dredge within one hour, and only a small fraction takes longer to resettle (Anchor Environmental 2003).

Overall, water quality impacts from either dredging method are anticipated to be minor and temporary in nature. Once dredging operations are complete, the project area will return to ambient conditions within an hour due to the large grain size of the dredge material (beach compatible sand).

Whales

No information is available on the effects of total suspended solids (TSS) on whales. TSS is most likely to affect whales if a plume causes a barrier to normal behaviors. Whales in the action area during dredging may avoid a sediment plume by swimming around it. However, if whales do interact with the plume, TSS levels are below levels shown to have an adverse effect on fish, so it is reasonable to assume that these levels would also be below those that would cause adverse effects to whales. Based on this information, the effects of suspended sediment resulting from dredging, beach nourishment, and fill placement activities on whales are extremely unlikely; therefore, effects to whales from turbidity related to these activities are discountable.

Sea Turtles

No information is available on the effects of TSS on juvenile and adult sea turtles. Studies of the effects of turbid waters on fish suggest that concentrations of suspended solids can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton 1993). Elevated TSS levels could affect sea turtles if a plume causes a barrier to normal behaviors. As sea turtles are highly mobile, they will be able to avoid any sediment plume they encounter with minor movements to alter their course out of the sediment plume. Thus, any effect on sea turtle movements is likely to be immeasurable and therefore, insignificant.

Sturgeon

The life stages of sturgeon most vulnerable to increased sediment are eggs and non-mobile larvae which are subject to burial and suffocation. As noted above, no sturgeon eggs and/or larvae will be present in the action area. Sturgeon in the action area during dredging may avoid a sediment plume by swimming around it. However, if sturgeon do interact with the plume, expected TSS levels (up to 475.0 mg/L) are below those shown to have an adverse effect on fish (580.0 mg/L for the most sensitive species, with 1,000.0 mg/L more typical (Burton 1993)). Based on this information, the effects of suspended sediment resulting from dredging, beach nourishment, and fill placement activities on sturgeon are extremely unlikely; therefore, effects to sturgeon from turbidity related to these activities are discountable.

Habitat Modification Effects

Dredging

Any prey targeted by whales in the action area would pelagic and highly mobile, and therefore would not be impacted by dredging interactions. Dredging can affect future use of the action area by sea turtles and sturgeon by reducing prey species through the alteration of the existing biotic assemblages. The area to be dredged has predominantly sand substrate and sparse SAV and limited benthic resources. Green sea turtles forage on sea grasses and no sea grasses will suffer adverse effects from dredging the borrow site. Leatherback sea turtles feed on jellyfish. As jellyfish are pelagic species and not vulnerable to interactions with the dredge, there is not likely to be a reduction in the forage base for leatherbacks. Kemp's ridley and loggerhead sea turtles typically feed on crabs, other crustaceans and mollusks. Some of the prey species targeted by turtles and sturgeon, including crabs, are mobile; therefore, some individuals are likely to avoid the dredge. While there is likely to be some temporary reduction in the amount of prey in the dredge areas, the action will result in the loss of only a portion (approximately 55 acres) of the available forage of Long Island Sound. The studies reviewed by Wilbur and Clarke (2007) demonstrate that benthic communities in temperate regions occupying shallow waters with a combination of sand, silt, or clay substrate reported recovery times between 1-11 months after dredging. Thus, we expect benthic communities within the project's dredged area to recover in less than one year, and the action will not result in the permanent removal of potential forage items from the area. The dredge area is not known to be a preferred foraging ground for sea turtles or sturgeon, but should the species opportunistically forage in this area, they would only be exposed to a reduction in forage in a small area for the season immediately following dredging. The loss of sea turtle and sturgeon prey resulting from dredging will be so small and temporary that the effects will be undetectable and therefore, insignificant.

In summary, as (l) the area to be directly affected by dredging is small (approximately 55 acres) relative to the available forage habitat in surrounding area; (2) few motile organisms will be affected by the proposed dredging; and (3) recolonization of the benthic community will be rapid, we have determined that any effects to foraging sea turtles and sturgeon will be insignificant.

Fill Placement: Groin Construction and Beach Nourishment

Whales

ESA listed species of whales will not occur in the area where beach nourishment and fill placement for the construction of groins will occur and will not experience any direct effects from these activities. As such, this section will discuss the effects of fill placement on sea turtle and sturgeon habitat.

Sturgeon and Sea Turtles

The placement of fill (e.g., beach nourishment, groin construction) may cause effects to sturgeon and sea turtles by reducing prey species through the alteration of existing biotic assemblages and habitat. There is no information to indicate that the groin construction or beach nourishment sites have more abundant sturgeon and turtle prey or better foraging habitat than other surrounding areas. The assumption can be made that sturgeon and sea turtles are not likely to be more attracted to the waters of the action area than to other foraging areas in the waters of Long Island Sound and are able to find sufficient prey in these alternate areas.

Minor disruptions or removal of small proportions of benthic habitat associated with these projects that may provide opportunistic foraging habitat will have minimal impacts on the overall availability of suitable foraging habitat for both sturgeon and sea turtles throughout Long Island Sound. These groins and beach nourishment fill will impact less than one acre. Less than one acre is minor in comparison to the size of the surrounding area of Long Island Sound. As such, ample habitat will remain available for both sea turtles and sturgeon to opportunistically forage. Additionally, the proposed fill placement operations are not likely to alter the habitat in any way that prevents sturgeon and sea turtles from using any portion of the action area as a transit route and therefore, would not disrupt any essential behaviors such as migrating or foraging. Based on this information, the effects of fill placement on sturgeon and sea turtle migration and foraging are expected to be insignificant and discountable.

Effects of Vessel Interactions
Sea turtles, whales, and sturgeon may be injured or killed as a result of being struck by boat hulls or propellers. The factors relevant to determining the risk to these species from vessel strikes vary, but may be related to the size and speed of the vessels, navigational clearance (i.e., depth of water and draft of the vessel) in the area where the vessel is operating, and the behavior of individuals in the area (e.g., foraging, migrating, overwintering, etc.). We have considered the likelihood that an increase in vessel traffic associated with the projects increases the risk of interactions between listed species and vessels in the project areas, compared to baseline conditions. The use of one dredge will cause a small, localized, temporary increase in vessel traffic. Given the large volume of traffic in the project area, the increase in traffic associated with the projects is extremely small. Based on this information, we believe the effects of vessel traffic on sea turtles, whales, and sturgeon from dredging operations are insignificant.

Ongoing Maintenance Dredging
As the effects of future maintenance dredge and beach nourishment events will be the same as those of the initial events, and the magnitude of the effects will not change and not accumulate over the 50 years, the effects of additional dredge events during the 50 year life of the permit will also be insignificant or discountable.

Conclusion
Based on the analysis that any effects to ESA-listed species will be insignificant or discountable, we concur with your determination that the proposed project is not likely to adversely affect any listed species under our jurisdiction. Therefore, no further consultation pursuant to section 7 of the ESA is required. Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the consultation; or (c) If a new species is listed or critical habitat designated that may be affected by the identified action. No take is anticipated or exempted. If there is any incidental take of a listed species, reinitiation would be required. Should you have any questions regarding these comments, please contact Daniel Marrone at Daniel.Marrone@noaa.gov or by phone (978-282-8465).

Technical Assistance for Proposed Species

On March 23, 2015, we published a proposed rule to list three distinct population segments (DPS) of green sea turtles as endangered and eight distinct population segments of green sea turtles as threatened, including the North Atlantic DPS (80 FR 15272). This rule, when finalized, would replace the existing listing for green sea turtles. Once a species is proposed for listing, the conference provisions of the ESA may apply (see ESA section 7(a)(4) and 50 CFR § 402.10). Conference is defined as "a process which involves informal discussions between a Federal agency and the Service... regarding the impact of an action on proposed species or proposed critical habitat and recommendations to minimize or avoid the adverse effects" (50 CFR § 402.02). Federal agencies are required to confer with NMFS on any action which is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat (50 CFR § 402.10).

Currently, green sea turtles are listed as threatened, except for the Florida and Pacific coast of Mexico breeding populations, which are listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green sea turtles are currently considered endangered wherever they occur in U.S. waters. In the analysis above, we have considered effects to the current global listing of green sea turtles. Green sea turtles in the action area are from the North Atlantic DPS. As explained above, all effects to green sea turtles will be insignificant and discountable, and the proposed action will not result in the injury or mortality of any green sea turtles; as this determination was based on the potential effects to individuals, the proposed change in status for these sea turtles (i.e., from endangered to threatened) would not change these determinations. As all effects of the proposed action are insignificant and discountable, and the proposed action will not result in the injury or mortality of any green sea turtles, the action is not likely to appreciably reduce the survival and recovery of any DPS of green sea turtle, including the North Atlantic DPS. Therefore, it is not reasonable to anticipate that this action would be likely to jeopardize the continued existence of any DPS of green sea turtles. As such, we have determined that no conference is necessary for green sea turtles.

Essential Fish Habitat Comments

NMFS Habitat Conservation Division (HCD) is responsible for overseeing programs related to Essential Fish Habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act and other NOAA trust resources under the Fish and Wildlife Coordination Act. HCD will provide comments separately on this project. If you wish to discuss this further, please contact Melissa Alvarez (732-872-3116 or Melissa.Alvarez@noaa.gov).

Sincerely,

Kimberly B. Damon-Randall
Assistant Regional Administrator
for Protected Resources

EC: Marrone, GAR/PRD
Alvarez, GAR/HCD
Weppler, ACOE

References

Anchor Environmental. 2003. Literature review of effects of resuspended sediments due to dredging. June. 140 pp.

Army Corps of Engineers (USACE). 1983. Dredging and Dredged Material Disposal. U.S. Dept. Army Engineer Manual 111 0-2-5025.

Atlantic Sturgeon Status Review Team (ASSRT). 2007. http://www.nero.noaa.gov/prot_res/CandidateSpeciesProgram/AtlSturgeonStatusReviewReport.pdf

Bain, M.B., N. Haley, D. Peterson, J. R. Waldman, and K. Arend. 2000. Harvest and habitats of Atlantic sturgeon *Acipenser oxyrinchus* Mitchill, 1815, in the Hudson River Estuary: Lessons for Sturgeon Conservation. Instituto Espanol de Oceanografia. Boletin 16:43-53.

Boysen, K. A. and Hoover, J. J. (2009), Swimming performance of juvenile white sturgeon (Acipenser transmontanus): training and the probability of entrainment due to dredging. Journal of Applied Ichthyology, 25: 54–59.

Burton, W.H. 1993. Effects of bucket dredging on water quality in the Delaware River and the potential for effects on fisheries resources. Versar, Inc., 9200 Rumsey Road, Columbia, Maryland 21045.

Burlas, M., G. L Ray, & D. Clarke. 2001. The New York District's Biological Monitoring Program for the Atlantic Coast of New Jersey, Asbury Park to Manasquan Section Beach Erosion Control Project. Final Report. U.S. Army Engineer District, New York and U.S. Army Engineer Research and Development Center, Waterways Experiment Station.

Clarke, D. 2011. Sturgeon Protection. Presented to the Dredged Material Assessment and Management Seminar 24-26 May, 2011 Jacksonville, FL.

EPA (Environmental Protection Agency). 1986. Quality Criteria for Water. EPA 440/5-86-001.

ERC (Environmental Research and Consulting, Inc.). 2012. Acoustic telemetry study of the movements of juvenile sturgeons in reach B of the Delaware River during dredging operations. Prepared for the U.S. Army Corps of Engineers. 38 pp.

Jensen, A. S., and G. K. Silber. 2004. Large Whale Ship Strike Database. U.S. Department of Commerce, NMFS-OPR-25 37.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science 17(1):35-75.

Morreale, S.J. 1999. Oceanic migrations of sea turtles. PhD Thesis. Cornell University.

Morreale, S.J. 2003. Assessing health, status, and trends in Northeasten sea turtle populations. Interim report: Sept. 2002-Nov. 2003.

Morreale, S.J. and E.A. Standora. 1998. Early life stage ecology of sea turtles in northeastern U.S. waters. U.S. Dep. Commer. NOAA Tech. Mem. NOAA Fisheries-SEFSC-413, 49 pp.

Morreale, SJ. and E.A Standora. 2005. Western North Atlantic waters: Crucial developmental habitat for Kemp's ridley and loggerhead sea turtles. Chel. Conserv. Biol. 4(4):872-882.

National Research Council (NRC). 1990. Decline of sea turtles: causes and prevention. National Academy Press, Washington D.C. 259 pages.

New York State Department of Environmental Conservation (NYSDEC). 2014. Determining the connectivity among and fine-scale habitat-use within Atlantic sturgeon Aggregation areas in the Mid-Atlantic Bight: implications for gear restricted management areas to reduce bycatch. Protected Species Progress Report and Evaluation No. 8 for the period 06/1/2014 - 11/31/2014. Unpublished Report to NMFS, NMFS Grant Number: NA10NMF4720039.

Nightingale, B., and C. Simenstad. 2001. White Paper: Dredging Avitivities. Marine Issues. Submitted to Washington Department of Fish and Wildlife; Washington Department of Ecology; Washington Department of Transportation. 119 pp.

Reine, K., D. Clarke, M. Balzaik, S. O'Haire, C. Dickerson, C. Frederickson, G.Garman, C. Hager, A. Spells, and C. Turner. 2014. Assessing Impacts of Navigation Dredging on Atlantic Sturgeon (*Acipenser oxyrinchus*). Dredging Operations Technical Support Program. ERDC/EL TR-14-12. 44 pp.

Ruben, H. J., and Morreale, S. J. 1999. Draft Biological Assessment for Sea Turtles: New York and New Jersey Harbor Complex. Unpublished Biological Assessment submitted to the National Marine Fisheries Service.

Savoy, T. and D. Pacileo. 2003. Movements and important habitats of subadult Atlantic sturgeon in Connecticut waters. Transactions of the American Fisheries Society 132: 1-8.

Shoop, C.R. and R.D. Kenney. 1992. Seasonal distributions and abundances of loggerhead and leatherback sea turtles in waters of the northeastern United States. Herpetological Monographs 6: 43-67.

Shortnose Sturgeon Status Review Team. 2010. A Biological Assessment of shortnose sturgeon (*Acipenser brevirostrum*). Report to National Marine Fisheries Service, Northeast

Regional Office. November 1, 2010. 417 pp.

Vanderlaan A.S.M. and C.T. Taggart. 2007. Vessel collisions with whales: The probability of lethal injury based on vessel speed. Marine Mammal Science 23:144-156.

Wilbur, D.H., and D.G. Clarke. 2007. Defining and assessing benthic recovery following dredging and dredged material disposal. Proceedings XXVII World Dredging Congress 2007:603-618.

Zydlewski, G. B., Kinnison, M. T., Dionne, P. E., Zydlewski, J. and Wippelhauser, G. S. (2011), Shortnose sturgeon use small coastal rivers: the importance of habitat connectivity. Journal of Applied Ichthyology, 27: 41–44. doi: 10.1111/j.1439-0426.2011.01826.x

Appendix D

Fish and Wildlife Coordination Act Report

Appendix E

Essential Fish Habitat

Draft Essential Fish Habitat Assessment Asharoken Coastal Storm Risk Management Project

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ABBREVIATIONS AND ACRONYMS

A	adults
°C	degrees Celsius
cm	centimeter
District	U.S. Army Corps of Engineers, New York District
DO	dissolved oxygen
E	eggs
EFH	Essential Fish Habitat
EJ	early juveniles
F	fall
ft	feet
J	juveniles
L	larvae
LJ	late juveniles
m	meters
MAB	Mid-Atlantic Bight
MLW	Mean Low Water Mark
mm	millimeters
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act of 1976
NEFMC	New England Fisheries Management Council
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Services
ppt	parts per thousand
S	summer
SNE	southern New England
Sp	spring

TL	total length
W	winter
YOY	young-of-the-year

1.0 Introduction

In accordance with the Magnuson-Stevens Fishery Conservation and Management Act, this assessment identifies the potential impacts of the United States Army Corps of Engineers (USACE), New York District's (District), proposed Town of Asharoken storm damage reduction project on essential fish habitat (EFH) in the Village of Huntington, Suffolk County, New York. The Magnuson-Stevens Act as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267) set forth a number of new mandates for the National Marine Fisheries Service (NMFS), regional fishery management councils, and other federal agencies to identify and protect important marine and anadromous fish habitat.

EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The regulations further clarify EFH by defining "waters" to include aquatic areas that are used by fish (either currently or historically) and their associated physical, chemical, and biological properties; "substrate" to include sediment, hard bottom, and structures underlying the water; and, areas used for "spawning, breeding, feeding, and growth to maturity" to cover a species' full life cycle.

2.0 Asharoken Project Description

The Village of Asharoken lies on a narrow section of land that connects Eatons Neck peninsula to the mainland of the Town of Huntington in Suffolk County New York. The length of Asharoken Beach is approximately 2.4 miles long and varies in width from about 50-ft at the most eroded sections in the east to approximately 100-ft at the western end. Asharoken Avenue runs parallel to the Sound and is the only access/evacuation route for residents or essential services. Protecting this roadway is one of the primary considerations of this project (Figure 1).

The project site is located along 2.4 miles of shoreline of the north shore of Long Island seaward of Asharoken Avenue along Long Island Sound. The project reach runs along the beach between Bevin Road to the west and the Northport Power Plant jetty to the east. The project site includes beach and berm much of which may be considered developed with shore protection structures including bulkheading and rip-rap of private residences, as well as landward areas of maritime forest and shrub, salt marsh and open water bay habitats. There are two critical erosion areas within the project beach, displayed in Figure 2.

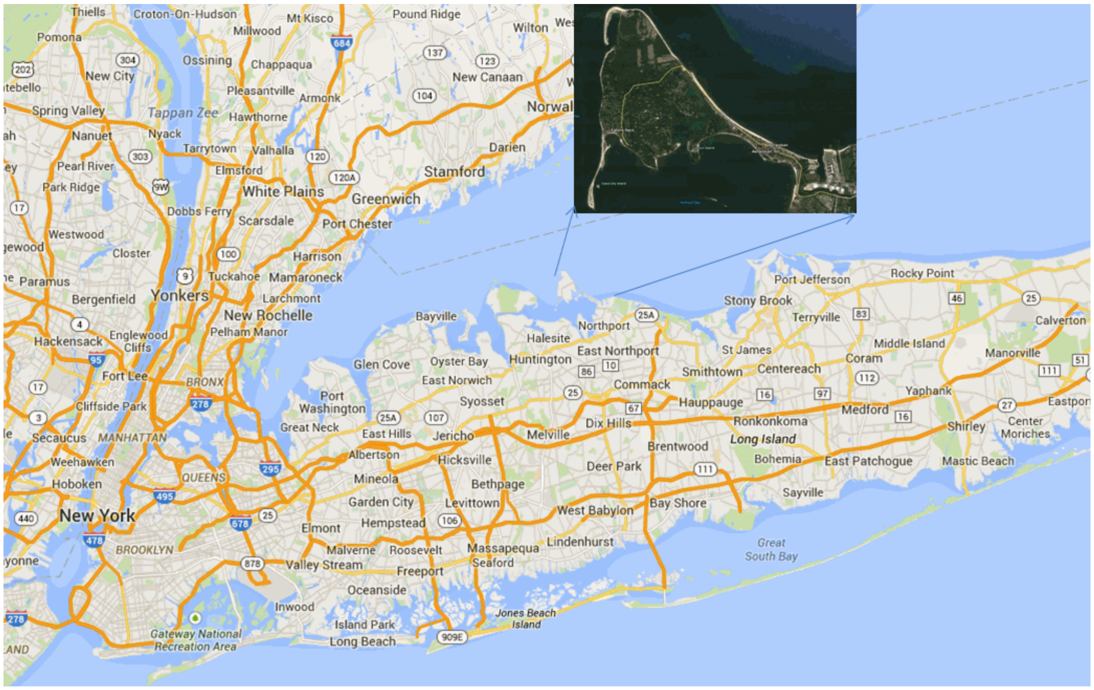


Figure 1 Project Location Map

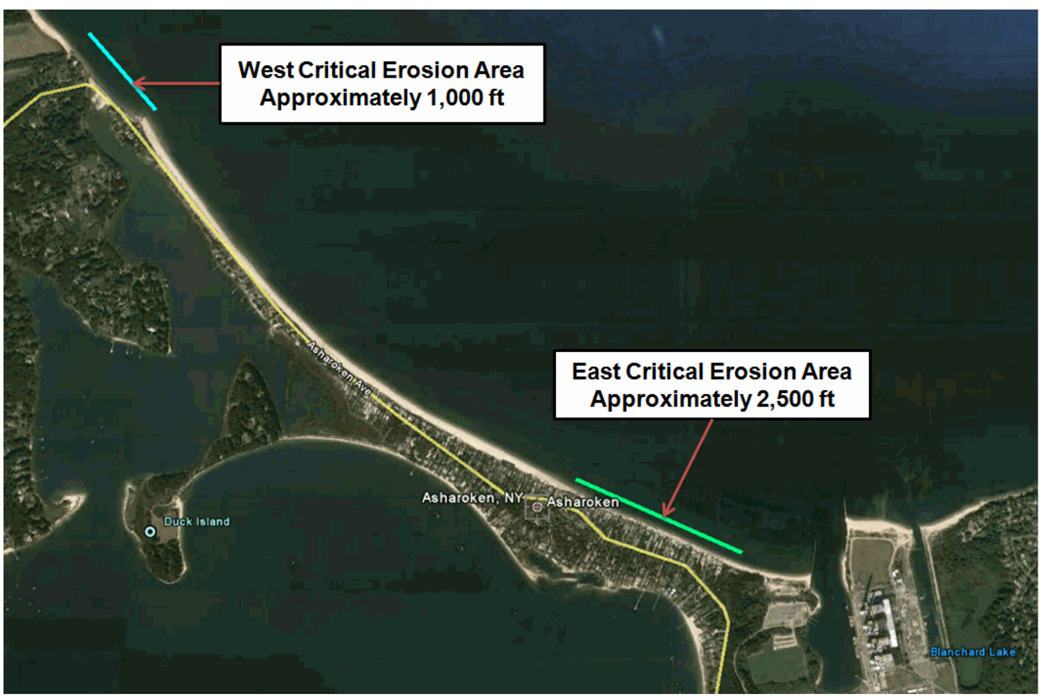


Figure 2

Current Project Description

The proposed plan for Asharoken Beach includes the dredging and placement of approximately 600,000 cy of fill material (Borrow Area “A” Figure 3a) to rebuild the beach and berm. Periodic renourishment is anticipated at a frequency of 80,000 cy every 5 years with the renourishment sand trucked in from an outside source. Post storm nourishment is estimated at 25,000 cy every 5 years. Another re-nourishment source will be sand dredged from the LILCO power station inlet channel to the east and “by passed” to the project site. By passed sand from Northport is dredged and placed on an annual basis.

Initial fill will cover approximately 75 acres of intertidal and littoral nearshore benthic habitat seaward of mean high tide limit. Sand will be dredged from a nearby offshore borrow area (Area “A” Figure 3) and will require dredging a surface area of about 55 acres . Average depth of the dredge foot print will be increased from about 35 to 45 feet MLW, but is not expected to leave a depression as the sand will be coming from the side and foot of an above grade ridge (Figures 3b and 3c) The project will also the require the construction of a western critical area groin field consisting of a total of 3 stone groins with a cumulative foot print (berm, intertidal and littoral lands) of about 0. 58 acres. The tapering groins have respective lengths of 120’,100’ and 80’ and are each 64’ wide at the base (Figure 4).

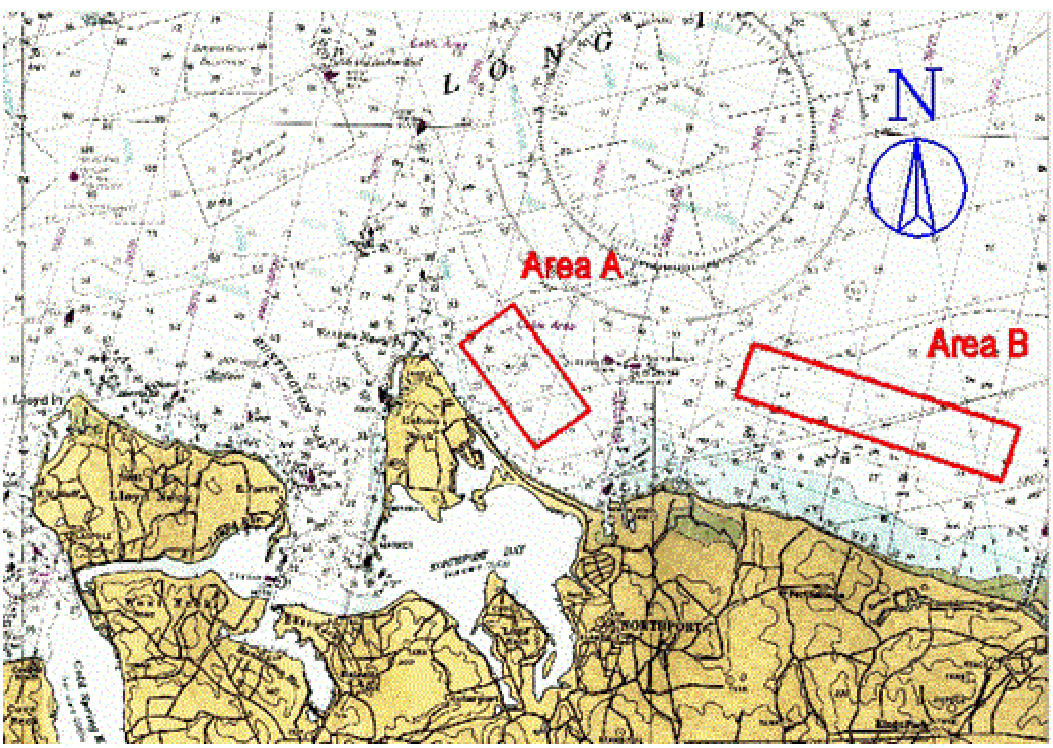


Figure 3a Borrow Area A

Figure 3b Dredge Footprint: note transect lines

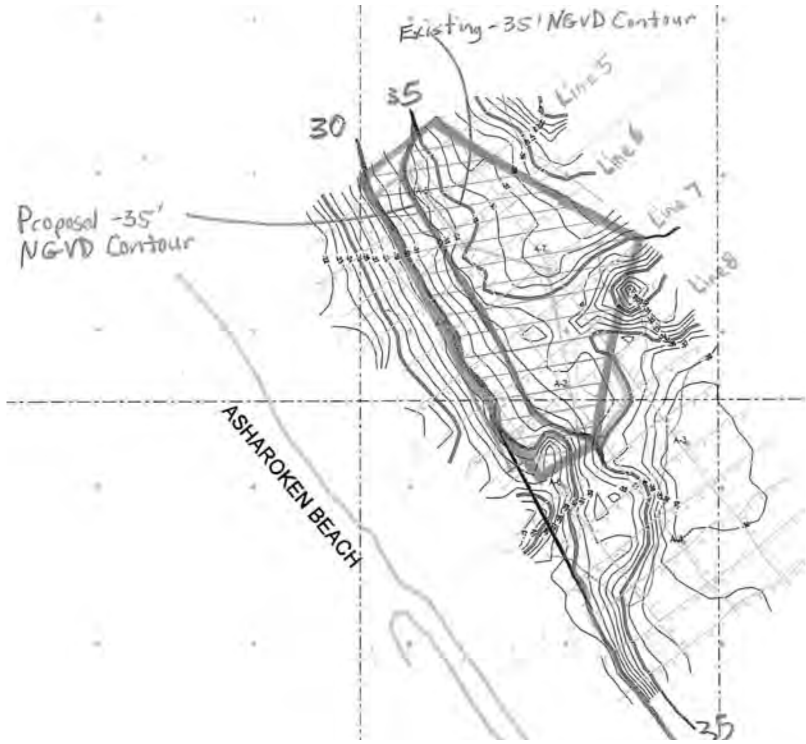
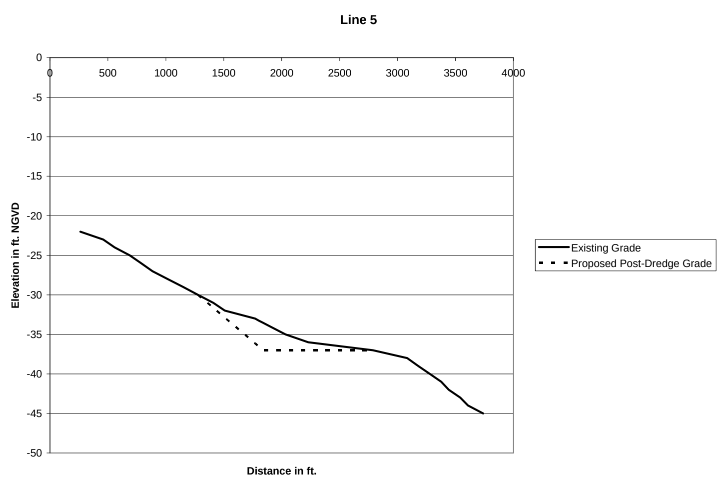
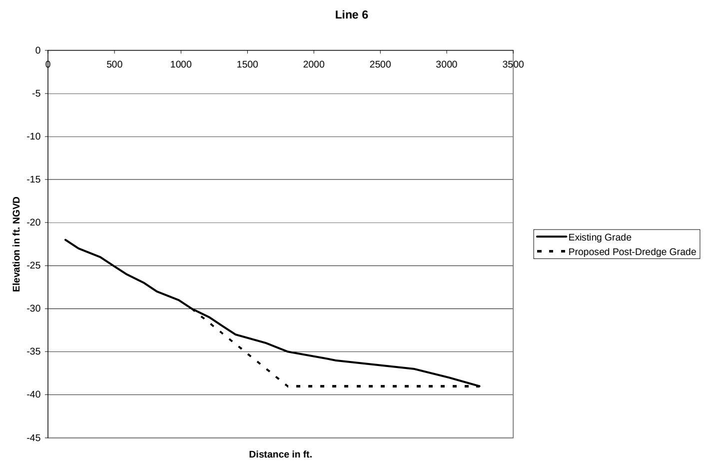
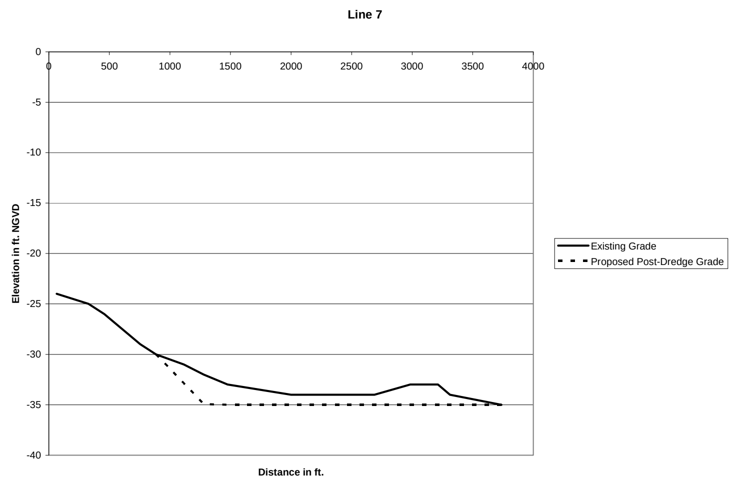
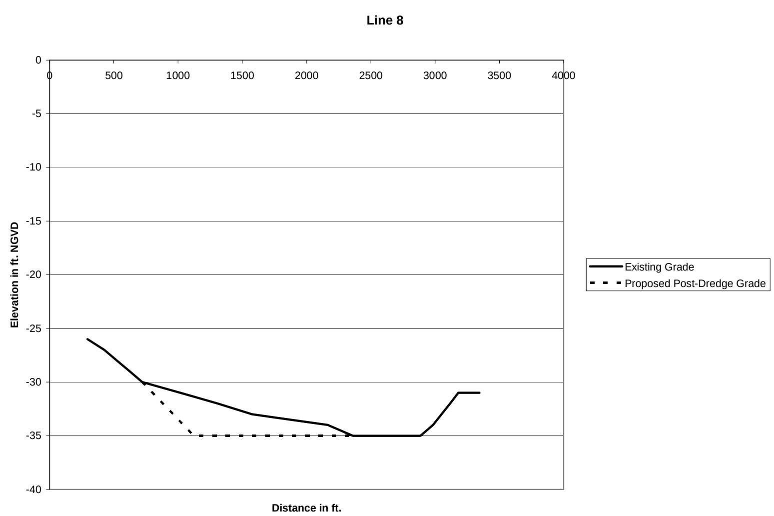


Figure 3c (4 graphs) Borrow Area dredge transect bathymetry profiles




Line 6
Elevation in ft. NGVD
Distance in ft.
Existing Grade
Proposed Post-Dredge Grade


Line 7
Elevation in ft. NGVD
Distance in ft.
Existing Grade
Proposed Post-Dredge Grade


Line 8
Elevation in ft. NGVD
Distance in ft.
Existing Grade
Proposed Post-Dredge Grade

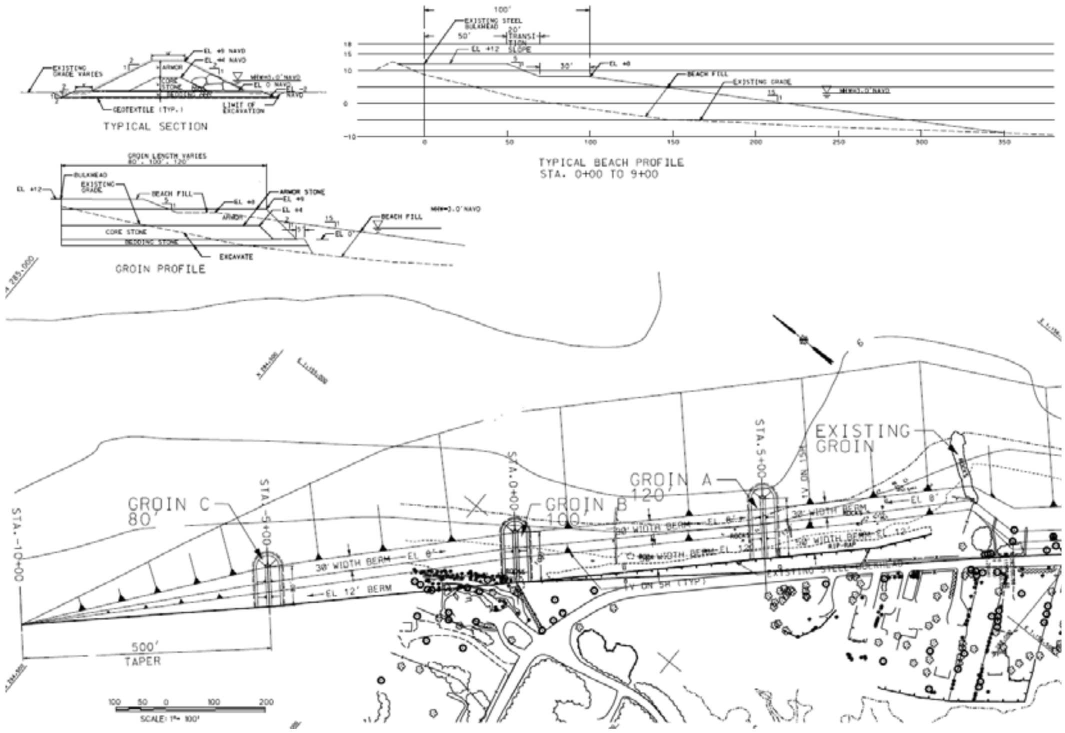


Figure 4 Selected Alternative with Groin Field (West)

3.0 Existing Environment

The project study area encompasses a dynamic marine environment that includes characteristic north shore of Long Island features consisting of sand/cobble beaches and inter-tidal zones, and gently sloping near-shore littoral and sub-littoral areas. Upland (south) of the LIS shoreline the project area includes a mix of beach, small dunes, estuarine marsh, maritime scrub-shrub and maritime woodland habitats, hard structures Asharoken Ave and private residences.

3.1 Existing Physical Setting

Asharoken Beach was formed and is sustained by littoral sediment from the east as the predominant sediment forcing wave action is from the northeast. Littoral materials also come from the west as the Eatons Neck bluffs erode providing sediment driven eastward by waves from the northwest. The net volume of littoral material contributed to Asharoken Beach is naturally supplied from the east

Tides along Asharoken are semidiurnal (twice daily) with a mean tide range of 7.1 ft. and spring range of 8.2 feet. Salinity values in the Asharoken project are generally range between 25-28 ppt and temperatures range between 2-24 ^{o}C, typical for western LIS.

Table 1 Astronomical Tide Elevations
Asharoken, New York

Datum	Elevation (ft NGVD)
Highest Observed (6 Feb. 1978)	+9.1
Mean Higher High Water (MHHW)	+3.9
Mean Tide Level (MTL)	+0.4
Mean Lower Low Water (MLLW)	-3.2
Mean Tide Range (ft)	7.1
Spring Tide Range (ft)	8.2
Lowest Observed (10 Jan. 1978)	-6.6

Note: Highest and lowest observed elevations are at Port Jefferson

Currents at Eatons Neck, the average maximum strength of current is 2.4 feet per second (fps) for both flood and ebb tides. The tidal current velocity at Asharoken Beach is expected to range from 0.3 to 0.8 feet per second along the study shoreline.

4.0 Essential fish habitat

4.1 Designated Species

Based on the NOAA Guide to EFH Designations in the Northeastern United States, designated EFH occurs in the greater Project Area as identified by a 10-minute by 10-minute areas of latitude and longitude bounded on the north, west, south, and east as follows: 41 degrees (°) 00 minutes (′) N latitude, 73° 20′ W longitude, 40° 50′ N latitude, and 73° 30′ W longitude.
http://www.greateratlantic.fisheries.noaa.gov/hcd/webintro.html

EFH designations for the project area were based on information compiled by the NOAA/National Ocean Services (NOS) Estuarine Living Marine Resources (ELMR) Program (Stone *et al.* 1994), the New England Fisheries Management Council (NEFMC 1999), and the National Marine Fisheries Service (USDOC 1999b). A total of 13 finfish one shark and two skate species are currently designated as EFH species in the area (Table 2). Table 3 summarizes the EFH life history and habitat parameters for each species.

Table 2. EFH-Designated Fish, Shark and Skate Species and Life History Stages in the Northport Harbor Area.

<u>Square Description (i.e. habitat, landmarks, coastline markers):</u> Atlantic Ocean waters within the square within Long Island Sound affecting the following: on the north shore of Long Island from just north of Northport, NY., to Cooper Bluff, NY. on Cove Neck, west of Cold Spring Harbor, NY. These waters are north of the following: Northport., NY, Eatons Neck, Northport Bay, Little Neck, East Neck, West Neck, and Lloyd Neck, Huntington, NY., Greenlawn, NY., Centerport, NY., Woodbury, NY., and Huntington Bay. Also, there is a discontinued dumping ground along with a present disposal area, both on the northern boundary of the square, south of Noroton Heights, CT. and South Norwalk, CT.

Fish Species	**Life History Stage**			
	E	**L**	**J**	**A**
Atlantic Herring (*Clupea harengus)*			X	X
Atlantic Mackerel (*Scomber scombrus*)	X	X	X	X
Atlantic Salmon (Salmo salar)			X	X
Black Sea Bass (*Centropristis striata*)			X	
Bluefish (*Pomatomus saltatrix*)			X	X
Cobia (*Rachycentron canadum)*	X	X	X	X
King Mackerel	X	X	X	X
Pollock (*Pollachius virens)*			X	X
Red Hake (*Urophycis chuss*)	X	X	X	X
Scup (*Stenotomus chrysops)*	X	X	X	X
Summer Flounder (*Paralichthys dentatus)*			X	
Windowpane (*Scopthalmus aquosus)*	X	X	X	X
Winter flounder (*Pseudopleuronectes americanus)*	X	X	X	X
Shark Species				
Sand tiger shark (*Odontaspis taurus)*	X			
Skate Species			**J**	**A**
Little (*Leucoraja erinacea)*			X	X
Winter (*Leucoraja ocellata)*			X	X

Table 3. Asharoken EFH Life History/Habitat Parameters

Species	**Life Stage**	**Temp (°C)**	**Salinity (ppt)**	**Depth (m)**	**Season**	**Habitat description**
Red hake	Eggs	<10	<25		May to November	Surface waters of innercontinental shelf
	Larvae	<19	>0.5	<200	May to December	Surface waters
	Juveniles	<16	31-33	<100		
Windowpane	Eggs	<20		<70	February to November	Surface waters
	Larvae	<20		<70	February to November	Pelagic waters

Species	Life Stage	Temp (°C)	Salinity (ppt)	Depth (m)	Season	Habitat description
	Juveniles	<25	5.5-36	1-100		Bottom habitats with fine-grained sand or mud substrate
	Adults	<21	5.5-36	1-75		Bottom habitats with fine-grained sand or mud substrate
Winter flounder	Eggs	<10	10-30	<5	February to June	Bottom habitats with sand, muddy sand, mud and gravel substrates
	Larvae	<15	4-30	<6	March to July	Pelagic and bottom waters
	Juveniles	<25	15-33	1-50		Bottom habitats with mud or fine-grained sand substrate
	Adults	<25	15-33	1-100		Bottom habitats including estuaries with mud, sand, or gravel substrate
	Spawning adults	<15	5.5-36	<6	February to June	Bottom habitats including estuaries with mud, sand, or gravel substrate
Atlantic herring	Juveniles	<10	26-32	15-135		Pelagic waters and bottom habitats
	Adults	<10	>28	20-130		Pelagic waters and bottom habitats
	Spawning adults	<15	32-33	20-80	July through November	Bottom habitats with gravel, sand, cobble, or shell fragment substrates, also on aquatic macrophytes
Atlantic mackerel	Eggs	5 to 23	18->30	0-15		Pelagic waters
	Larvae	6 to 22	>30	10-130		Pelagic waters
	Juveniles	4 to 22	>25	0-320		Pelagic waters
	Adults	4 to 16	>25	0-380		Pelagic waters
Black sea bass	Juveniles	>6	>18	1 to 38	Spring/summer in estuaries	Rough bottom, shellfish and eel grass beds, man-made structures in sandy-shelly areas
	Adults	>6	>20	20-50	May to October in estuaries	Structured habitats (natural and man-made), sand and shell substrates preferred
Bluefish	Juveniles	19-24	23-36		May to Oct. in estuaries	Pelagic waters
	Adults	14-16	>25		April to Oct. in estuaries	Pelagic waters
Scup	Eggs	13-23	>15	<30	May to August	Pelagic waters in estuaries

Species	Life Stage	Temp (°C)	Salinity (ppt)	Depth (m)	Season	Habitat description
	Larvae	13-23	>15	<20	May to September	Pelagic waters in estuaries
	Juveniles	>7	>15	0-38	Spring to summer in estuaries	Inshore on various sands, mud, mussel, and eelgrass bed substrates
	Adults	>7	>15	2-185	Inshore April to November	Inshore estuaries
Summer flounder	Larvae	9 to 12	23-33, also fresh	10 to 70		Pelagic waters
	Juveniles	>11	10-30, also fresh	0.5-5 in estuary		Demersal waters, sand to mud substrate, found in estuaries in flats, channels, salt marsh creeks, and eelgrass beds
	Adults		Fresh	0-25	Warmer months inshore	Demersal waters and estuaries
Little skate	Juveniles	4-15	15-34	0-137		Sand, gravel, and mud bottom habitats
	Adults	2-15	15-34	0-137		Sand, gravel, and mud bottom habitats
Winter skate	Juveniles	-1.2 to 21	22-34	0-400		Sand, gravel, and mud bottom habitats
	Adults	-1.2 to 20	30-36	0-371		Sand, gravel, and mud bottom habitats
Cobia	Eggs	28-30	30-34	<1		
	Larvae	24-32	19-38	3-300		
	Juveniles	17-25	30-36	0-300		
	Adults	23-28	25-30	1-70		
King mackerel	Eggs			35-180	May to Sept.	
	Larvae	22-31	27-37	35-180		Surface waters
	Juveniles			23-34		Outer reefs and coastal waters
	Adults	>20	32-36	23-34		Outer reefs and coastal waters
Sand tiger shark	Neonates			<25		Shallow coastal waters
Atlantic Salmon	Juveniles	<25	Fresh to Oceanic	10-61 cm		Bottom habitats of shallow gravel/cobble riffles interspersed with deeper riffles and pools in rivers and estuaries Water velocities between 30 - 92cm/se
	Adults	<22.8	Fresh to			Oceanic adult Atlantic

Species	Life Stage	Temp (°C)	Salinity (ppt)	Depth (m)	Season	Habitat description
			Oceanic			salmon are primarily pelagic and range from waters of the continental shelf off southern NE north throughout the GOME Dissolved oxygen above 5ppm for migratory pathway.
Pollock	Juvenile	<18	29-32	0-250		Bottom habitats with aquatic vegetation or a substrate of sand, mud or rocks
	Adult	<14	31-34	16-365		Hard bottom habitats including artificial reefs

4.2 N.Y. District Finfish and Benthic Invertebrate Survey of the Asharoken Project Site

The New York District conducted a limited monitoring program to collect finfish and benthic invertebrate data in the existing habitats of the project site from the fall of 2003 through the summer of 2004. Full details of the monitoring effort can be found in the NY District 2007 monitoring report which can be found as Appendices C and D of the EA. The sections below summarize the reports (Tables 4 and 5)

Table 4. Rank Order Abundance and Percentage of Total Fish Collections, Asharoken Nearshore Investigation (2003-2004), all seasons combined.

Common Name	Scientific Name	Abundance	Percentage of Total
Atlantic silverside	***Menidia menidia***	**2,940**	**45.89**
Atlantic menhaden	***Brevoortia tyrannus***	**2,480**	**38.71**
Bluefish	**Pomatomus saltatrix**	**262**	**4.09**
Bay anchovy	***Anchoa mitchilli***	**158**	**2.47**
Weakfish	***Cynoscion regalis***	**156**	**2.44**
Blueback herring	***Alosa aestivalis***	**108**	**1.71**
Striped killifish	***Fundulus majalis***	**105**	**1.64**
American sand lance	***Ammodytes americanus***	**65**	**1.02**

Mummichog	***Fundulus heteroclitus***	**64**	**1.0**
Winter flounder	***leuronectes americanus***	**30**	**0.47**
Northern pipefish	***Syngnathus fuscus***	**15**	**0.24**
Atlantic tomcod	***Microgadus tomcod***	**8**	**0.13**
Cunner	**Tautogolabrus adspersus**	**7**	**0.11**
Sheepshead minnow	***Cyprinodon variegatus***	**3**	**0.05**
Striped mullet	***Mugil cephalus***	**1**	**0.02**
Northern sea robin	***Prionotus carolinus***	**1**	**0.02**
Striped bass	***Morone saxatilis***	**1**	**0.02**
Windowpane flounder	***Scophthalmus aquosus***	**1**	**0.02**
Tautog	***Tautoga onitis***	**1**	**0.02**
Scup	**Stenotomus chrysops**	**1**	**0.02**

Table 5. Rank Order Abundance and Percentage of Total Fish and Macroinvertebrate Collections, Asharoken Borrow Area Investigation (2003-2004), all seasons combined.

Common Name	Scientific Name	Abundance	Percentage of Total
Bay anchovy	*Anchoa mitchilli*	48,409	N/A*
Scup	*Stenotomus chrysops*	3,250	60.7
Winter flounder	*Pleuronectes americanus*	523	9.8
Spider crab	*Libinia dubia*	511	9.5
Weakfish	*Cynoscion regalis*	226	4.2
Long-finned squid	*Loligo pealei*	123	2.3
Atlantic butterfish	*Peprilus triacanthus*	109	2.0
Grubby	Myoxocephalus aenaeus	96	1.8
Red hake	*Urophycis chuss*	86	1.6
Windowpane flounder	*Scophthalmus aquosus*	76	1.4
Blueback herring	*Alosa aestivalis*	61	1.1
Cunner	Tautogolabrus adspersus	52	1.0
Atlantic horseshoe crab	*Limulus polyphemus*	45	0.8
Asteriid sea star	*Asterias forbesi*	39	0.7
Rock crab	*Cancer irroratus*	30	0.6

Table 5. Rank Order Abundance and Percentage of Total Fish and Macroinvertebrate Collections, Asharoken Borrow Area Investigation (2003-2004), all seasons combined.			
Common Name	**Scientific Name**	**Abundance**	**Percentage of Total**
Clearnose skate	*Raja eglanteria*	19	0.4
Bluefish	Pomatomus saltatrix	16	0.3
Summer flounder	*Paralichthys dentatus*	13	0.2
Smallmouth flounder	*Etropus microstomus*	11	0.2
Atlantic herring	*Clupea harengus*	9	0.2
Spotted hake	*Urophycis regia*	8	0.2
Tautog	*Tautoga onitis*	8	0.2
Rock gunnel	*Pholis gunnellus*	5	0.1
Lady crab	*Ovalipes ocellatus*	5	0.1
Atlantic tomcod	*Microgadus tomcod*	5	0.1
Silver hake	*Merluccius bilinearis*	4	0.1
Mantis shrimp	*Squilla empusa*	3	0.1
Black sea bass	*Centropristis striata*	3	0.1
Channeled welk	*Busycon canaliculatum*	2	<0.1
Alewife	Alosa pseudoharengus	2	<0.1
American lobster	*Homarus americanus*	2	<0.1
Stone crab	*Menippe mercenaria*	2	<0.1
Hogchoker	*Trinectes maculatus*	2	<0.1
Banded gunnel	*Pholis fasciata*	1	<0.1
Feather blenny	*Hypsoblennius hentz*	1	<0.1
Northern sea robin	*Prionotus carolinus*	1	<0.1
Lookdown	*Selene vomer*	1	<0.1
Northern puffer	*Sphoeroides maculatus*	1	<0.1
Oyster toadfish	*Opsanus tau*	1	<0.1
Striped searobin	*Prionotus evolans*	1	<0.1
Round herring	*Etrumeus teres*	1	<0.1
Atlantic silverside	*Menidia menidia*	1	<0.1
Atlantic menhaden	*Brevoortia tyrannus*	1	<0.1
*Bay anchovies were excluded from Percent of Total calculations.			

4.2.1 Offshore Finfish and Mega-invertebrates

Finfish were sampled at both potential borrow areas (A & B Figure 4) via a 30-foot otter trawl fitted with a 1/4 inch cod end. Evaluation physical factors (volume of available compatible sand, likely obstructions, bottom contour and distanced to the placement site) resulted in borrow area A as the preferred site to use for the project. The approximate area of Borrow Area A is 8,270,150 square feet or 0.224 square nautical miles (0.29 square miles).

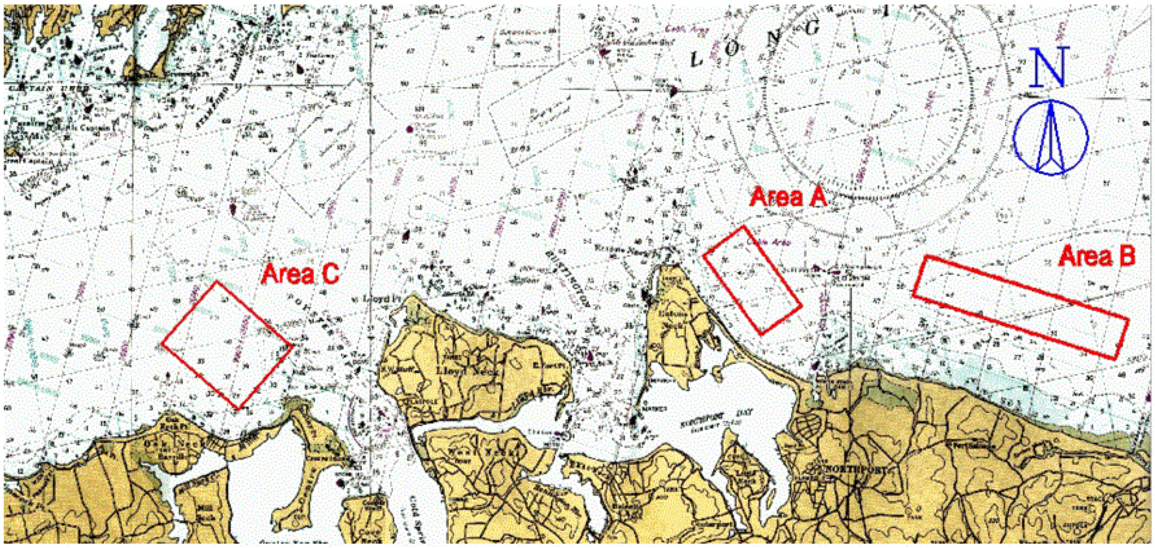


Figure 6. Alternate Borrow Areas Sampled

Thirteen (13) pre-determined transects were selected for the Borrow Area A September 2003 sampling event and seven predetermined transects were selected for the Borrow Area B. Sixty-eight (68) otter-trawls (total tows A & B) were conducted in water depths of 29–47 feet and for durations of 8–10 minutes during the September 2003, February 2004, May 2004, and July 2004 sampling events. As a result, a total of 33 finfish species and 10 mega-invertebrate species (including squid) were collected.

It is important to note that bay anchovy were extremely abundant (in excess of 13,000 individuals in Borrow Area A and more than 31,000 individuals in Borrow Area B) during the September 2003 sampling event. Bay anchovy was excluded from general analsis but would have represented 90% of abundance. Excluding anchovy, scup was the dominant species, accounting for 60.7% of the overall catch The second most abundant species was winter flounder (9.8%), followed by spider crab (9.5%), weakfish (4.2%), long-finned squid (2.3%), and Atlantic butterfish [2.0% (Figure 12]. The remaining 11.5% was comprised of all other species. In borrow area B rocky substrate made bottom fishing extremely difficult and multiple nets were damaged during the process resulting in lost catches and additional attempts. A quick comparison of the top five species from Borrow Areas A and B shows that winter flounder and spider crab were among the most abundant species in both borrow areas Weakfish (juvenile) was among the most common species in Borrow Area A, but not in Borrow Area B. For all of the sampling events combined, a total of eight (8) EFH-designated species were collected in both borrow areas . The EFH species consisted of Atlantic herring, black sea bass, bluefish, red hake, scup, windowpane, and winter flounder)

For the four combined sampling events, eight EFH-designated species, including Atlantic herring, black sea bass, bluefish, red hake, scup, summer flounder, windowpane, and winter flounder, were collected in Borrow Area A. Winter flounder was the most abundant EFH-designated species collected in Borrow Area A accounting for 22.6% of the total catch. The next most abundant EFH-designated species was scup, accounting for 11.4% of the total catch. Other EFH-designated species of significant value were red hake, accounting for 3.4% of the total catch and windowpane, accounting for 3.2% of the total catch. Based on the sediment grain size and the length of the winter flounders captured, as well as the abundance of young of year the borrow areas may be utilized as a nursery for scup potentially a spawning ground for winter flounder.

4.2.2 Near Shore Monitoring

Finfish

At the placement site beach intertidal and littoral finfish were collected using a beach seine with ¼ mesh (6mm), during fall 2003, spring 2004 and summer 2004. Nineteen species of finfish were collected, they consisted of :

Atlantic Silversides, Bay Anchovy, Blackfish, Blueback Herring, Bluefish, Cunner, Menhaden, Mullet, Mummichog, Northern Pipefish, Northern Sea Robin, Sandlance, Sheepshead Minnow, Striped Bass, Striped Killifish, Tomcod, weakfish, windowpane. Windowpane flounder, winter flounder and scup.

Atlantic Silversides at 45% and Menhaden at 46% were the two numerically dominant species overall. Four EFH species were captured in the beach seines. They consisted of bluefish, scup winter flounder and windowpane flounder

Juvenile bluefish was the most abundant EFH species representing 2.5% of the total catch (spring and summer). Juvenile winter flounder was the next most abundant EFH species at about 0.5 % of the total catch, captured during all three seasons sampled.

Borrow Area Benthic Grabs: Infauna

Nematode and the oligochaete worms were the first and second most abundant benthic Invertebrates collected from the Asharoken borrow areas. Other common benthic invertebrates collected in the borrow areas included polychaete worms, copepods and amphipods. Grab results also showed that gastropods (e.g., snails) and pelecypods (bivalve species) were fairly abundant at Borrow Area A, but rare in Borrow Area B.

Placement site Benthic Invertebrates

Benthic Invertebrates were collected using a 7.5 mm coring tube penetrating the sediments to a depth of approximately 10 to 15 cm. Core samples were than sieved to 0.5 mm preserved by standard methods and identified later. Benthic samples revealed 8 phyla to be present that included 46 taxa (inclusive of all periods sampled). Annelid worms clearly dominated infauna abundance capturing 80 to 90% of the abundance with Nematoda the second most abundant forms at about 4 to 9 %. Other “common” species included mollusks (snails) which dominated biomass. Grain size samples derived from the cores revealed sediment composition to be on average about 70 – 90% sand followed by gravel with trace fractions of mud, silt and clay. Dissolved oxygen averaged 5.38 mg/l for the summer, 7.9 mg/l in the fall and 7.0 mg/l in the spring.

4.3 Individual Species assessments

Atlantic Herring (*Clupea harengus*): Juveniles and Adults

Life History Information: Adult Atlantic sea herring migrate south into southern New England and mid-Atlantic shelf waters in the winter after spawning in the Gulf of Maine, on Georges Bank, and Nantucket Shoals. Juveniles and young of the year are abundant in LIS during the fall at depths of 30-60 m and preferred salinities of 30-32 ppt. In a NEFSC bottom trawl of LIS, adult springtime abundance was highest at temperatures of 9-10 C, depths ranging from 10-30 m and salinities of 25-28 ppt.

Project Area: Juvenile and adult Atlantic herring are not expected to be within the project area in great numbers as their preferable depths are deeper than those found within the project areas and their preferred salinities area higher. Also these fish area highly mobile filter feeders and not closely associated with the benthos where potential impacts would be greatest. A total of 9 Atlantic Herring were captured during September 2003 during the borrow area monitoring program at Asharoken. Constructing the proposed project is not expected to significantly impact this species.

Atlantic Mackerel (*Scomber scombrus*): All Life Stages

Life History Information: Atlantic mackerel overwinter in deep water on the continental shelf from Sable Island Bank (Canada) to Chesapeake Bay and in spring move inshore and northeast. This pattern in reversed in the fall. In spring, adults form two spawning aggregations; the southern group spawns off New Jersey and New York and in the Gulf of Maine from mid April to June. Most spawning occurs in the shoreward half of the continental shelf. Although spawning was found to be rare in LIS, surveys have found an abundance of eggs and larvae within the Sound between April and May. The eggs are pelagic, occurring at depths ranging from 10-325 m and at salinities greater than 34 ppt. Larvae inhabit open bays and estuaries at depths ranging from 5-10 m. Juvenile and adult Atlantic mackerel are reported to be common in the LIS during the months of April through November, with adults being more abundant in the spring into midsummer and the juveniles abundant primarily in September through October. Atlantic mackerel prefer salinities greater than 25 ppt, depths 10 – 70m and are intolerant of temperatures below 5–6°C or above 15–16°C.

Occurrence in Project Area and Impacts: Given salinities that are at the lower threshold level for Atlantic mackerel, this species is not expected to be common at the project area. This species is highly mobile and not associated with the benthos or near bottom where impacts are potentially greatest. Additionally, it is likely that a majority of the construction will take place at a time when this species has migrated out of the area to overwinter in oceanic waters. No life stages of this species were captured during either phase of the monitoring plan. Constructing the proposed project is not expected to significantly impact this species.

Atlantic Salmon (Salmo salar): Juveniles and Adults

This species is not expected to occur within the project area as there are no known native spawning streams/rivers in the vicinity of Asharoken Beach. No life stages of this species were captured during either phase of the monitoring plan. Presence of this species (any life stage) is considered extremely rare. Constructing the proposed project is not expected to significantly impact this species.

Black Sea Bass (*Centropristis striata*): Juveniles

Life History Information: This species is usually strongly associated with structured, sheltering habitats such as reefs and wrecks. Spawning occurs on the continental shelf, beginning in the spring off Cape Hatteras and progressing into the fall in the New York Bight and off southern New England. In general, juvenile black sea bass utilize various substrates such as rough bottom shellfish, sponge and eelgrass beds, and man-made objects found in depths ranging from 1-38 m, and can withstand a wide range of salinity levels (8-33 ppt) although they prefer 18-20 ppt. Within LIS, juveniles and adults were uncommon until September and October where they were collected at bottom temperatures of 14-19 ºC, depths of 5-50m, and salinities of 23-32 ppt. Black sea bass do not tolerate cold inshore winter conditions and as such were primarily collected along outer continental shelf south of Long Island during winter.

Occurrence in Project Area and Impacts: Juveniles may occur within the project area at both the borrow area and in the nearshore. During monitoring only two juvenile sea bass were captured, at the borrow area. Because these juveniles are oriented to the benthos there is the potential for entrainment if hopper dredges are utilized. Because borrow areas generally lack significant benthic structure, the preference for this type of habitat by black sea bass is expected to be low. Temporary impacts to black sea bass could include gill abrasion, displacement and a reduction in visibility. However, the waters of the western sound are often turbid and any further increase in turbidity would be localized and short term, directly related to the type and duration of construction activity. Though a temporary increase in turbidity is likely to occur, re-suspension at both the dredging and the placements may provide or attract an abundance of prey items which is likely beneficial impact to the black sea bass. Significant adverse impacts are not expected. Constructing the proposed project is not expected to significantly impact this species.

Bluefish (*Pomatomus saltatrix*): Juveniles and Adults

Life History Information: Bluefish adults begin to appear in LIS during May when temperature preferences are 9-18 ^{o}C . Abundance is highest during mid-summer on the Connecticut side of the sound in depths less than 18m. Peak abundance occurred during September when they are found throughout the Sound. Abundance decreases rapidly after September and juveniles appear to depart before adults. Juvenile bluefish occurred in abundance in depths between 9-27 m over mud substrate. They usually occur at salinities of 23 to 33 ppt, but can tolerate salinities as low as 3 ppt. Adults often occur near shore as well as offshore. Adults usually prefer warm water (at least 14 to 16°C).

Occurrence in Project Area and Impacts: Juvenile/YOY bluefish would be common in the nearshore especially around structures such as jetties or groins in the project area from July through September. Adults and yearling fish can occur in the Sound from June until November. Blue fish juveniles were captured in the nearshore. No adults were captured by trawls likely due to net avoidance and not lack of presence. Adults would be expected to occur in the project area at the borrow as well as in the nearshore. Both juvenile and adult blue fish are highly mobile fast swimming fish and are not generally associated with the bottom. Re-suspension of sediments may affect visual predation in the near shore and blue fish may be displaced. Activities leading to resuspension (dredging and placement)may be a more of a beneficial impact to juvenile blue fish than a negative impact due to presence of prey organisms introduced into the water column. Only short term insignificant negative impacts to adult or juvenile bluefish are expected. Constructing the proposed project is not expexted significantly impact this species.

Cobia (*Rachycentron canadum*): All Life Stages.

Life History Information: This is a southern species that overwinters near the Florida Keys and migrates in the spring and summer to the Mid-Atlantic States to spawn. Adults are rarely found as far north as Massachusetts, and their presence in LIS is also considered very rare.

Occurrence in Project Area and Impacts: Long Island Sound is near the northern extent of their range, cobia (any life strage) are not likely to occur in the Project Area in significant numbers, if at all. No significant impacts are expected to Cobia.

King Mackerel (*Scomberomorus cavalla*): All Stages

Life History Information: These highly migratory species migrate north from Florida as far as the Gulf of Maine in the summer and fall. King mackerel spawn in coastal waters of the Gulf of Mexico and southern Atlantic coast. Adults are usually found in waters associated with Oceanic salinities ranging from 32 to 35 ppt. King Mackerel are highly mobile fast swimming fish and are not generally associated with the bottom. If any individuals were in the vicinity of the project it is expected that they would move away from any disturbance.

Occurrence in Project Area and Impacts: Since the LIS is near the northern extent of King Mackerel's range and the salinity of the Sound is lower than prefered, no life history stages this species are likely to be common in the Project Area. Therefore the project is not expected to have any significant impacts to the King Mackerel.

Spanish Mackerel *(Scomberomorus maculatas):* All Life Stages

Spanish mackerel spawn as far north as Sandy Hook and off of Long Island in late August to late September. All life stages of this species usually inhabit fully saline waters (32+), although juvenile Spanish mackerel have been collected in lower salinities.

A review of LIS fishery data reveals that Spanish mackerel eggs, larvae, juveniles, or adults have not been captured in the vicinity of the Project Area. During the recent trawl monitoring, no adults or juveniles were captured. Because LIS has a somewhat lower than preferred salinity adults or juveniles were captured during the USACE trawl survey and this species if present would easily move away from any disturbance the project is not expected to have any significant impacts to the Spanish Mackerel.

Pollock (*Pollachius virens*): Juveniles and Adults

Pollock are not commonly caught in the surveys of LIS. In surveys conducted by the Connecticut Fisheries Division from 1984-1990 throughout LIS, only 24 juveniles were caught from July-August at all depths and bottom types except sand. Generally, juvenile pollock have been reported over a wide variety of substrates including sand, mud, or rocky bottom and vegetation and prefer salinities of 29-32 ppt, temperatures from 0-16 ^{o}C and depths of ranging from 5-150 m. Inshore subtidal and intertidal zones serve as an important nursery area for age 0 - 1 juveniles while juveniles aged 2+ move offshore, inhabiting depths of 130-150 m.

Adults exhibited little preference for bottom types and were found at salinities 31-34 ppt, temperatures of 0-14 ^{o}C and depths ranging from 35-36 m. Adults tend to inhabit deeper waters in spring and summer than in winter and are found further offshore than juveniles.

Occurrence in Project Area and Impacts: The possibility exists that the juvenile life stage of this species may occur within the project area, though none were caught during monitoring. It is doubtful that they may occur in significant numbers within the project area due to preferred higher salinities and lower temperatures. However, because Pollack is a benthic species juveniles might be susceptible to impacts related to dredging such as entrainment or burial during project construction. Because of the Pollock's mobility and the use of the draghead deflector this type of impact would is not expected to be common. It is also likely that juvenile Pollack would see a benefit during construction due to re-suspension of prey items.

Because Pollack are not expected to be common in the project area and the use of the turtle deflector significant short term or long term adverse impacts to this species are not expected from project implementation.

<u>Red Hake (*Urophycis chuss*): All Life Stages</u>

<u>Life History Information</u>: This species spawns along the continental shelf off SNE and eastern Long Island. Larvae dominate the summer ichthyoplankton in the Mid Atlantic Bight and are most abundant on the mid-and outer continental shelf. Eggs and larvae are pelagic with demersal settlement beginning in the juvenile stage generally occurring in the fall. Juveniles seek shelter and commonly associate with scallops, surf clam shells, and seabed depressions. Juveniles were found in LIS in the spring although they were most abundant during the summer. Their preferred substrate was mud, water depths ranged between 5- 50 m, salinities were between 24-32 ppt, and temperatures 2-22 ^{o}C. Adults were generally found in abundance within the Sound from spring to fall in water depths greater than 25 m, salinities between 20-33 ppt, and on mud substrates. Both juveniles and adults make offshore migrations during the winter months.

<u>Occurrence in Project Area and Impacts</u>: Juvenile and adult Red Hake can be expected to occur in the project area. Only juveniles were captured This is a demersal fish spending most of its time on or very close to the bottom. It is not a particularly fast or agile fish. Potential impacts to this species would be associated with the type of equipment used to dredge sand at the borrow site analogous to the Pollock, including assisted avoidance via the deflector device. If a hopper dredge were used entrainment could occur. There would be temporary increases in turbidity at the placement site, however re-suspension is likely to benefit the juvenile Red Hake in the nearshore. Project activities would be expected to displace individuals of this species at both the dredging area and at the fill sites. Life history data as well as project monitoring results shows that Red Hake is a common species in the Sound and in the vicinity of the project. Insignificant short term impacts may occur. Relative long term (minimal) impacts would include a loss of habitat with the conversion of part of the intertidal zone to an area above high tide. This impact is expected to be insignificant since the project area is small relative to the availability of common similar intertidal/nearshore habitat.

<u>Sand Tiger Shark (*Odontaspis taurus): Juveniles and Adults*</u>

The sand tiger shark is found in sandy coastal waters, shallow bays, estuaries and rocky or tropical reefs. The Sand Tiger Shark (adults) can occur from Gulf of Maine to Argentina. This species is somewhat benthic in its habits and preys on small fish, crabs and squid.

<u>Occurrence in Project Area and Impacts</u> EFH is designated within the project area grid for sand tiger shark larvae. EFH for neonates/early juveniles (≤ 125-cm total length) is shallow coastal waters from Barnegat Inlet, NJ to Cape Canaveral, FL out to the 25-meter isobath, entirely outside of the project area. The presence of larvae is possible within the

project area. Due to this species known distribution and little data suggesting that it may be present in the project area, no more than minimal impact on sand tiger shark EFH is anticipated with the proposed project.

Scup (*Stenotomus chrysops*): All Life Stages

Life History Information: Scup spawn along the inner continental shelf from Delaware Bay to Southern New England between May and August, mainly in bays and sounds in and near Southern New England. Spawning occurs in May and June during the morning over weedy or sandy areas. Scup eggs are commonly found in the water column less than 30 m deep in larger coastal bays and sounds in and near Southern New England during spring and summer. Larval scup are pelagic and occur in coastal waters during the warmer months and have been collected in the more saline parts of LIS and eastern Long Island bays from May through September at water temperatures of 14-22^{o} C. Adult and juvenile life history stages were identified at the project site. Young of the year juveniles are commonly found from the intertidal zone to depths of about 30 m in portions of bays and estuaries where salinities are above 15 ppt. In general, juvenile scup appear to use a variety of coastal intertidal and subtidal sedimentary habitats during their seasonal inshore residency, including sand, mud, mussel beds, and eel grass beds. Within LIS, juvenile scup were very abundant, collected in sandy habitat 9 m deep and mud substrate 17 m deep. Their preferred bottom temperatures range 7-18 ^{o} C in spring 15-22 in fall salinities of 25-31 ppt.

Occurrence in Project Area and Impacts: Juvenile and adult scup occupy the project area spring through fall. Eggs and larvae were not identified and may be confined to the higher saline eastern regions of the Sound. Scup are a benthic feeding species but juvenile and adult life stages are highly mobile, equipment related direct impacts are highly unlikely. Re-suspension at the fill site is likely to be beneficial to any individuals foraging in that area. Impacts other than temporary displacement are not expected. No significant impact to scup are expected due to the construction of the this project.

Summer Flounder (*Paralichthys dentatus)*: Juveniles

Life History Information: Summer flounder spawn offshore in fall and winter migrating inshore entering coastal and estuarine nursery areas to complete transformation. Juveniles are distributed inshore and occupy many estuaries during spring, summer, and fall. Some juveniles remain inshore for an entire year before migrating offshore, whereas others move offshore in the fall and return the following spring. Juvenile summer flounder utilize several different estuarine habitats such as marsh creeks, seagrass beds, mud flats, and open bay areas. Some studies indicate that juveniles prefer mixed or sandy substrates, whereas others show that mud and vegetated habitats are used.

Adult summer flounder inhabit shallow, inshore, coastal and estuarine waters during warmer months and migrate offshore in the fall. Adults are reported to prefer sandy habitats, but can be found in a variety of benthic habitats.

Occurrence in Project Area and Impacts: According to the EFH quadrant only juveniles are expected to occur within the project area. Construction activities would result in a temporary increase in turbidity near the fill zone and there would be mechanical disturbance to the borrow site. It is likely that some displacement away from construction activities would occur. If turbidity levels at the reached a particular level there could be an adverse impact because of this species' dependence on sight for foraging. However, high turbidity is expected to be very localized and short lived due to the nature of the fill sand. Summer flounder juveniles are highly mobile and wary and would likely avoid mechanical disturbance at the borrow site. The deflector device will also decrease the potential for entrainment or injury. Under disturbance conditions juveniles (and any adults) are expected to temporarily relocate. Very small juveniles are not likely to be found at the depths of the borrow site therefore entrainment is not likely by dredging equipment. Small juveniles will be found in the nearshore shallow and may be susceptible to burial or other high suspended sediment impacts. Re-suspension at the fill site may be a benefit to small juveniles located nearby.

Relative long term impacts would include a loss of existing intertidal foraging habitat with the conversion of part of the intertidal zone to an area above high tide. This impact is expected to be minor since new intertidal area will develop rapidly and the area affected is small in comparison to similar available intertidal/nearshore habitat. No significant impact to summer flounder are expected due to the construction of the this project.

Windowpane (*Scophthalmus aquosus*): All Stages

Life History Information: This is a mid and inner-shelf species found primarily between Georges Bank and Cape Hatteras on fine sandy sediment. Spawning begins in February and March in inner shelf waters, and peaks in spring and autumn within the LIS. Spawning occurs in inner shelf waters, including many coastal bays and sounds, and on Georges Bank. In the MAB, eggs and larvae are planktonic, found in waters less than 70m deep from February- July and again in September- November.

Juveniles and adults are similarly distributed. They are found in most bays and estuaries south of Cape Cod throughout the year at a wide range of depths (1 to 110 m), bottom temperatures (3–12°C in the spring and 9–12°C in the fall), and salinities 15-33ppt. Juveniles that settle in shallow inshore waters move to deeper offshore waters as they grow. Adults occur primarily on sand substrates off Southern New England and Mid Atlantic Bight.

Bottom trawl surveys in LIS found that juvenile and adult windowpane were most abundant in spring (April-June) at temperatures of 3-18 ^{o}C at salinities 21-31 ppt and depths less than 60 m. The distribution pattern in autumn September-November was similar than spring but reduced in abundance. Adults were found at bottom temperatures of 8-23 ^{o}C, salinities of 18-32 ppt and depths less than 50m.

Occurrence in Project Area and Impacts: All life history stages may occur within the immediate project area. During project monitoring adults and juveniles were captured. If spawning does occur around the project area there is a low potential for adverse impacts to early life history stages because both larvae and eggs tend to occur closer to the surface than to the bottom Construction activities that result in a temporary increase in turbidity may have an adverse impact on the windowpane because of this species' dependence on sight for foraging. This adverse affect is expected to be short term and localized. It is expected that juvenile and adults will avoid highly turbid conditions. Relative long term (minimal) impacts would include a loss of habitat with the conversion of part of the intertidal zone to an area above high tide. This impact is expected to be insignificant since the project area is small relative to the availability of common similar intertidal/nearshore habitat and new intertidal habitat will develop. No significant impact to windowpane are expected due to the construction of the this project.

Winter Flounder (*Pseudopleuronectes americanus*): All Stages

Life History Information: Winter flounder Spawning occurs from mid winter through early spring, peaking south of Cape Cod in February and March at depths of less than 5 m – 45 m. Eggs are found inshore in depths of .3–4.5 m and salinities ranging from 10–30 ppt. Eggs are adhesive and demersal and are deposited on a variety of substrates, but sand is the most common; they have been found attached to vegetation and on mud and gravel. Larvae are negatively buoyant and non-d ispersive; they sink when they stop swimming. Thus, recently settled YOY juveniles are found close to spawning grounds and in high concentrations in depositional areas with low current speeds.

YOY juveniles migrate very little in the first summer, move to deeper water in the fall, and remain in deeper cooler water for much of the year. Habitat utilization by YOY is not consistent across habitat types and is highly variable among systems and from year to year. Several field and lab studies suggest a "preference" for muddy/fine sediment substrates where they are most likely to have been deposited by currents. Adult winter flounder utilize a variety of substrates and prefer temperatures of 12–15°C, and salinities above 22 ppt, although they have been shown to survive at salinities as low as 15 ppt. Mature adults are found in very shallow waters during the spawning season.

Occurrence in Project Area and Impacts: All life history stages may occur within the immediate project area. During project monitoring adults and juveniles were captured. If spawning does occur around the project area there is the potential for adverse impacts to eggs because they are demersal. They could be removed during dredging or buried at the fill site. This same situation is true for newly settled juveniles which may settle in deeper areas. Eventually early juveniles will move into shallow water. Construction activities that result in a temporary increase in turbidity may have a small adverse impact on the winter flounder's foraging ability. The winter flounder is not as dependent on visual cues during foraging as other flounders It is expected that more mobile juveniles and adults will avoid highly turbid conditions. Eggs and less mobile early juvenile may be adversely affected by resuspended sediments. Adults and older juveniles may benefit from prey introduced into the water column or resettled to the benthic surface.

Measures to protect winter flounder spawning activity will include a no-work window from February through May thus dredging in the fall will not affect spawning or very early life history stages. Temporary EFH impacts would include a loss of habitat with the conversion of part of the intertidal zone to an area above high tide. This impact is expected to be insignificant since the project area is small relative to the availability of common similar intertidal/nearshore habitat and new intertidal habitat will develop rapidly. No significant impact to winter flounder is expected during or after construction of the this project.

Little Skate (*Leucoraja erinacea*): Juveniles and Adults ?

Life History Information: This species ranges from Nova Scotia, Canada to Cape Hatteras. It is most abundant in the northern section of the Mid-Atlantic Bight (MAB) and on the northeastern part of Georges Bank. Little skate exhibit seasonal movements. Adult and juvenile little skate move inshore during spring and autumn, and offshore in mid to late summer, and midwinter. They also move north and south with seasonal temperature changes along the southern fringe of their range. They may leave some estuaries for deeper water during warmer months. Little skates are common on sandy or gravelly substrates, but may occur on mud as well. They tend to bury themselves in depressions during the day and become active at night. Data is unavailable about the specific spawning habits of little skate along the New Jersey and New York shoreline, but it is known that they spawn biannually; typically in October and May.

Trawl surveys conducted from 1984-1994 in LIS found both adults and juveniles in spring and fall on transitional and sand bottoms at depths less than 9 m. Their preferred summer and fall depths were less than 27 m.

Occurrence in Project Area and Impacts: Both juveniles and adult skates may occur within the project area during those periods in which they are expected to move inshore. No adults or juveniles were captured during monitoring. As both life stages of this species are motile, during construction they can avoid the area during periods of disturbance. Displacement to non- disturbed areas is likely. However it is also possible depending on the type of dredging done, that smaller juveniles might be entrained at the borrow area and placed upon the beach.

Winter Skate (*Leucoraja ocellata*): Juveniles and Adults ?

Life History: Winter Skates are found over a wide range extending from southern New England and the Mid-Atlantic Bight (MAB) to North Carolina. They exhibit seasonal movements by moving offshore in the summer and nearshore in the autumn. Egg deposition of winter skate occurs during the summer and fall off Nova Scotia and the Gulf of Maine. It continues into the winter (December and January) off southern New

England. The preferred substrate of this species is sand and gravel bottoms although they have been documented in areas with mud bottoms. Winter Skates are most active at nights and remain buried in depressions during the day. General depths at which they are found range from the shoreline to 111m. Adults car typically found in most abundance on sand bottoms of LIS during the spring. Trawl surveys conducted from 1984-1994 report juveniles most abundant during the spring on sand bottom in LIS. Abundance increased again in for both juveniles & adults in October and November in depths ranging from 0-9 m. and then in depths greater than 18 m in April-May.

Occurrence in Project Area and Impacts: Both juveniles and adult skates may occur within the project area during those periods in which they are expected to move inshore. No adults or juveniles were captured during monitoring. As both life stages of this species are motile, they can avoid the area during periods of disturbance due to construction by movement to non- disturbed areas is possible. It is also possible depending on the type of dredging done that due to the highly demersal nature and tendency to bury into the surface sediments that adults and juveniles might be entrained at the borrow area.

Relative long term (minimal) impacts would include a loss of habitat consisting of conversion of part of the intertidal zone to an area above high tide No significant impact to winter skate is expected during or after construction of the this project.

4.3 Prey Species

Principal prey items for EFH-designated species that have been identified as probable occupants of the Project Area are listed in Table 6. Winter and windowpane flounder are obligate bottom feeders. Sandbar sharks are also primarily bottom feeders, although they eat mostly fish. Black sea bass, summer flounder, and scup feed on benthic and pelagic organisms and, Atlantic herring, Atlantic mackerel, and bluefish are pelagic feeders.

Table 6. EFH Species and Life History Stages Likely To Be Present in Project Area.

Species	Presence in Project Area and Season				Comments
	E	L	J	A	
Atlantic sea herring			No	Possible but unlikely	Project area depths too shallow for both; project area salinity values too low for juveniles
Atlantic mackerel			No	Possible	More common offshore
Atlantic Salmon	No	No	No	No	Project area lacking freshwater run
Black sea bass			Yes SF	Possible with structure	Juveniles more common than adults

Bluefish			Possible	Possible	
Cobia			No	No	
Pollock			Possible	No	Generally rare in LIS, predominantly caught in July-August; project area is at the lower end of preferred salinities
Red hake	No	No	Yes	No	Present at the borrow area in Spring
Scup	No	Yes S	Yes SpSF	Yes SpSF	YOY juveniles more likely in nearshore zone in the fall.
Spanish mackerel	No	No	No	No	
King mackerel	No	No	No	No	
Summer flounder			Yes Sp,S,F	Yes Sp, S	
Windowpane	Yes SpSF	Yes SpSF	Yes All	Yes All	
Winter flounder	Yes W	Yes WSp	Yes SpSF	Yes All	
Sandtiger shark			Yes	Yes	
Little skate			Yes	Yes	
Winter skate			Yes	Yes	

Source: Compiled by Northern Ecological Associates, Inc. 2000.

[1] Shading = life history stage not designated

E = eggs W = winter
L = larvae Sp = spring
J = juveniles S = summer
A = adults F = fall

Table 7. Prey Species for EFH-Designated Fish Species and Life History Stages Likely To Occupy the Northport Bay Project Area.

Species	**Life History Stage**	**Principal Prey**
Bottom Feeders		
Winter flounder	Larvae, Juveniles and adults	Mostly nauplii, invertebrate eggs, polychaetes and amphipods (*e.g.*, *Ampelisca abdita*), also *Crangon*, sand dollars, and bivalves.
Windowpane	Juveniles and adults	Small crustaceans (*e.g.*, mysids and decapod shrimp) and fish larvae (hake, tomcod, other flounder, silversides).
Sandbar shark	Adults	Small bottom and pelagic fish with some mollusks and crustaceans.

Little skate	Juveniles and Adults	Primarily decapod crustaceans and amphipods
Bottom and Pelagic Feeders		
Black sea bass	Juveniles	Small benthic crustaceans and small fish.
Black sea bass	Adults	Crabs, mysids, polychaetes, caridean shrimp, and small fish.
Summer flounder	Adults	Crustaceans (*e.g.*, crabs), bivalves, marine worms, sand dollars, and a variety of fish species (other flounders, silversides, mummichog).
Scup	Juveniles	Polychaetes, amphipods, other small crustacea (copepods, mysids), small mollusks, and fish eggs and larvae.
Scup	Adults	Benthic and near bottom invertebrates, small fish.
Winter skate	Juveniles and Adults	Polychaetes, amphipods, fish
Pollock	Juveniles	Primarily crustaceans, fish, mollusks
Red hake	Juveniles	benthic, pelagic crustaceans, amphipod, fish, squid
Sand tiger shark	Juveniles and Adults	fish, crabs, squid
Pelagic Feeders		
Bluefish	Juveniles	Polychaetes, crustaceans (sand and grass shrimp), but mostly fish (bay anchovy, striped killifish, silversides).
Bluefish	Adults	Wide variety of fish species.
Scup	Larvae	zooplankton

Sources: EFH Source Documents (see references).

5.0 Impact Assessments

Placement of sand along the Asharoken shoreline is not expected to have any significant or long-term lasting effects on the “spawning, breeding, feeding, or growth to maturity” of the designated EFH species that occupy the nearshore or borrow zones. However, proposed activities would have immediate, short-term, direct and indirect impacts on EFH for some of the designated fish species and life history stages that occur in the immediate vicinity of project action areas. This section identifies direct and indirect effects that could result from beach nourishment as well as potential species-specific impacts and recommendations for minimizing these impacts (Table 8).

*The New York State Department of Environmental Conservation (NYDEC) has placed very limited dredging window on the Asharoken Storm Protection Project due to the potential to impact finfish and invertebrate species that may spawn or have early life states occurring in LIS during the fall. The DEC has stated that if it does allow dredging to occur it will only be permitted October through December. The District assessed potential impacts to the species submitted by the state and after careful about a dozen it appears that about a dozen maybe vulnerable to dredge impacts in regard to spawning or early life stages. Of these 3 were EFH species consisting of Winter and Summer Flounder and Red Hake. The District is seeking to expand this window to include September.

5.1 Direct Impacts

Bluefish, summer flounder, scup, Atlantic mackerel, sea bass, herring and black sea bass if present, are mobile species and would relocate due to mechanical, noise or turbidity distrubsance . These species should not be affected by construction because they can easily relocate to nearby unaffected areas. Windowpane, winter and summer flounder, skates, red hake, winter and little skate are highly demersal and though mobile, are less likely to move off a great distance and therefore maybe vulnerable to multiple disturbances. Skates both adult and juvenile maybe the EFH species most at risk form hopper dredging. The deflector device should greatly reduce this risk Any species spawning during or just prior to construction especially one with demersal eggs larvae or juveniles is at greatest risk during project implementation from entrainment or potentially adverse affects of high concentrations suspended particulates. There are no known areas of contamination within the borrow are, therefore significant exposure to any HTRW is not anticipated via particulate exposure is not anticipated.

Beach nourishment activities along the Asharoken shoreline has the potential to directly impact winter flounder by burying eggs and possibly juveniles in nearshore subtidal waters during sand placement. Juveniles of other demersal species including windowpane summer flounder, red hake and skates could also be impacted. Winter flounder in LIS can show spawning activity from December to April. Winter flounder egg mortality will be minimized by limiting project construction activities to non-spawning times of year (*September-December*). Mortalities of small juvenile flounder, which begin to appear on the bottom in the spring and remain near shore throughout the year, will be minimized by restricting beach nourishment to the late summer and fall, after YOY juveniles have grown and are more capable of avoiding burial or entrainment. With regard to construction techniques, placement of the sand slurry is pumped up on the beach above the high tide mark and then graded out. Direct placement of sand into the water does not generally occur. Thus, mortalities of small flounder and other juveniles with restricted movement will be minimized. Highly mobile juveniles and adults of other designated species can easily avoid any direct impacts caused by placement activity. Many species of fish including EFH species may benefit from the placement as the sand contains many organisms that are suitable prey and are disbursed into the water during the placement process.

Placement of large amounts of dredged sand will temporarily increase turbidity in the intertidal and nearshore zones on the order of 100's of meters. This increase in turbidity is not expected to cause significant impacts do to its localized nature and the mobility of species of concerned and the fact that near shore environments are often very turbid because of storms or wind events. Species that utilize these areas have the ability to survive such events. Impacts to dissolved oxygen are also not expected to be of concern because of the naturally low organic content of the placement sand and the shallow nature of the LIS nearshore which is well oxygenated from wind mixing and wave action.

Beach restoration at the Asharoken shoreline would result in the placement of large quantities of sand on the beach causing portions of intertidal and subtidal zones and their associated benthic communities to be initially buried with little to no biological baseline other than those organisms carried along with the sand. Re-colonization is expected to be rapid but duration of recovery will be dependent on the time of placement. Diversity and abundance is expected to be similar to, but not identical to preconstruction conditions at least initially, since the new substrate will not be identical to the substrate that will be covered especially since this new benthic/intertidal surface area is less likely to contain organic materials.

5.2 Indirect Impacts

Beach nourishment will have a temporary indirect effect on EFH by burying infauna and epi-fauna prey organisms underneath new sand in the intertidal and the nearshore subtidal zone. Mortality and/or burial of benthic prey organisms is not expected to have a significant impact on the feeding success of EFH species since they will re-locate to nearby undisturbed areas. Benthic feeding fish have been observed feeding on benthic invertebrates that are being delivered into the water during pumping and re-grading operations.

Benthic communities in the construction site will recover, probably within a year’s time, depending on the season of completion. If beach nourishment occurs prior to the spring recruitment of benthic organisms to intertidal and adjacent sub-tidal habitats, recovery would be quicker. Species composition may change in accordance with physical characterization of the new sand. An alteration in benthic community structure is not likely to significantly affect the quality of EFH in the LIS nearshore zone since common bottom-feeding species like winter flounder, summer flounder, windowpane, and scup are opportunistic predators and will switch from less abundant to more abundant species. Pelagic-feeding species will not be affected.

In addition, due to the increased slope of the new beach front, the intertidal zone will become significantly narrower. This is not likely to affect bottom-feeding EFH species since they feed on a wide variety of intertidal and sub-tidal prey species and the amount of area changed by the project is only a fraction of the available forage habitat. Eventually, this slope will level out under the influence of tidal action, waves and storms. Similarly, offshore displacement of the subtidal zone will not affect EFH since fish that utilize the sub-tidal habitat for feeding or spawning will simply move seaward following beach nourishment. Impacts to early life stages will be minimized by constructing the project between the prime winter and summer spawning seasons.

Impacts related to any renourishment cycles will be similar to those resulting from the initial fill but will occur to lesser degree in terms of both changes in diversity and scale.

Sand will be trucked in so there will be no dredging impacts. For all proposed Asharoken beach protection projects each renourishment cycle consists of a significantly smaller volume of fill than the initial fill , thus a smaller zone of the intertidal and littoral benthos will be affected.

Table 8. Potential Impacts and Mitigation Strategies for EFH-Designated Species (Asharoken)

Species	Life History Stage	Potential Impacts	Direct or Indirect Impact	Mitigation
Atlantic Salmon	Juveniles	Not expected to be present at the project site	N/A	
	Adults	Not expected to be present at the project site	N/A	
Pollack	Juveniles	Possible entrainment, displacement	Direct	
	Adults			
Winter flounder	Eggs	Burial/mortality of eggs in intertidal zone	Direct	Avoid spawning season (Feb-May)
	Juveniles	Burial of some fish and their prey (polychaetes, amphipods)	Direct/Indirect	Avoid early larval settlement period
	Adults	Displacement to undisturbed areas, temporary loss of infaunal food items and offshore displacement (no loss) of spawning habitat; long-term improvement of spawning habitat.	Indirect	Beach nourishment in the late summer or fall to speed recovery of benthic community, allow for recovery of spawning habitat
Windowpane	Juveniles	Burial of some fish and their prey	Direct/Indirect	Beach nourishment in the late summer or fall to speed recovery of benthic community, pump sand at low tide
	Adults	Temporary loss of infaunal food items, displacement to undisturbed areas	Indirect	Beach nourishment in the late summer or fall to speed recovery of benthic community
Summer flounder	Juveniles, Adults	Temporary loss of infaunal food items; displacement to undisturbed areas	Indirect	Beach nourishment in the late summer or fall to speed recovery of benthic community
Bluefish	Juveniles, Adults	Temporary displacement of fish and their prey (crustaceans, other fish)	Indirect	NA
Scup	Juveniles	Temporary displacement of fish, burial of some prey organisms	Indirect	Beach nourishment in the late summer or fall to speed recovery of benthic community
King Mackerel	All	Temporary displacement		
Atlantic and Spanish mackerel	Juveniles	Temporary displacement of fish and their prey (other fish)	Indirect	NA
Black sea bass	Juveniles	Burial of some prey organisms (small crustaceans), temporary displacement of fish	Indirect	Beach nourishment in the late summer or fall to speed recovery of benthic community
Atlantic herring	Juveniles	No impact	NA	NA

Red Hake	Eggs,Larvae Juveniles	Entrainment, displacement, loss, gain of prey		
Sandtiger shark	larvae	No impact	NA	NA
Cobia	Juveniles	No impact	NA	NA
Winter Skate	Juveniles	Displacement/ loss of prey	Direct/Indirect	Nourishment in fall to speed recovery
Little Skate	Juveniles	Displacement/ loss of prey	Direct/Indirect	Nourishment in fall to speed recovery

5.3 Cumulative Impacts

No significant cumulative impacts to EFH or EFH species are expected as a result of implementing the proposed action. There are no concurrent Federal or State projects being constructed in the project area or projects slated to occur in the near future. Relatively recent Hurricane Sandy related repairs (Federal) were implemented to the existing 103 project but these would not have had any significant impact to EFH issues. During construction of the proposed Asharoken Storm Damage Protection project there will be dredging and sand by- passing to the eastern section of the beach in the amount of approximately 15,000 cy This by passed sand is dredged from the Northport Power Plant channel. However, this beneficial action has been ongoing for many years on an annual basis, and is confined to a small area of the project site beach.

6.0 BIBLIOGRAPHY

Bowman, R.E., T.R. Azarovitz, E.S. Howard, and B.P. Hayden 1987. Food and distribution of juveniles of seventeen northwest Atlantic fish species, 1973-1976. NOAA Tech. Memo. NMFS-F/NEC 45. 57 p.

Chang S., P. L. Berrien, D. L. Johnson, and W. W. Morse 1999. Essential fish habitat source document: windowpane, *Scophthalmus aquosus*, life history and habitat characteristics. NOAA Tech. Memo. NMFS-NE-137, 32 pp.

Fahay, M. P., P. L. Berrien, D. L. Johnson, and W. W. Morse 1999. Essential fish habitat source document: bluefish, *Pomatomus saltatrix*, life listory and habitat characteristics. NOAA Tech. Memo. NMFS-NE-144, 65 pp.

Godcharles, M.F. and M.D. Murphy 1986. Species profiles: life histories and environmental requirements of coastal fishes and invetebrates (south Florida) --- king mackerel and Spanish mackerel. U.S. Fish Wildl. Serv. Biol. Rep. 82(11.58). U.S. Army Corps of Engineers, TR EL-82-4. 18 pp.

Gottschall, K., M.W. Johnson, and D.G. Simpson. In review. The distribution and size composition of finfish, American lobster and long-finned squid in Long Island Sound, based on the Connecticut Fisheries Division bottom trawl survey, 1984-1994. NOAA Tech. Rep.

New England Fishery Management Council (NEFMC). 1999. Amendment #11 to the Northeast Multispecies Fishery Management Plan, Amendment #9 to the Atlantic Sea Scallop Fishery Management Plan, Amendment #1 to the Monkfish Fishery Management Plan, Amendment #1 to the Atlantic Salmon Fishery Management Plan, and Components of the Proposed Atlantic Herring Fishery Management Plan, for Essential Fish Habitat, incorporating the Environmental Assessment, Vol. I. New England Fishery Management Council in consultation with the National Marine Fisheries Service.

NOAA 1999a. Guide to Essential Fish Habitat Designations in the Northeastern United States. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Regional Office, Gloucester, MA.

NOAA 1999b. Final Fishery Management Plan for Atlantic Tunas, Swordfish and Sharks. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Sustainable Fisheries, Silver Spring, MD, Vol II, April 1999.

Packer, D. B., S. J. Griesbach, P. L. Berrien, C. A. Zetlin, D. L. Johnson, and W. W. Morse 1999. Essential fish habitat source document: summer flounder, *Paralichthys dentatus*, life history and habitat characteristics. NOAA Tech. Memo. NMFS-NE-151, 88 p.

Pereira, J.J., R. Goldberg, J.J. Ziskowski, P.L. Berrien, W.W. Morse, and D.L. Johnson 1999. Essential fish habitat source document: winter flounder, *Pseudopleuronectes americanus*, life listory and habitat characteristics. NOAA Tech. Memo. NMFS-NE-138, 39 pp.

Reid, R.N., A.B. Frame, and A.D. Draxler 1979. Environmental baselines in Long Island Sound, 1972-73. NOAA Tech. Rep. NMFS SSRF-738, 31 p.

Reid, R.N., L.M. Cargnelli, S.J. Griesbach, D.B. Packer, D.L. Johnson, C.A. Zetlin, W.W. Morse, and P.L. Berrien 1999. Atlantic herring, *Clupea harengus*, life history and habitat characteristics. NOAA Technical Memorandum NMFS-NE-126. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA: 48 pp.

Sedberry, G.R. 1973. Food habits and trophic relationships of a community of fishes on the outer continental shelf. NOAA Tech. Rep. NMFS SSRF-773, 56 p.

Steimle, F.W., W.W. Morse, P.L. Berrien, and D.L. Johnson 1999a. Essential fish habitat source document: red hake, *Urophycis chuss*, life listory and habitat characteristics. NOAA Tech. Memo. NMFS-NE-133, 34 pp.

Steimle, F.W., C.A. Zetlin, P.L. Berrien, D.L. Johnson, and S. Chang 1999b. Essential fish habitat source document: scup, *Stenotomus chrysops*, life listory and habitat characteristics. NOAA Tech. Memo. NMFS-NE-149, 39 pp.

Stone, S.L., T.A. Lowery, J.D. Field, C.D. Williams, D.M. Nelson, S.H. Jury, M.E. Monaco, and L. Andreasen 1994. Distribution and abundance of fishes and invertebrates in Mid-Atlantic estuaries. ELMR Rep. No. 12. NOAA/NOS Strategic Environmental Assessments Division, Silver Spring, MD. 280 p.

Studholme, A.L., D.B. Packer, P.L. Berrien, D.L. Johnson, C.A. Zetlin, and W.W. Morse 1999. Essential fish habitat source document: Atlantic mackerel, *Scomber scombrus*, life listory and habitat characteristics. NOAA Tech. Memo. NMFS-NE-141, 35 pp.

University of Delaware. 2001. Sand Tiger Shark (*Odontaspis taurus)*. Found at http//www.ocean.udel.edu/kiosk/shark.html

U.S. Army Corps of Engineers (USACE) 2000a. Draft Environmental Assessment for Cliffwood Beach, New Jersey. Raritan Bay and Sandy Hook Bay Hurricane and Storm Damage Reduction Study, February 2000

U S. Army Corps of Engineers (USACE) 2001 The NY Distirct's BMP for the Atlantic Coast of NJ, Asbury Park to Manasquan Section Beach Erosion Control Project.

Appendix A: Essential Fish Habitat Worksheet

Action: Village of Asharoken Storm Protection and Shoreline Stabilization

1. INITIAL CONSIDERATIONS			
EFH Designations	Y	N	Species
Is it located in or adjacent to EFH	X		Study area experiences transient EFH designated species along with forage species of EFH designated species.
Is EFH designated for eggs?	X		Red hake, winter flounder, windowpane flounder, Atlantic mackerel, scup, king mackerel, spanish mackerel and cobia
Is EFH designated for larvae?	X		Red hake, winter flounder, windowpane flounder, Atlantic mackerel, scup, king mackerel, Spanish mackerel, cobia and sand tiger shark
Is EFH designated for juveniles?	X		Atlantic salmon, pollock, red hake, winter flounder, windowpane flounder, Atlantic sea herring, bluefish, Atlantic mackerel, summer flounder, scup, black sea bass, king mackerel, Spanish mackerel, cobia, sand tiger shark, winter skate and little skate
Is EFH designated for adults?	X		Atlantic salmon, pollock, red hake, winter flounder, windowpane flounder, Atlantic sea herring, bluefish, Atlantic mackerel, scup, king mackerel, Spanish mackerel, cobia, sand tiger shark, winter skate and little skate
Is there HAPC at or near project site?		X	
Does action have the potential to adversely effect EFH of species or life stages checked above to any degree?		X	

2. SITE CHARACTERISTICS	
Site Characteristics	Description
Is the site intertidal/sub-tidal/water column?	Site is intertidal;
What are the sediment characteristics?	The sediment characteristics are primarily sand, cobble and gravel.
Is there HAPC at the site, if so what type, size, characteristics?	No HAPC at the site.
What is typical salinity and temperature regime?	Salinity around the project site is normally 23-28 ppt. Winter temperature averages around 2^0C while summer temperature averages 22 º C.
What is the normal frequency of site disturbance?	Shoreline erosion through tidal action .
What is the area of impact (work footprint & far afield)?	2.4 mi. of shoreline

3. ASSESSMENT OF IMPACTS			
Impacts	Y	N	Description
Nature and duration of activity (s)			Breach nourishment. Action 5 months
Will benthic community be disturbed?	X		Benthic community immediately along the shoreline will be buried during fill activities. Recolonization of species preferential to rock bottoms is expected after cessation of construction activities. Additionally, benthic species located within the footprint of the borrow area will be removed to the fill area. Recolonization will occur following construction completion.
Will SAV be impacted?		X	No SAV in project area.
Will sediments be altered and/or sediment rates changed?	X		The intertidal zone within the project area will be modified in width and sediment type. Sand, coble gravel will become primarily sand.
Will turbidity increase?	X		Localized increased turbidity during construction. .
Will water depth change?	X		Intertidal zone will be pushed bayward in some locations. Hardening of intertidal zone
Will contaminants be released into sediments or water column?		X	Most of the material is inorganic. Contaminants have not been found in the area.
Will tidal flow, currents or wave patterns be altered?		X	MHW tide will be extended bayward. Wave patterns may change

Will ambient salinity or temperature regime change?		X	
Will water quality be altered?		X	
Will functions of EFH be impacted for:			If yes, list species, Life State and Habitat to be Impacted
Spawning		X	
Nursery		X	
Forage		X	
Shelter		X	
Will impacts be temporary or permanent?			Adverse impacts from excavating and placing fill will be temporary, lasting for period of construction
Will compensatory mitigation be used?		X	

4. DETERMINATION OF IMPACT		
		EFH Determination
Overall degree of adverse effects on EFH (not including compensatory mitigation) will be: (check the appropriate statement)		No more than minimal adverse effect on EFH- there is no need for further assessment. This worksheet is sufficient for consultation.
	X	Adverse effect on EFH is not substantial-use contents of this form to develop written assessment
		Adverse effect on EFH substantial-a written assessment and methods to avoid or minimize impacts must be provided expanding upon the impacts revealed in this form. Typically, this degree of impact will require an expanded consultation

Appendix F

Coastal Zone Management Act

NEW YORK STATE COASTAL MANAGEMENT PROGRAM

CONSISTENCY DETERMINATION

Project: Village of Asharoken, New York, Coastal Storm Risk Management Project.

The proposed plan for Asharoken Beach includes the dredging and placement of approximately 600,000 cy of fill material to rebuild the beach with a 50' wide berm and dune and the construction of three rock groins on the Western end of the project. The dune will be planted. The source of the initial sand for the beachfill will be a nearby Long Island Sound offshore borrow area . Periodic renourishment is anticipated at a frequency of 80,000 cy every 5 years with the renourishment sand trucked in from a certified upland source. Another re-nourishment source will be sand annually dredged from the LILCO power station inlet to the east and "by passed" to the project site (@15,000 cy annually).

A number of reasonable non-structural measures were evaluated in regard to implementing a plan to protect residential property and infrastructure from future erosion and storm damage. None of these measures were accessed as suitable solutions. Assessed not structural measures consisted of:

Buy-outs - not cost effective

Zoning - not within USACE prevue, not cost effective

Flood Proofing - not effective for most houses that face the LIS which are subject to erosion and wave attack.

House raising - not cost effective, would not prevent erosion.

Relocation - not cost effective, would not prevent erosion.

Road raising - not cost effective, would not prevent erosion or storm damage to homes

Applicant: U.S. Army Corps of Engineers, New York District.

Applicable Policies: Based on a review of the Coastal Management Program policies for New York, 20 were found to be applicable to the proposed project. These policies are listed below.

Consistency Determination: **<u>Consistency Determination:</u>** All of the applicable policies were evaluated with respect to the Project's consistency with their stated goals. The Project has been found to be consistent with each policy.

The construction of this storm damage reduction project will serve to protect the sole access roadway to Eaton's Neck and thus the community and allows the existing commercial uses and public infrastructure to continue to function within a safer and more secure environment. The nourishment of the beach will also improve the recreational opportunities of the beach as well as improve safety in regard to beach usage in areas that front previously constructed bulkheads/seawall. Therefore, the New York District has determined that the proposed project would be consistent with the 20 applicable policies that were deemed applicable and evaluated with respect to the project's consistency with the stated goals.

POLICY 2 FACILITATE THE SITING OF WATER-DEPENDENT USES AND FACILITIES ON OR ADJACENT TO COASTAL WATERS.

Determination: The Asharoken project is water dependent, as it involves the construction of erosion protection structures dependent on tidal and wave influences. As the use of the project site will not change with construction, existing facilities or services will be sufficient to support this project and the proposed activities are compatible with adjacent properties. The project will improve the existing environmental quality of the site, including the protection of coastal marsh resources in the western portion. Construction of the project will not have a significant adverse impact to water quality or biota, however short term localized impacts to these resources are anticipated. It is therefore determined that this project is consistent with this policy.

POLICY 7 SIGNIFICANT COASTAL FISH AND WILDLIFE HABITATS WILL BE PROTECTED, PRESERVED, AND WHERE PRACTICAL, RESTORED SO AS TO MAINTAIN THEIR VIABILITY AS HABITATS.

Determination: The project site consists of beach and nearshore areas along the southern shoreline of Long Island Sound, and is adjacent to residential development as well as estuarine wetlands of national significance. The project area includes the offshore borrow site from which sand will be dredged and placed upon the beach. The project beach/shoreline has been regularly disturbed by various construction programs built to protect the shoreline, adjacent property, infrastructure and natural areas from erosion and storm damage.

The purpose of this project is to restore eroded coastal beach and berm habitat, which is in direct accord with this policy. While some excavation may occur during preparation for groin placement, dredging filling and grading will be the major activities at the project site. All aspects of construction including dredging will be conducted using best management practices to minimize environmental impacts. This includes dredging and placement during the season when impacts to spawning fish will be minimized, according to the NYSDEC. The project plan will include planting/seeding of native vegetation which will further restore lost ecological habitat functions as well as and help stabilize the dune strengthening it’s protective properties.

This policy requires that a narrative for each significant habitat be provided to aid in consistency determination. The following is a narrative for the project site, noting the five required items.

(1) The project site is located along the shoreline of Long Island Sound at Asharoken Beach, Asharoken New York. (2) Many different species of fish, birds, and other wildlife may utilize the project site and vicinity. These species are described in the existing conditions of the environmental assessment accompanying this determination. (3) Excavation, filling, grading and stone placement will be implemented and will impact the existing habitat. All work will be undertaken using best management practices to minimize impacts to wildlife and habitats. Any construction related adverse impacts to terrestrial and aquatic species are expected to be minor and short term. 4) The results of the completed project are expected to be beneficial to both species and habitat functions of the site. Prevention of future erosion will decrease potential threats to property, human safety and natural areas including the reduction of episodic fine sediment input to near shore waters know to be deleterious to many forms of sessile bottom dwelling organisms. 5) Existing conditions including the fish and wildlife communities, tidal patterns, and human use patterns at the project sites were observed, and assessed and incorporated the selection process of the recommended plan.

The Asharoken Storm Project has been found to be consistent with and furthering the goals of this policy.

The selected plan will not have significant adverse impacts to species within the Project area. Dredging will be accomplished outside of the most sensitive spawning windows. Turbidity and activity from construction activities will displace resident fish to localities elsewhere in the Sound. The temporary impacts to fish and benthic organisms will be localized. Habitat would be temporarily affected during beach fill placement, as elevated suspended sediment levels may impact visual feeding efficiency, and may also affect respiratory efficiency likely causing displacement of mobile individuals. Sessile benthic invertebrates will be buried or entrained and ultimately lost during construction. These areas will recover within a relatively short period of time. Dredging and placement activities will provide a certain level of benefit to those species able to feed on the organisms dispersed into the water column and exposed on the surface during construction activities.

The adjacent wetlands will be protected from construction activities via best management practices including and environmental protection plan. The piping plovers, a federally threatened species will not be directly affected as construction will occur outside its residence time in NY State. The restored, enlarged beach area will be beneficial to this species. This project is compatible with this policy.

POLICY 9 EXPAND RECREATIONAL USE OF FISH AND WILDLIFE RESOURCES IN COASTAL AREAS BY INCREASING ACCESS TO EXISTING RESOURCES, SUPPLEMENTING EXISTING STOCKS, AND DEVELOPING NEW RESOURCES.

Determination: Construction of the project will augment the use of the project site as a water oriented community resource and expand recreational use and access as well as enhance the habitat of the project site, promoting productivity and use by various aquatic and terrestrial species. Placement of groins will increase productivity and biodiversity and improve recreational fishing opportunities. The project supports the use of the site as a water oriented recreational area which includes fishing and boating, as well as non consumptive activities such as swimming, walking, sun bathing and wildlife/ bird watching. The project is consistent with this policy.

POLICY 11 BUILDINGS AND OTHER STRUCTURES WILL BE SITED IN THE COASTAL AREA SO AS TO MINIMIZE DAMAGE TO PROPERTY AND THE ENDANGERING OF HUMAN LIVES CAUSED BY FLOODING AND EROSION.

Determination: The only structures to be sited and constructed with in the Asharoken project site are 3 stone groins as described in the project plans as well as several dune crossover/beach access structures which includes access for the handicapped. The placement of these structures will not represent an increased potential for damage to property or endangerment to human life during flooding or other storm events. The groin structures will serve to protect adjacent property and decrease hazards to humans by helping to maintain beach and dune and decrease flooding potential, erosion damage and threats to human life.

The project is consistent with this policy.

POLICY 12 ACTIVITIES OR DEVELOPMENT IN THE COASTAL AREA WILL BE UNDERTAKEN SO AS TO MINIMIZE DAMAGE TO NATURAL RESOURCES AND PROPERTY FROM FLOODING AND EROSION BY PROTECTING NATURAL PROTECTIVE FEATURES INCLUDING BEACHES, DUNES, BARRIER ISLANDS AND BLUFFS.

Determination: The purpose of constructing this project is to restore natural barriers (beach and berm) such that these restored features once again provide inherent levels of protection to inland habitats and residential properties from flooding and erosion. Stabilization structures (groins) will help to maintain existing and constructed beaches, dunes will protect inland areas from flooding and erosion. Construction of the project will help to maintain the coastal area including the marshes to the south of the project site. Best management practices will be used to minimize the impacts to natural habitats from construction procedures. Temporary impacts to both terrestrial and aquatic habitats and associated biota are anticipated with full recovery within 1 to two years.

The project is consistent with this policy.

POLICY 13 THE CONSTRUCTION OR RECONSTRUCTION OF EROSION PROTECTION STRUCTURES SHALL BE UNDERTAKEN ONLY IF THEY HAVE A REASONABLE ROBABILITY

OF CONTROLLING EROSION FOR AT LEAST THIRTY YEARS AS DEMONSTRATED IN DESIGN AND CONSTRUCTION STANDARDS AND/OR ASSURED MAINTENANCE OR REPLACEMENT PROGRAMS.
Determination: The present emergency action provides immediate protection, has an engineered project life of 50 years and provides for regular project maintenance to ensure effectiveness.

The project is consistent with this policy.

POLICY 14 ACTIVITIES AND DEVELOPMENT, INCLUDING THE CONSTRUCTION OR RECONSTRUCTION OF EROSION PROTECTION STRUCTURES, SHALL BE UNDERTAKEN SO THAT THERE WILL BE NO MEASURABLE INCREASE IN EROSION OR FLOODING AT THE SITE OF SUCH ACTIVITIES OR DEVELOPMENT, OR AT OTHER LOCATIONS.
Determination: The erosion protection structures have been designed to prevent/minimize erosion and flooding at the project site and construction/existence of this project will not increase flooding or erosion at the project site or at any other areas flood or erosion protection at other locations.

Determination: This project is consistent with this policy.

POLICY15 Mining, excavation or dredging in coastal waters shall not significantly interfere with the natural coastal processes which supply beach materials to land adjacent to such waters and shall be undertaken in a manner which will not cause an increase in erosion of such land.

Determination: The purpose of constructing this project is to restore natural barriers (beach and berm) such that these restored features once again provide inherent levels of protection to inland habitats and residential properties and essential infrastructure. Also, under existing conditions beach erosion is substantial, coastal processes are not supplying adequate material to the beach to prevent erosion. The project seeks to decrease the loss of littoral materials by placing groins to reduce this loss and allow future backpasing of accreted materials. Sand will be removed from a shoal area such that with careful dredging of this elevated area will not leave a significant depression and analysis of the proposed dredging plan has not revealed any anticipated increase in wave activity, angle of attack or other erosional forces .

This project is consistent with this policy.

POLICY 16 PUBLIC FUNDS SHALL ONLY BE USED FOR EROSION PROTECTIVE STRUCTURES WHERE NECESSARY TO PROTECT HUMAN LIFE, AND NEW DEVELOPMENT WHICH REQUIRES A LOCATION WITHIN OR ADJACENT TO AN EROSION HAZARD AREA TO BE ABLE TO FUNCTION, OR EXISTING DEVELOPMENT; AND ONLY WHERE THE

PUBLIC BENEFITS OUTWEIGH THE LONG TERM MONETARY AND OTHER COSTS NCLUDING THE POTENTIAL FOR INCREASING EROSION AND ADVERSE EFFECTS ON NATURAL PROTECTIVE FEATURES.

Determination: The erosion protection structures are necessary to support protection of essential infrastructure, residences, coastal features and habitats located adjacent to the LIS. Without installation of erosion control structures it is expected that the current rates of erosion will continue to cause significant damage to vital roadways and property and includes serious threats to human safety. Unchecked erosion will also impact significant wildlife habitats of the back bay. The public benefits outweigh the costs in that there will be a significant reduction in the potential threat to human life and property by permitting continued access and egress to and from Eaton's Neck by the residents as well as emergency and public service vehicles. This project is consistent with this policy.

POLICY 17 NON-STRUCTURAL MEASURES TO MINIMIZE DAMAGE TO NATURAL RESOURCES AND PROPERTY FROM FLOODING AND EROSION SHALL BE USED WHENEVER POSSIBLE.

Determination: The major component of this shore protection project is beach fill, a non structural measure.

This project is consistent with this policy.

POLICY 19 PROTECT, MAINTAIN, AND INCREASE THE LEVEL AND TYPES OF ACCESS TO PUBLIC WATER-RELATED RECREATION RESOURCES AND FACILITIES.
Determination: The project is restoration of beach and berm. Restoring the beach to increase storm and erosion protection also creates an expanded area for recreational activities. Expenditure of public funds will require provision of expanded parking facilities and an increase in public accessibility points and will include ADA compatible access.

This project is consistent with this policy.

POLICY 20 ACCESS TO THE PUBLICLY-OWNED FORESHORE AND TO LANDS IMMEDIATELY ADJACENT TO THE FORESHORE OR THE WATER'S EDGE THAT ARE PUBLICLY-OWNED SHALL BE PROVIDED AND IT SHALL BE PROVIDED IN A MANNER COMPATIBLE WITH ADJOINING USES.
Determination: Where best suited, public access accommodations will be provided in a manner compatible with adjoining uses. Access to publicly owned lands will be safeguarded.

This project is consistent with this policy.

POLICY 21 WATER-DEPENDENT AND WATER-ENHANCED RECREATION WILL BE ENCOURAGED AND FACILITATED, AND WILL BE GIVEN PRIORITY OVER NON-WATER-RELATED USED ALONG THE COAST.
Determination: The project will restore the beach and protect and enhance access to it. Parking along the project site will be expanded. Water related recreational use is consistent with the project's purpose of preserving, enhancing, and restoring coastal resources. No boat launching facilities are located within project sites, however kayaks and canoes can access the water from the site and restoration of the beach will enhance this activity. No accepted water related uses are expected to be adversely affected. Expanded parking and access features will encourage greater use of these recreational areas.

The project is consistent with this policy.

POLICY 22 DEVELOPMENT, WHEN LOCATED ADJACENT TO THE SHORE, WILL PROVIDE FOR WATER-RELATED RECREATION, WHENEVER SUCH USE IS COMPATIBLE WITH REASONABLY ANTICIPATED DEMAND FOR SUCH ACTIVITIES, AND IS COMPATIBLE WITH THE PRIMARY PURPOSE OF THE DEVELOPMENT.
Determination: The project may be considered "development" of the shoreline and in doing so provides for active and passive water-related recreational use of the site which is compatible with the project's purpose.

Therefore it has been determined that the project is consistent with this policy.

POLICY 25 PROTECT, RESTORE OR ENHANCE NATURAL AND MAN-MADE RESOURCES WHICH ARE NOT IDENTIFIED AS BEING OF STATEWIDE SIGNIFICANCE, BUT WHICH CONTRIBUTE TO THE OVERALL SCENIC QUALITY OF THE COASTAL AREA.
Determination: The project will preserve and restore shorefront beach habitat, enhancing a highly eroded area that includes sections of damaged bulkhead. The scenic coastal environment of Asharoken is important to all who reside or visit there. Its restoration and protection maintains this essential natural resource. The project will enhance and maintain these scenic resources of this section of Long Island Sound shoreline. As this area is already heavily affected by bulk heading and the remnants of old groins and other erosion protection structures additional of the new rock groins will not detract from the scenic quality of the project site.

This project is found to be consistent with and furthers the goals of this policy.

POLICY 30 MUNICIPAL, INDUSTRIAL, AND COMMERCIAL DISCHARGE OF POLLUTANTS, INCLUDING BUT NOT LIMITED TO, TOXIC ANDHAZARDOUS SUBSTANCES, INTO COASTAL WATERS WILL CONFORM TO STATE AND NATIONAL WATER QUALITY STANDARDS.

Determination: Pollutant discharge is not anticipated as a result of this project. Best management practices including an environmental protection plan regarding construction equipment, fueling sources etc will be implemented to prevent leakage, spills and contaminations etc. The District has prepared and Environmental Assessment that contains the appropriate analysis and regulatory documentation as required by NEPA including a NY state water quality certificate, an HTRW report/investigation and Clean Air Act State Implementation Plan. No significant discharges of HTRW are anticipated via this project.

Therefore the project is consistent with this policy.

POLICY 35 DREDGING AND FILLING IN COASTAL WATERS AND DISPOSAL OF DREDGED MATERIAL WILL BE UNDERTAKEN IN A MANNER THAT MEETS EXISTING STATE PERMIT REQUIREMENTS AND PROTECTS SIGNIFICANT FISH AND WILDLIFE HABITATS, SCENIC RESOURCES, NATURAL PROTECTIVE FEATURES, IMPORTANT AGRICULTURAL LANDS, AND WETLANDS.

Determination: The Asharoken project includes offshore dredging, beach fill which will cover areas of the nearshore and intertidal zone. Approximately 600,000 cubic yards will be dredged (foot print approximately 55 ac). The dredged sand will be placed on the beach from mean high water (MHW) to the toe of fill which will cover approximately 74 ac. These operations will temporarily impact fish and wildlife and their habitats, localized to the immediate project site and vicinity. All construction actions will be in compliance with state and federal regulations including NEPA and NYSDEC permit conditions. This includes clean, compatible sand to be used as fill and as needed, best management plans to minimize all impacts to significant habitats, flora, fauna, scenic resources and protective features. Dredging activities will be consistent with permit conditions including dredging windows which will provide protection to sensitive species, including summer spawning fish and the piping plover. All construction related adverse impacts are expected to be localized and short term, and full recovery to preconstruction conditions at both the offshore area and the placement site are expected.

The project is consistent with this policy.

POLICY 38 THE QUALITY AND QUANTITY OF SURFACE WATER AND GROUNDWATER SUPPLIES WILL BE CONSERVED AND PROTECTED, PARTICULARLY WHERE SUCH WATERS CONSTITUTE THE PRIMARY OR SOLE SOURCE OF WATER SUPPLY.

Determination: The project will not impact ground water. Surface waters do not constitute primary or sole source water supplies. However LIS surface waters will be temporarily affected on a localized scale by construction measures. The relatively shallow near shore waters of the project site are relatively turbid due to wind mixing and resuspension of nearshore fine particles. Any additional turbidity due to the project actions will be temporary and localized.   Sand fill will not significantly impact any surface water or ground water parameters resources in the long term. Impact such as localized increases turbidity will minimized by best management practices such as maximizing construction actions during low tide and strictly adhering to all best management practices. These impacts created by construction of the project are similar to those naturally occurring through coastal storms and in fact are of a much smaller magnitude because they are so localized.

The project is consistent with this policy.

POLICY 41 LAND USE OR DEVELOPMENT IN THE COASTAL AREA WILL NOT CAUSE NATIONAL OR STATE AIR QUALITY STANDARDS TO BE VIOLATED.
Determination: No State Air Quality Standards will be violated with the construction of this project. Final emissions calculations will be computed when the construction plans are finalized.   However, due to the fact that Suffolk County NY is a severe non-attainment area there is no anticipated exceedence of deminimus trigger levels from any of the controlled pollutants. With the final emissions, construction plans will be coordinated with the State and configured so as not to violate State Laws. There are no long-term emissions expected from this project. This project is consistent with this policy.

The project is consistent with this policy.

POLICY 44 **PRESERVE AND PROTECT TIDAL AND FRESHWATER WETLANDS AND PRESERVE THE BENEFITS DERIVED FROM THESE AREAS.**
Determination: The project (beach) site is only a short distance from Northport Bay and wetland habitats. Construction of the project will be conducted in such a way using best management practices as to protect these areas from impact during construction. These practices will include restrictive, protective covenants for storage of equipment and fuel together with regulations preventing damage to wetlands by vehicle activity, runoff from the project site or any other kind of contaminant or pollutant input. Rebuilding the beach will decrease the frequency of overwash events which have filled in proximal area's which have since been subject to invasive *phragmites of little habitat value in regard to marsh productivity. The project is consistent with this policy.*

LONG ISLAND SOUND COASTAL MANAGEMENT PROGRAM POLICIES

Project: Village of Asharoken, New York, Coastal Storm Damage Reduction Project.

The proposed plan for Asharoken Beach includes the dredging and placement of approximately 600,000 cy of fill material to rebuild the beach with a 50' wide berm and dune and the construction of three rock groins on the Western end of the project. The dune will be planted. The source of the initial sand for the beachfill will be a nearby Long Island Sound offshore borrow area . Periodic renourishment is anticipated at a frequency of 80,000 cy every 5 years with the renourishment sand trucked in from a certified upland source. Another re-nourishment source will be sand annually dredged from the LILCO power station inlet to the east and "by passed" to the project site (@15,000 cy annually).

Applicant: U.S. Army Corps of Engineers, New York District.

Applicable Policies: Based on a review of the LIS Coastal Management Program policies for New York, 11 policies and sub-policies were found to be applicable to the proposed project. These policies are listed below.

Consistency Determination: All of the applicable policies were evaluated with respect to the Project's consistency with their stated goals. The Project has been found to be consistent with each policy and the proposal will be conducted in a manner consistent to the maximum extent practicable with the LIS CMP.

Policy 1: **Foster a pattern of development in the Long Island Sound coastal area that enhances community character, preserves open space, makes efficient use of infrastructure, makes beneficial use of a coastal location, and minimizes diverse effects of development.**

1.1 ***Concentrate development and redevelopment in or adjacent to traditional waterfront communities.***

Determination: The project will serve to stabilize the existing infrastructure including protection of residential property. In the without-project condition, erosion west of the power plant jetties was forecast to continue at an average accelerated rate about 50 percent greater than the regional average rate. The continued erosion will further reduce the width and elevation of the down drift beaches causing continued damages to existing bulkheads and even a need to construct more bulkheads. With or without bulkheads, the erosion will continue to cause accelerated land losses, which would increase the risk of damage to nearby residences and reduce community character, open space and recreational use of the beach. Therefore, it has been determined that the project conforms to this sub-policy.

1.3 ***Protect stable residential areas.***
Determination: Along with the potential possibility of a breach, the Asharoken shoreline west of the power station continues to erode which contributes to failure of existing bulkheads and loss of any beach fronting them. The erosion has been accelerated due to the presence of the power plant jetties. The preferred project alternative will protect existing homes, the essential roadway and utilities. Therefore, the project conforms to this sub-policy.

1.4 ***Maintain and enhance natural areas, recreation, open space, and agricultural lands.***
Determination: The proposed alternative will decrease beach/berm erosion and help rebuild the beach, maintain the natural areas including the beach, bay marshes and recreational open space. By restoring the beach the project will also enhance the aesthetics of the site. The project is consistent with this sub-policy.

1.5 ***Minimize adverse impacts of new development and redevelopment.***
Determination: The project will incorporate Best Management Practices during all phases of construction minimizing any impacts related to redevelopment. Also, the completed project will significantly decrease erosion and buffer impacts from episodic storms etc. including the risk of a breach and resulting loss of natural resources as well residences. Therefore, the project is consistent with this sub-policy.

Policy 2: **Preserve historic resources of the Long Island Sound coastal area.**
Determination: Based on a Phase I Cultural Resources survey conducted for the project, there are no significant historic or archaeological resources within the project area, thus no cultural or historic resources will be affected. Thus the project is consistent with this policy.

Policy 3**: Enhance visual quality and protect scenic resources throughout Long Island Sound.**

3.1 ***Protect and improve visual quality throughout the coastal area.***
Determination: The eroding beaches and failing bulkheads have impaired the visual quality of the project area. By rebuilding the beach the proposed project will improve the scenic quality of the shore front.

3.2 ***Protect aesthetic values associated with recognized areas of high scenic quality.***

Determination: The aesthetics of the project area will be greatly improved by rebuilding the beach and dune.

Policy 4 **Minimize loss of life, structures and natural resources from flooding and erosion.**

4.*1* ***Minimize losses of human life and structures from flooding and erosion hazards*****.**

Determination: The project provides storm/flooding protection to residences and utilities and infrastructure. The chosen alternative will provide the best level of protection for citizens and property while minimizing adverse environmental impacts. Thus the project complies with this policy. The project is located in an established residential area, which precludes relocation of the existing road, utilities and potentially adjacent residences. The preferred alternative optimizes providing the highest level of protection while minimizing adverse environmental impacts. Therefore, the project complies with this policy.

4.2 ***Preserve and restore natural protective features.***

Determination: The preferred alternative is designed to decrease erosion and help maintain a protective beach buffer. Groins are placed to decrease the loss of sand as well as facilitate back passing of captured sand. Ultimately, the project will maintain the beach and project property and infrastructure. Thus, the project is consistent with this sub-policy.

4.5 ***Ensure that expenditure of public funds for flooding and erosion control projects results in a public benefit.***

Determination: Implementation of the preferred alternative will protect an essential roadway and protect public utilities including emergency services. The project will also greatly improve the beach aesthetics and recreational functionality. Therefore this project is consistent with this policy.

4.6 ***Consider sea level rise when sitting and designing projects involving public expenditures.***

Determination: The project as formulated has a 50-year project life and is designed to accommodate expected sea level rise. Therefore, the project is consistent with this policy.

Policy 5: **Protect and improve water quality and supply in the Long Island Sound coastal area.**

5.1 ***Prohibit direct or indirect discharges, which would cause or contribute to contravention of water quality standards.***

Determination: Project construction processes including storage and fueling procedures will utilize agency mediated regulatory guidelines and Best Management Practices including an HTRW protection plan will minimize the potential for spills or exposure to any potential contaminants or other hazardous materials. The completed project will significantly decrease erosion thus decreasing the input of surface or soil related pollutants or fine sediment material known to degrade near shore areas. The preferred alternative supports this policy.

5.2 ***Manage land use activities and use best management practices to minimize nonpoint pollution of coastal waters.***
Determination: An erosion control plan will be developed and implemented during construction to minimize sedimentation to the sound. Additionally, an oil spill, HTRW contingency plan will be prepared for the construction equipment. Therefore, the project is consistent with this sub-policy.

5.3 ***Protect and enhance the quality of coastal waters.***
Determination: The preferred alternative supports this sub-policy by decreasing erosion thus minimizing the introduction of soils and potential contaminants into the Sound from surrounding properties, including the potential for inputs of toxic household material that might occur from storm damage to residences.

Policy 6: **Protect and restore the quality and function of the Long Island Sound ecosystem.**

6.1 ***Protect and restore ecological quality throughout Long Island Sound.***
Determination: The project will contribute to improvements of local water quality by reducing the potential of upland soil erosion and ensuing sedimentation within the shallow surface waters of project area. Storm damage protection also decreases the potential for input of house hold contaminants into the Sound that could result from flooding/damage of residences.

6.2 ***Protect and restore Significant Coastal Fish and Wildlife Habitats.***
Determination: Increased levels of storm protection will decrease the likelihood of significant infilling of the adjacent marshes of Northport Bay and the propagation of invasive Phragmites. The restored beach and berm will decrease the potential for upland erosion and sedimentation of nearshore waters. Dredging and placement will have temporary adverse impacts on the benthos and finfish of the borrow area and the intertidal and littoral areas of the placement site. However, monitoring of these types of impact areas has shown that these areas recover within 6 months (intertidal) to 2 years (borrow area) depending on the location and the previously established communities. These are temporary relatively localized impacts are compensated for by the existence/availability of similar habitats regional in scope.

6.3 ***Protect and restore tidal and freshwater wetlands*.**
Determination: The selected alternative is not expected to have any direct impacts to tidal wetland areas. However, the standard procedures of using Best Management Practices will minimize any unanticipated wetland impacts. The completed project will

decrease the spread of invasive species (Phragmites) on the adjacent shoreline of Northport Bay. Therefore, the project is consistent with this sub-policy.

6.4 ***Protect vulnerable fish, wildlife and plant species, and rare ecological communities.***
Determination: The selected plan will not have significant adverse impacts to species within the Project area. Dredging will be accomplished outside of the most sensitive spawning windows. Turbidity and activity from construction activities will displace resident fish to localities elsewhere in the Sound. The temporary impacts to fish and benthic organisms will be localized. Habitat would be temporarily affected during beach fill placement, as elevated suspended sediment levels may impact visual feeding efficiency, and may also affect respiratory efficiency likely causing displacement of mobile individuals. Sessile benthic invertebrates will be buried or entrained and ultimately lost during construction. These areas will recover within a relatively short period of time. Dredging and placement activities will provide a certain level of benefit to those species able to feed on the organisms dispersed into the water column and exposed on the surface during construction activities.

The adjacent wetlands will be protected from construction activities via best management practices including and environmental protection plan. The piping plovers, a federally threatened species will not be directly affected as construction will occur outside its residence time in NY State. The restored, enlarged beach area will be beneficial to this species. This project is compatible with this policy.

Policy 7: ***Protect and improve air quality in the Long Island Sound coastal area.***

7.1 ***Control or abate existing and prevent new air pollution.***
Determination: An air quality analysis will be completed for the project. Based upon the completed analysis, the emissions from the project are considered to have an insignificant impact on the regional air quality, and according to 40 CFR 93.153 (f) and (g) the proposed project is presumed to conform to the State Implementation Plan.

7.4 ***Limit sources of atmospheric deposition of pollutants to the Sound, particularly from nitrogen sources.***
Determination: An air quality analysis was completed for the project. Based upon the completed analysis, the emissions from the project are considered to have an insignificant impact on the regional air quality, and according to 40 CFR 93.153 (f) and (g) the proposed project is presumed to conform to the State Implementation Plan. See Policy 7.1

Policy 8: ***Minimize environmental degradation in the Long Island Sound coastal area from solid waste and hazardous substances and wastes***

8.2 **Manage hazardous wastes to protect public health and control pollution.**

See policy 5. All project/construction activities will be governed by an environmental protection plan and SOP, including the HAZMAT plan that will be developed in the next planning phase of the project

8.3 ***Protect the environment from degradation due to toxic pollutants and substances hazardous to the environment and public health.*** The environmental protection plan will have contingencies to cover any potential contamination contingencies as well as best management plans to minimize potential hazards, spills etc.

8.4 ***Prevent and remediate discharge of petroleum products.***
Determination: An oil spill prevention plan outlining precautionary measures to be taken during construction and rapid responsiveness strategies should an accidental oil spill occur will be developed. Petroleum spills and clean up strategies will developed for the project and located in the Hazardous material

8.5 ***Transport solid waste and hazardous substances and waste in a manner which protects the safety, well-being, and general welfare of the public; the environmental resources of the state; and the continued use of transportation facilities.***
Determination: All hazardous materials will be regulated under the project HTRW guidelines and Best Management practices developed in the project SOP.

Policy 9*:* **Provide for public access to, and recreation use of, coastal waters, public lands, and public resources of the Long Island Sound coastal area.**

9.1 ***Promote appropriate and adequate physical public access and recreation throughout the coastal area.***
The Asharoken project includes a project specific Public Access plan. Five public access walk overs will constructed, one at every half mile along the project reach.

Policy 10*:* **Protect Long Island Sound's water-dependent uses and promote siting of new water-dependent uses in suitable locations.**

10.1 ***Protect existing water dependent uses.***

Determination: The rebuilding and stabilizing of Asharoken beach will protect/preserve all water dependent uses generally associated with the utilization of a residential recreational beach. The project is compatible with this policy

10.3 ***Allow for development of new water dependent uses outside of maritime centers.***

Determination: The restoration of the beach will make access to the water safer along the revetment of the 103 area as well as increase the usable beach surface appropriate for most recreational activities typical of beaches.

Policy 11 **Promote sustainable use of living marine resources in Long Island Sound**

11.2 ***Provide for commercial and recreational use of the Sound's finfish, shellfish, crustaceans and marine plants.***

Determination: The rebuilding of Asharoken beach and construction of groins will cause temporary localized impacts to the benthic and finfish communities of the dredging and placement site. The nearshore/intertidal communities are anticipated to recover within 1 year. The borrow area may take a somewhat longer recolonization period (1-2 years) as it is not as dynamic an environment as the nearshore/intertidal. Once re-colonization has begun at the intertidal and nearshore, the overall diversity and of the finfish and invertebrates will increase with the addition of the groins which add new types of spacial habitat to the nearshore ecosystem. Many species will benefit from the existence of the groins including lobster, black fish and sea bass.. The restored beach and new groins will offer enhanced access to shoreline fishing under safer conditions promoting and enhancing recreational (surf) fishing.

11.4 ***Promote recreational use of marine resources.***

Determination: The rebuilding and expansion of Asharoken beach and construction of groins will provide enhanced recreation opportunities and promote utilization of the beach for a variety of recreational activities including passive activities as sunbathing/walking, better safer access to waterside activities such as fishing swimming and personal watercraft usage (kayaks, canoes etc).

Appendix G

HTRW

DRAFT

APPENDIX D

ENVIRONMENTAL ASSESSMENT

AND

HAZARDOUS, TOXIC AND RADIOLOGICAL WASTE STUDY (HTRW)

APPENDIX D

A. INTRODUCTION

1.0 PURPOSE AND GOAL

As part of North Shore of Long Island, New York, Storm Damage Protection and Beach Erosion Control Reconnaissance Study, an Environmental Assessment and a Hazardous, Toxic and Radiological Waste Study were performed for the North Shore study area.

Federal statutes and regulations require, as an element of project planning, the identification of significant environmental resources and mitigation of adverse impacts to such resources within the study area resulting from project activities. The goal of the Environmental Assessment is to provide a summary of the significant environmental resources known to exist on the north shore of Long Island, with particular emphasis on the Bayville and Asharoken Beach areas.

An additional requirement of project planning is an investigation performed to identify the existence of and potential for Hazardous, Toxic and Radioactive Waste (HTRW) contamination that will impact the North Shore Long Island Storm Damage Protection and Beach Erosion Control project corridor. Guidance for the investigation is provided by Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (ASTM Standard E-1527-94).

B. ENVIRONMENTAL ASSESSMENT

1.0 SCOPE

This Appendix identifies significant environmental resources found on Long Island's north shore. Significant resources are identified as far west as Little Neck Bay and as far east as Fishers Island (see Figure D-1). Additional detail is provided with regard to the resources located in the two proposed project areas, Bayville and Asharoken Beach.

The State of New York recently published the draft report of its Long Island Sound Coastal Management Program (NYSDOS 1994b). This document combined with a companion study published by the Long Island Regional Planning Board (LIRPB 1993) provide a recent comprehensive review of the environmental resources of both the Bayville/Asharoken Beach areas and the north shore in general. Therefore, these documents serve as the primary sources of data for this Appendix. Specific citations are provided only for those data reported in other sources. The following individuals/agencies were contacted for additional data or to verify the accuracy of the data reported in the Coastal Management Program report:

- New York State Department of State, Division of Coastal Resources and Waterfront Revitalization, for information regarding significant changes, if any, that were made to the Coastal Management Program report after publication of the draft version.

- New York State Natural Heritage Program, for information regarding endangered, threatened or rare species.

- U.S. Fish and Wildlife Service, National Wildlife Refuge program, for information regarding the areas on Long Island's north shore designated as Refuges.

2.0 ENVIRONMENTAL SETTING

Physically, Long Island is dominated by glacial features resulting from the advance and retreat of two separate ice sheets. The most prominent of these features are two terminal moraines that mark the extent of the glaciers' forward progress. The physical characteristics of the north shore of the island are most closely associated with the younger, and more northerly, of the two moraines. This moraine, referred to as the Harbor Hill moraine, extends from Brooklyn in the west to Orient Point in the east.

The northern shoreline of Long Island is most easily separated into two provinces: the "necks" section and the "bluffs" section. The "necks" section comprises the western half of the north shore and is characterized by numerous bays and harbors that separate irregularly shaped headlands (or necks) projecting north into Long Island Sound. The Bayville and Asharoken Beach project areas are centrally located within this province. The "bluffs" section, comprising the eastern half of the north shore, is characterized by a more regular shoreline with much smaller headlands, and bluffs that gradually decrease in height from west to east. The "necks" and "bluffs" sections converge in the area of Port Jefferson.

3.0 BIOLOGICAL RESOURCES

This section identifies significant biological resources known to exist along the north shore of Long Island. This information is presented in two parts. The first part identifies resources found in areas other than the Bayville and Asharoken Beach project areas, while the second focuses on the resources found in the project areas.

3.1 North Shore

3.1.1 Threatened or Endangered Species

The following is a list of species that the federal government and/or the State of New York have designated as threatened or endangered and that have been observed at one or more locations along the north shore of Long Island (NY Natural Heritage Program 1995, NYS DEC 1993).

Species	Status	Location(s)
Kemp's ridley sea turtle *Lepidochelys kempii*	Endangered (US and NY)	Bays and marsh areas between Oyster Bay and Fishers Island, open water between Orient Point and Fishers Island
Loggerhead turtle *Caretta caretta*	Threatened (US and NY)	Sound waters, from Stony Brook to Northville
Diamondback terrapin *Malaclemys terrapin*	Special Concern (NY only)	Nissequogue River (shores near mouth and associated salt marshes), Conscience Bay (likely breeding ground), Mount Saini Harbor (likely breeding ground), Orient Harbor, Long Beach Bay marsh
Piping plover *Charadrius melodus*	Endangered (NY) Threatened (US)[1]	Short Beach (important nesting site), Stony Brook Harbor, Flax Pond, Port Jefferson beaches, Fishers Island
Least tern *Sterna antillarum*	Endangered (NY only)	Plum Point sand spit (Manhasset Bay, important nesting habitat), Prospect Point (Manhasset Neck), Short Beach (important nesting site), Stony Brook Harbor, Flax Pond, Old Field Beach, Port Jefferson beaches, Fishers Island
Common tern *Sterna hirundo*	Threatened (NY only)	Prospect Point (Manhasset Neck), Short Beach (important nesting site), Stony Brook Harbor, Old Field Beach, Port Jefferson beaches, Fishers Island
Osprey *Pandion haliaetus*	Threatened (NY only)	Vail Pond, Mattituck Inlet wetland, Orient Harbor, Long Beach Bay (large nesting area), Fishers Island
Roseate tern *Sterna dougallii*	Endangered (US and NY)	Gull Island (off Fishers Island)
Harbor porpoise *Phocoena phocoena*	Special concern (NY only)	Open water between Orient Point and fishers Island
Right whale *Eubalaena glacialis*	Endangered (US and NY)	Open water between Orient Point and Fishers Island

[1] In the Great Lakes, the piping plover is listed as federally endangered; in the Atlantic coastal region it is listed as federally threatened.

3.1.2 Fisheries

Recreational

While non-commercial harvesting of shellfish occurs at numerous locations along the north shore, recreational fishing in the nearshore environment is predominantly for finfish. Anglers fish both from the shore and from private and charter boats in the bays and harbors. As part of its Estuarine Living Marine Resources Program, the National Oceanic and Atmospheric Administration's National Ocean Service developed a database describing the temporal and spatial distribution of 61 fish and invertebrate species in 22 mid-Atlantic estuaries, including Long Island Sound (Stone et al. 1994). The database describes relative abundances of these species in three categories corresponding to salinity conditions: tidal fresh, mixing and seawater. The following is a list of finfish and shellfish species that are characterized in the database as common, abundant or highly abundant during the adult life stage in the tidal fresh and mixing salinity zones of Long Island Sound. The abundant and highly abundant species are noted with asterisks. It is expected that these species roughly characterize the nearshore finfishery along the north shore of Long Island. Bluefish (*Pomatomus saltatrix*) and weakfish (*Cynoscion regalis*) are reported to be two of the more popular species among recreational anglers (Kahn, no date)

Blue mussel	*Mytilus edulis*
American oyster*	*Crassostrea virginica*
Northern quahog*	*Mercenaria mercenaria*
Softshell clam	*Mya arenaria*
Daggerblade grass shrimp*	*Palaemonetes pugio*
Sevenspine bay shrimp*	*Crangon septemspinosa*
American lobster*	*Homarus americanus*
Blue crab	*Callinectes sapidus*
American eel	*Anguilla rostrata*
Blueback herring*	*Alosa aestivalis*
Alewife*	*Alosa pseudoharengus*
American shad	*Alosa sapidissima*
Atlantic menhaden*	*Brevoortia tyrannus*
Atlantic herring	*Clupea harengus*
Bay anchovy*	*Anchoa mitchilli*
Channel catfish	*Ictalurus punctatus*
Rainbow smelt*	*Osmerus mordax*
Atlantic tomcod*	*Microgadus tomcod*
Red hake	*Urophycis chuss*
Oyster toadfish	*Opsanus tau*
Sheepshead minnow	*Cyprinodon variegatus*
Killifishes*	*Fundulus* species
Silversides*	*Menidia* species
Northern pipefish	*Syngnathus fuscus*
Northern searobin	*Prionotus carolinus*
White perch*	*Morone americana*
Striped bass	*Morone saxitilis*
Yellow perch*	*Perca flavescens*
Bluefish	*Pomatomus saltatrix*
Weakfish	*Cynoscion regalis*
Tautog	*Tautoga onitis*
Cunner	*Tautogolabrus adspersus*

American sand lance	*Ammodytes americanus*
Gobies	*Gobiosoma* species
Butterfish*	*Peprilus triacanthus*
Windowpane flounder*	*Scophthalamus aquosus*
Winter flounder*	*Pseudopleuronectes americanus*
Hogchoker	*Trinectes maculatus*

Commercial

Long Island Sound has historically been an important commercial fishery for both finfish and shellfish. The independent baymen and lobstermen who fish the nearshore areas comprise the largest segment of the New York commercial fishing industry, harvesting oysters, hard and soft clams, mussels, conch and lobster. Shellfishing occurs to a greater or lesser extent in the many harbors and bays located on the north shore, including (from west to east): Manhasset Bay, Hempstead Harbor, the Oyster Bay system, the Huntington Bay system, Port Jefferson Harbor, Mount Sinai Harbor and Mattituck Inlet. The largest nearshore shellfishery on the north shore is located in the Huntington Bay system, which includes Lloyd Harbor, Huntington Harbor, Centerport Harbor and Northport Bay. Oyster Bay Harbor is home to New York's largest oyster cultivating and harvesting operation.

3.2 Bayville/Asharoken Beach

3.2.1 Threatened or Endangered Species

A number of species that the federal government and/or the State of New York have designated as endangered or threatened have been identified in the Bayville/Asharoken Beach areas. The following is a list of these species and their designations; whenever possible, specific locations where these species are known to exist are noted as well.

Species	Status	Location(s)
Least tern	Endangered (NY)	Two areas in particular provide nesting sites for these three shorebird species: Sand City and Eatons Neck Point, which are on the western shore of Eatons Neck (Asharoken Beach is on the eastern shore of Eatons Neck). East Beach, on the eastern shore of Lloyd Neck, is identified as an important potential nesting site for least tern.
Common tern	Threatened (NY)	
Piping plover	Threatened (US) Endangered (NY)	
Bald eagle *Haliaeetus leucocephalus*	Endangered (US and NY)	One of the few areas on Long Island where bald eagles are frequently sighted during the winter is the Mill Neck Creek wetlands, which form the southern and western boundaries of Bayville.
Diamondback terrapin	Special Concern (NY)	Nesting sites for this species have been observed throughout the Oyster Bay Harbor-Cold Spring Harbor-Lloyd Harbor-Huntington Bay-Northport Harbor complex
Kemp's ridley sea turtle	Endangered (US and NY)	Lloyd Harbor, Huntington Bay and Northport Bay provide important developmental habitat for this species, especially during the late summer and early fall.
Osprey	Threatened (NY)	Osprey nests have been observed in the Crab Meadow marsh, just east of Asharoken Beach, and at Fly Island and Fresh Pond on Lloyd Neck.

3.2.2 Fisheries

The harbor and bay complex between Bayville and Asharoken Beach are important fisheries, both for finfish and shellfish. Between April and November, Northport Bay, Oyster Bay, Lloyd Harbor and Cold Spring Harbor are important nursery and feeding areas for scup (*Stenotomus chrysops*), bluefish (*Pomatomus saltatrix*), Atlantic silverside (*Menidia menidia*), menhaden (*Brevoortia tyrannus*), winter flounder (*Pseudopleuronectes americanus*), striped bass (*Morone saxitilis*) and blackfish (*Tautoga onitis*). Winter flounder spawn between January and March and can be found in these embayments throughout the year (USDOI 1991 as excerpted in NYSDOS 1994b).

Near Bayville, Oak Neck Creek provides valuable nursery and feeding habitat for a variety of marine species, while Oyster Bay Harbor provides abundant hard clams and is one of the most important commercial oyster harvesting areas in the New York. However, Mill Neck Creek, the southern portion of Oyster Bay Harbor (including Oyster Bay Cove), and an area near Plum Point on Centre Island are uncertified as shellfishing areas. Recreational fishing pressure in Oyster Bay Harbor is heavy; most of this pressure is for finfish, though some recreational shellfishing also occurs. Further to the east, Cold Spring Harbor also experiences heavy recreational fishing pressure and provides hard clam shellfishing at its northern end.

On the east side of Lloyd Neck, the waters of Lloyd Harbor, Huntington Bay and Northport Harbor support recreational and commercial shellfishing. Recreational fishing pressure for finfish is somewhat less in this area than in the Oyster Bay-Cold Spring Harbor area. The southern and central portions of

Northport Harbor and Huntington Harbor, as well as the southern portion of Centerport Harbor, are uncertified for shellfishing.[2]

The coastal waters to the west of Asharoken Beach (near Eatons Neck Point) and the tidal creeks associated with Crab Meadow to the east of Asharoken Beach are noted as productive nursery and feeding areas for both finfish and shellfish.

4.0 SIGNIFICANT HABITAT

The identification of "significant" habitats is accomplished primarily through a review of those areas designated by the State of New York as Significant Coastal Fish and Wildlife Habitats. This designation, which is made pursuant to the New York State Waterfront Revitalization of Coastal Areas and Inland Waterways Act, indicates that the area:

- Is essential to the survival of a large portion of a particular fish or wildlife population;
- Supports populations of species which are endangered, threatened or of special concern;
- Supports populations having significant commercial, recreational, or educational value; and/or
- Exemplifies a habitat type that is not commonly found in the state or in a coastal region.

Other designations of significance at the federal level are noted as well.

The Long Island Coastal Management Program report (NYSDOS 1994b) defines seven "ecological complexes" along the island's north shore. The concept of an ecological complex is based in large part on species occurrence data. In general, an ecological complex comprises two or more "individual habitat or landform units that are each of importance to a single species or multiple species and which are either contiguous or in a relatively close proximity to each other so as to allow their being recognized as a single, interrelated ecological unit . . . " (USDOI 1991). The system of classifying the shoreline into complexes presents a useful framework within which to describe significant habitats and has been adopted for this Appendix (see Figure D-1).

As in the previous section on biological resources, this section begins with the identification of north shore habitats outside of the Bayville and Asharoken Beach areas and then describes in more detail the habitats located near the Bayville and Asharoken project areas.

4.1 North Shore

The State of New York has designated a total of 22 Significant Coastal Fish and Wildlife Habitats along the north shore of Long Island, exclusive of the Bayville/Asharoken Beach area. These habitats are

[2] Uncertified shellfishing areas are posted as closed to all recreational and commercial harvest.

associated with six ecological complexes: the Narrows Complex (which also includes five SCFWHs in Westchester County), the Nissequogue River Complex, the Central Bays Complex, the Eastern Bluffs Complex, the Deep, Open Water Complex, and the Fishers Island Complex. The following is a list of the 22 habitats and their general locations (from west to east). Additional detail is provided only for those habitats that have a particularly unique characteristic.

Narrows Complex

1,2,3. **Little Neck Bay, Manhasset Bay and Hempstead Harbor** are uncertified commercial shellfishing areas, though young clams are transplanted from Little Neck and Manhasset Bays to approved areas.

4. **Alley Pond Park** is located at the southern end of Little Neck Bay.
5. **Udalls Cove** is located at the southeastern end of Little Neck Bay.
6. **Prospect Point** is located at the northern tip of Manhasset Neck and comprises one of the few remaining beach and marsh ecosystems on the north shore.

Nissequogue River Complex

7. The **Nissequogue River** flows from Mill Pond to Long Island Sound.
8. The **Nissequogue Inlet Beaches** are located at the mouth of the Nissequogue River.

Central Bays Complex

9. **Stony Brook Harbor- West Meadow** is located at the eastern end of the Long Beach barrier peninsula and is one of the largest and most diverse wetland ecosystems on the north shore.
10. **Flax Pond** is located between Crane Neck Point and Old Neck Point.
11. **Conscience Bay-Little Bay-Setauket Harbor** together contain the largest contiguous intertidal mudflats on the north shore.
12. The **Port Jefferson Beaches** comprise the barrier peninsula at the mouth of Port Jefferson Harbor.
13. **Port Jefferson Harbor** marks the eastern extent of the "necks" section of the north shore.
14. **Mount Sinai Harbor** is located just east of Port Jefferson Harbor and is reported to be a critical developmental habitat for Kemp's ridley sea turtles.

Eastern Bluffs Complex

15. The **Wading River Marsh** is located just east of the site of the decommissioned Shoreham nuclear power plant.
16. The **Mattituck Inlet Wetland** is located at the southern end of Mattituck Inlet.
17. **Orient Harbor** is located at one of the two eastern tips of Long Island and historically was one of the top bay scallop (*Aequipectin irradians*) producing areas on Long Island.
18. **Long Beach Bay** is located on the south side of Orient Point and has one of the largest concentrations of osprey nests in New York.

Deep, Open Water Complex

19. **Plum Gut** is located between Orient Point and Plum Island.

20. **The Race** is an open water channel between Valiant Rock and the western tip of Fishers Island.

Fishers Island Complex

21. The **Fishers Island Beaches** include Mud Pond Beach, Middle Farms Beach and Stone Beach.
22. The **Hungry Point Islands**, located along the north shore of Fishers Island, provide nesting sites for a large number of double-breasted cormorants

4.2 Bayville/Asharoken Beach

Both the federal government and the State of New York have, through statutory designations, noted the significance of particular habitats along the portion of the north shore that includes Bayville and Asharoken Beach. At the federal level, the Fish and Wildlife Service has established two National Wildlife Refuges (NWR) in this area. The Oyster Bay NWR comprises Mill Neck Creek, much of Oyster Bay Harbor and the western half of Cold Spring Harbor. This Refuge is the most important wintering area for waterfowl on the north shore, particularly scaup and black duck. The second Refuge is the Target Rock NWR. Located at the eastern end of Lloyd Neck on Huntington Bay, Target Rock NWR comprises a nature upland forest and a half-mile of rocky beach (US DOI 1992).

Bayville and Asharoken Beach are located within the area referred to as the Harbors Complex in the Long Island Coastal Management Program report. The western boundary of this Complex is Oak Neck Creek; the eastern boundary is Fresh Pond. From west to east, the major land and water features in this Complex are Oak Neck, Oyster Bay Harbor, Cold Spring Harbor, Lloyd Neck, Lloyd Harbor, Huntington Bay, Northport Bay, and Eatons Neck. Bayville is located on Oak Neck, while Asharoken Beach connects Eatons Neck to the Long Island mainland. The U.S. Fish and Wildlife Service has also designated the area within this Complex as one comprising "significant coastal habitats"; the Fish and Wildlife Service also includes the nearshore waters of Long Island Sound, to a depth of approximately 30 feet, as part of the area of significant habitat.

The State of New York has designated ten habitats in the Harbors Complex as Significant Coastal Fish and Wildlife Habitats. The following are brief summaries of the descriptions of these ten areas as they appear in the Long Island Coastal Management Program report.

> <u>Mill Neck Creek Wetlands</u> - This habitat consists of two wetlands that drain into Mill Neck Creek, which is located immediately south of Bayville. Oak Neck Creek, a 120-acre tidal creek system, comprises one of the largest remaining undeveloped salt marshes on Long Island's north shore. Beaver Lake is a 60-acre freshwater body. These wetlands are known as wintering areas for bald eagles, as a nursery and feeding habitat for various fish species, and as sources of organic matter and nutrients to the commercial oyster beds of Oyster Bay Harbor.
>
> <u>Oyster Bay Harbor</u> - This habitat covers those portions of the bay that are not included within the boundaries of the Oyster Bay National Wildlife Refuge. The harbor is an important waterfowl wintering area and a popular recreational and commercial fishery for both finfish and shellfish (hard clams and especially oysters).

Cold Spring Harbor - This habitat comprises the portion of the 2,500-acre harbor that is not part of the Oyster Bay NWR. Like Oyster Bay Harbor to the west, Cold Spring Harbor is an important waterfowl wintering area and an important recreational and commercial fishery. In addition, the harbor is one of the few areas on Long Island known to be the site of smelt spawning runs.

Lloyd Harbor, Huntington Bay and Northport Bay - The marsh, mudflat, and open water habitats associated with these three contiguous bodies of water, located between Lloyd Neck and Eatons Neck, are both important waterfowl wintering areas and important feeding and nesting areas for a variety of shorebirds. The bays support both commercial and recreational fisheries (finfish and shellfish) and provide important developmental habitat for the Kemp's ridley sea turtle.

Lloyd Point, Sand City and Eatons Neck Point - These three sand peninsula habitats, located on Lloyd Neck and Eatons Neck, are sparsely vegetated, and protect salt marshes and intertidal mud flats. Small bays are located behind Lloyd Point and Eatons Neck Point. All three peninsulas are important actual or potential nesting sites for least terns, common terns and piping plovers. Some of the largest least tern colonies in New York have been located at Sand City. In addition, the bays, mudflats and salt marshes associated with the peninsulas are feeding and nesting areas for a variety of shorebirds, wading birds and waterfowl.

Crab Meadow - This area, located just east of Asharoken Beach, is one of the last remaining largely undeveloped salt marshes on the north shore. Crab Meadow provides nesting and feeding habitat for numerous varieties of birds, including osprey. The salt marsh and associated tidal creeks are habitat for finfish and shellfish.

5.0 POINT SOURCES OF POLLUTION

Point sources of pollution pose significant threats to the environmental resources associated with the north shore of Long Island. Sewage treatment plant (STP) outfalls and combined sewer overflows are the primary sources of pollutants to Long Island Sound and the nearshore environment. This section briefly notes the locations of STPs on the north shore.

5.1 North Shore

Source	Discharges To
Belgrave STP	Little Neck Bay
Great Neck STP	Manhasset Bay
Port Washington STP	Manhasset Bay
Glen Cove STP	Glen Cove Creek
Kings Park STP	Long Island Sound
Port Jefferson STP	Port Jefferson Harbor
Greenport STP	Long Island Sound
Plum Island STP	Long Island Sound

5.2 Bayville/Asharoken Beach

Three sewage treatment plant outfalls are located between Bayville and Asharoken Beach. The Oyster Bay, Huntington and Northport STPs discharge into Oyster Bay, Huntington Harbor and Northport Harbor, respectively.

6.0 ENVIRONMENTAL ASSESSMENT SUMMARY

The north shore of Long Island comprises a rich and diverse set of ecosystems, ranging from large open bays to tidal creeks and wetlands to small salt marshes, mud flats and barrier peninsulas. The north shore provides important habitat for a wide range of shorebirds, wading birds, waterfowl, finfish, shellfish and other vertebrate species. Communities that include threatened or endangered species occur at many locations along much of the shore.

The portion of the shore that includes Bayville and Asharoken Beach includes some of the more important habitats on Long Island, including two National Wildlife Refuges and ten areas designated by the State of New York as Significant Coastal Fish and Wildlife Habitats. The harbors and bays in this area provide some of the most productive shellfish cultivation and harvesting grounds in New York. Wetlands associated with Mill Neck Creek and Oak Neck Creek, immediately south of Bayville, are among the largest undeveloped salt marshes left on Long Island. Shore areas to the east and west of Asharoken Beach, including Crab Meadow and Eatons Neck Point, are important nesting grounds for threatened or endangered species such as least tern, common tern, piping plover and osprey.

C. HAZARDOUS, TOXIC AND RADIOLOGICAL WASTE STUDY

1.0 SCOPE

To identify reported environmental problems in the project corridor which may potentially impact the project, URS Consultants requested federal and state database searches from Environmental Data Resources, Inc. (EDR). EDR compiles up-to-date information from pertinent federal and state agencies, including the U.S. Environmental Protection Agency (USEPA) and the New York State Department of Environmental Conservation (NYSDEC), to identify known environmental problems within the project corridor and within a half-mile area from the project corridor. URS also contacted regional and local agencies and conducted a site survey to verify the EDR database information, and to identify potential sites of concern that were not included in the database report. The EDR Report included information from the following databases:

- Resource Conservation and Recovery Information System (RCRIS)
- Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS)
- Emergency Response Notification System (ERNS)
- Hazardous Materials Information Reporting System (HMIRS)
- National Priorities List (NPL)
- RCRA Administrative Action Tracking System (RAATS)
- Facility Index System (FINDS)
- Corrective Action Report (CORRACTS)

- Leaking Underground Storage Tanks (LUST)
- Underground Storage Tanks (UST)
- Inactive Hazardous Waste Disposal Sites (SHWS)
- Solid Waste Facilities/Landfill Sites (SWF/LS)

Sites identified from the database search, the site survey, and from agency contacts were evaluated to determine their impact on the project corridor.

2.0 EXISTING SITE SETTING

2.1 Site Description

The North Shore of Long Island Storm Damage Protection and Beach Erosion Control Reconnaissance Study includes the villages of Bayville and Asharoken, located in Nassau and Suffolk Counties, respectively. EDR database searches for the two villages, Bayville and Asharoken, can be found in Appendix D-1, followed by maps covering the project area.

Project elements for the Village of Bayville (Oyster Bay Project) are located along the bay side of Bayville, from Washington Avenue to the end of West Harbor; the sound side from Seawall Road towards the east to the intersection of West Harbor and Bayville Avenue; and along Ludlam Avenue from the bay side to the sound side. The project elements for the Village of Asharoken (Lloyd Harbor Project) are located along the Asharoken beach from Bevin Road to the southeast towards the Long Island Lighting Company Northport Power Station boat launch area.

2.1.1 Village of Bayville

The Village of Bayville is located in Nassau County, Long Island, New York. The area is predominantly residential with limited commercial areas on Ludlam Avenue. Proposed seawall construction to control flooding in the Village of Bayville includes approximately five miles of sound side and bay side shorelines, including a drainage collection basin to be located on the Petra Schmitt Property, located at the northeast corner of Ludlam Avenue and West Harbor Road. Soundfront beaches are characterized as sandy with some rocky intertidal regions backed by bluffs, salt marshes, dunes and coastal structures. The areas fronting Oyster Bay Harbor consist of intertidal mudflats backed by coastal structures and salt marshes.

2.1.2 Village of Asharoken

The Village of Asharoken is located in Suffolk County, Long Island, New York. Asharoken beach is generally undeveloped with private estates. The northern beach is narrow with low sandy dunes with occasional grasses. The southern half of Asharoken beach is occupied by private estates with seawalls and occasional groins made of rock, wood and concrete to control beach erosion.

2.3 Site Reconnaissance

On June 15, 1995, URS conducted a site survey of the project corridor to verify the EDR database information. The survey included sites of concern that were not included in the database report. These sites are described in Section 6.1.

3.0 SITE HISTORY

The North Shore of Long Island has been affected by hurricanes and extratropical storms referred to as northeasters due to the direction from which the winds originate. United States Army Corps of Engineers (USACE) states that 65 moderate to severe northeasters have impacted the New York coastal region over the 100-year period preceding 1965 (North Shore of Long Island, Suffolk County, New York, Beach Erosion Control and Interim Hurricane Study (Study), June 1969). More recently, a series of severe northeasters impacted the New York coastal region with occurrences in October 1991, December 1992 and March 1993. Investigation in the Bayville and Asharoken areas was initiated by coastal erosion and flooding due to these storms. Flooding has also been reported in other communities along the North Shore, most notably, Port Washington, Makanah Beach and Port Jefferson.

4.0 VILLAGE OF BAYVILLE - DESCRIPTION OF FEDERAL AND STATE DATABASE REVIEW AND AGENCIES CONTACTED

The following sections identify and summarize information from U.S. Environmental Protection Agency and New York State Department of Environmental Conservation databases researched by EDR and provide a listing of the government agencies contacted by URS for this project. The EDR Database Report and associated maps are contained in Appendix D-1 and agency contact documentation (request letters, telecons, and responses) are contained in Appendix D-2.

4.1 U.S. Environmental Protection Agency

4.1.1 Resource Conservation and Recovery Information

Small Quantity Generators List. Two facilities (Table 1) were identified within the corridor of Bayville based upon a review of the March 14, 1995 RCRA small quantity waste generators list. These facilities generate, transport, store, treat and/or dispose of less than 1,000 kg hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA).

Table 1

Village of Bayville RCRIS - Small Quantity Generators			
Site Name	**Address**	**City**	**Waste Generated**
Sound View Motors	20 Bayville Avenue	Bayville	Lead Ignitable Hazardous Waste Benzene Not defined
Bayville One Hour Photo Inc.	271 Bayville Avenue	Bayville	Silver Not defined

Large Quantity Generator List. One facility (Table 2) was identified within the corridor of Bayville based upon a review of the March 14, 1995 RCRA large quantity waste generators list.

Table 2

Village of Bayville RCRIS - Large Quantity Generator			
Site Name	**Address**	**City**	**Waste Generated**
Bayville Village Cleaners, Inc.	290 Bayville Avenue	Bayville	Spent halogenated solvents

4.1.2 Comprehensive Environmental Response, Compensation and Liability Information Systems List

The CERCLIS list is a compilation of known and suspected uncontrolled or abandoned hazardous waste sites. These sites have been investigated or currently are under investigation by the USEPA for the release, or threatened release, of hazardous substances. No sites on the CERCLIS list as of December 1994 are located in the project corridor in the EDR Report.

4.1.3 Emergency Response Notification System

The ERNS is a national database system used to store information on the sudden and/or accidental release of hazardous substances, including petroleum, into the environment. The project corridor was investigated for inclusion on the ERNS list. Due to the ambiguous addresses of reported spills, EDR investigated the project area based on county and zip codes. Ten sites wēre identified as ERNS sites listed in the database updated April 1995. Not one of the ERNS sites listed was identified within the project corridor.

4.1.4 Hazardous Materials Information Reporting System

The HMIRS is a national database system used to store hazardous material spill incidents reported to the Department of Transportation (DOT). One site (Table 3) was identified within the project corridor from the HMRIS database updated June 1994. The spill located at Godfrey Avenue and Mountain Avenue, will not directly impact the proposed improvements due to the location.

Table 3

Village of Bayville Hazardous Materials Information Reporting System
Site Name
Godfrey Avenue and Mountain Avenue Bayville, New York

4.1.5 National Priorities List

The NPL, also known as the Superfund list, is a USEPA listing of uncontrolled or abandoned hazardous waste sites which are targeted for possible long-term remedial action under the Superfund Act. The list is primarily based upon a score which the site receives from the USEPA's Hazardous Ranking System. No sites on the Superfund list as of October 1991 which are located within the project corridor were identified in the EDR report. This was confirmed by Doug Garberini of the United States Environmental Protection Agency (Appendix D-2).

4.1.6 RCRA Administrative Action Tracking System

The RAATS list contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. No sites on the RAATS list as of April 1994 have been identified within the project corridor.

4.1.7 Facility Index System

FINDS contains both facility information and "pointers" to other sources that contain more detail. Some of these include RCRIS, CERCLIS and PCS (Permit Compliance System). Three sites (Table 4) were identified within the corridor of Bayville based upon a review of the July 1994 FINDS.

Table 4

Village of Bayville List of FINDS Sites	
• Bayville Village Cleaners, Inc. 240 Bayville Avenue Bayville, NY 11709 • Bayville One Hour Photo Inc. 271 Bayville Avenue Bayville, NY 11709	• Sound View Motors 20 Bayville Avenue Bayville, NY 11709

4.1.8 Corrective Action Report

The CORRACTS list identifies hazardous waste handlers with RCRA corrective action activity. No sites on the CORRACTS list as of August 1994 have been identified within the project corridor.

4.2 New York State Department of Environmental Conservation

4.2.1 Leaking Underground Storage Tanks

The New York State Leaking Underground Storage Tank (LUST) report is a comprehensive listing of all leaking storage tanks reported within the State. The EDR report utilized a LUST database dated January 1995. Five LUST sites (Table 5) were located within the project corridor. Ms. Igoe from the NYSDEC was contacted for request of facility status for the NY Telephone Manhole and the Unknown (abandoned site). No response has been made to date.

Table 5

Village of Bayville LUST Identified			
Site Name	**Address**	**City**	**Facility Status**
Centre Island	304 Centre Island Rd.	Centre Island	Complete/cleaned
Ansary Residence	306 Centre Island Rd.	Oyster Bay	Complete/cleaned
Unknown	250 Bayville Ave.	Bayville	Complete/cleaned
NY Telephone Manhole	Bayville Ave./Quincy Dr.	Bayville	Active spill to groundwater
Unknown (abandoned site)	Ludlam Ave./Bayville Rd	Bayville	Active spill/sewer

4.2.2 Underground Storage Tanks

The New York State Department of Environmental Conservation maintains a database of registered Petroleum Bulk Storage Underground Tanks. The project corridor was evaluated for inclusion on the UST list. Three sites (Table 6) within the project corridor were identified on the UST list, updated March 1995. The UST's listed in Table 6 will not directly impact the proposed improvements due to their locations.

Table 6

Village of Bayville Underground Storage Tanks		
Site Name	**Address**	**City**
Bayville W.D. Well 2-1	West Harbor Drive	Bayville
Sound View Motors	20 Bayville Avenue	Bayville
Bayville Intermediate School	Mountain Avenue	Bayville

4.2.3 Inactive Hazardous Waste Disposal Sites

The New York State Department of Environmental Conservation, Bureau of Hazardous Site Control maintains a Registry of Inactive Hazardous Waste Disposal Sites. Sites may appear in the registry if there is not enough information about past site activities to classify the site. Therefore, inclusion of a site on the list does not necessarily establish the presence of environmental hazards, hazardous materials and/or substances at the location, either formerly or at the present time. The latest data available to EDR was from April 1994. No sites in the Bayville project corridor were identified in the SHWS database. This was confirmed by Chris Lafemina of the New York State Department of Environmental Conservation (Appendix D-2).

4.2.4 Solid Waste Facilities/Landfill Sites

The list of SWF/LS type records typically contains an inventory of solid waste disposal facilities or landfills in a particular state. No solid waste or landfills were identified in the EDR report. Doug

Garberini of the United States Environmental Protection Agency was contacted and stated that no landfills were in the project corridor of Bayville (Appendix D-2).

4.3 Unmappable Sites

Unmappable sites include locations with a reported environmental risk that cannot be geocoded, but can be located by city, name or zip code. An ungeocoded record can be excluded if it can be determined to be outside the relevant project corridor. The following are the unmappable sites found from the database search.

4.3.1 Underground Storage Tanks

Four unmappable UST sites in the record database are believed to be outside the project corridor (see Appendix D-1). Two unmappable sites are believed to be within one mile of the project area and these sites are listed in Table 7. These sites do not impact the proposed improvements in the Village of Bayville.

Table 7

Village of Bayville UST Unmappable Sites With a Potential to be Within the Project Corridor		
Site Name	**Address**	**City**
Inc. Village of Bayville	34 School Street	Bayville
St. Gertrude's R.C. Church	28 School Street	Bayville

4.3.2 Leaking Underground Storage Tanks

Eighteen LUST sites are believed to be outside the project area, and 12 LUST sites (Table 8) in the record database are believed to be within the corridor site. Six of the LUST's that are believed to be within the corridor area are believed to have the potential to effect the proposed flood control project. Ms. Igoe of the NYSDEC has been contacted to request information on the six sites believed to impact the proposed shore improvements. No response has been made to date.

Table 8

Village of Bayville LUST Unmappable Sites With a Potential to be Within the Project Corridor		
Site Name	**Address**	**City**
Henderickson Bus Co.	264 Bayville Avenue	Bayville
Bayville Nursing Home	85 Bayville Avenue	Bayville
Donato Retigliano Landscape	Bayville Bridge	Bayville
Hendrickson Bus	Bayville Avenue/Merrit Lane	Bayville
Golf S/S Twin harbor Auto	23 Ludlam Avenue	Bayville
Suspect Gulf S/S	Ludlam Ave., 17th St., 1st St.	Bayville
Kawasaki	24B Ludlam Avenue	Bayville
Twin Harbor Auto Repair	23 Ludlam Avenue	Bayville
Village of Bayville	34 School Lane	Bayville
Village of Bayville	34 School Street	Bayville
Gemmell Residence	24 17th Street	Bayville
Parker Residence	9 Valley Road	Bayville

4.3.3 RCRIS Sites

Three RCRA small quantity generators are identified outside the project corridor. One large quantity RCRA generator is believed to be within the project corridor (Table 9).

Table 9

Village of Bayville RCRIS - Large Quantity Generator Unmappable Sites With a Potential to be Within the Project Corridor		
Site Name	**Address**	**City**
Nassau County BIN 3300010	Ludlam Avenue & Shore Drive	Bayville

The Nassau County BIN 3300010 site is believed to be the draw bridge crossing the bay area. EDR generated an additional report at our request (Appendix D-1). The report indicated the annual waste handled at the site was lead.

An attempt to contact H. Kallman, a contact listed from the EDR report at 516-628-3433 was made on Thursday, July 6, 1995 to confirm location of site. A phone call to the previous number indicated it had been disconnected and no forwarding number was given. Therefore, confirmation was not possible. More information will be obtained when the USEPA and NYSDEC respond to the Freedom of Information requests (Appendix D-2) on this site (approximately August 13, 1995).

4.4 Regional and Local Agencies

The following agencies were contacted for additional information. Documentation of these contacts can be found in Appendix D-2.

- NYSDEC's Bill Hewitt (718-482-4949) was contacted for general information regarding the project area. The request for information was forwarded to Sandy Boxenbaum of Region I (516-444-0200). A representative from Sandy Boxenbaum's office contacted URS on July 11, 1995 and indicated Chris Lafemina should be contacted regarding Superfund sites. Chris Lafemina from NYSDEC was contacted on July 11, 1995; he indicated no Superfund sites were listed in the Annual Registry Book for the Bayville area.

- Dick Schowe (518-457-4351) of the NYSDEC was contacted on August 7, 1995 to request information on spills in the Bayville area. He suggested contacting Theresa Igoe of the NYSDEC. A request letter was sent to Theresa Igoe on August 7, 1995 along with a list of reported leaking underground storage tanks in the Bayville area. No response has been made to date.

- New York State Department of Health representative Gary LaMay (518-474-8734) was contacted for general information concerning the Bayville area. A follow-up call was made to determine acknowledgement of Freedom of Information Act (FOIA) letter. Mr. LaMay indicated he received letter and we should hear from him when the search is complete. No response has been made to date.

- Chief Didomico of the U.S. Coast Guard (203-468-4464) was contacted in New Haven, Connecticut for information on spills that were reported in the area. Lieutenant Commander T.V. Skuby responded June 12, 1995 with one spill in Bayville.

- The NYC Department of Health, General Council Official, Patricia Caruso (212-788-5010) was contacted. She forwarded Freedom of Information Law (FOIL) request to the Environmental Investigation Department (212-442-3372). The department indicated they have no information concerning the Bayville area.

- Ms. Marie Dooley, Freedom of Information Officer of the NYC Department of Environmental Protection was contacted at 718-595-6799 in Corona, New York regarding the Bayville area. Ms. Dooley responded with an acknowledge receipt letter. Contact was attempted by URS on numerous occasions to follow up. No information to date has been obtained from Ms. Dooley.

- Mr. Doug Garberini and Mr. John Gorman, representatives of the USEPA Region II, were contacted first by telephone (212-637-4150), then by correspondence, regarding general information on sites in the Bayville and Asharoken area. Doug Garberini was contacted again on July 11, 1995; he indicated no Superfund sites were located within the project corridor (Appendix D-2).

- Mr. Ernest A. Regna responded on July 6, 1995 regarding FOIA letter request to Mr. Gorman. He indicated request required specific facilities. On July 13, 1995, URS requested information for Nassau County BIN 3300010. Response from Mr. Regna has not been made to date.

- Mr. Stanley Siegel from Hazardous and Solid Waste Programs Branch responded on July 12, 1995 with a RCRA Notifiers list for the zip codes covering the areas located in Bayville. The RCRA Notifiers list confirms the information from the EDR report.

- Mr. Louis H. Hoelman, II, a computer specialist with the U.S. Environmental Protection Agency, was contacted for a database list from the STORET Water Quality System for the Bayville area. The information from the database indicated the Water Quality in the Bayville area for each parameter was within the corresponding limit; therefore, further information from STORET is not required.

- During the site reconnaissance field survey the Petra Schmitt property was identified as a HTRW concern, therefore, Mayor Victoria Segal of the Village of Bayville (516-628-1439) was contacted on June 16, 1995 to discuss the Petra Schmitt Property along West Harbor Drive. Mayor Segal indicated that the Sear-Brown Group had conducted an Environmental Site Assessment eighteen months previously, and concluded that the site was not an environmental concern. A copy of the Sear-Brown Group Environmental Site Assessment for the Petra Schmitt Property can be found in Appendix D-2.

- Also during the project corridor site reconnaissance field inspections, LILCO transformers have been identified at various locations throughout the project corridor. LILCO representatives have been contacted to discuss the possibility of PCB-containing transformers. (Appendix D-2). LILCO indicated as of 1985, all LILCO transformers have contained mineral oil. Previous to 1985, no records of transformer oils used are available.

- The Sear-Brown Group, Environmental Site Assessment contained information from the Nassau County Fire Department regarding Soundview Marine located west of Ludlam Avenue on the bay shore. The file sheet (found in Appendix D of Addendum No. 1 of the Sear-Brown Group Environmental Site Assessment) indicated Soundview Marine washed lobster pots with kerosene. Inspector Tom Trousdell of the Nassau County Fire Department (516-572-1052) was contacted on August 8, 1995. Inspector Trousdell stated Soundview Marine used a fine spray of a kerosene mixture to waterproof the lobster pots. The Flower Oyster Company adjacent the Soundview Marine complained immediately due to the close proximity of their breeding area. The Nassau County Fire Department and the NYSDEC responded immediately. The NYSDEC ordered Soundview Marine to stop the kerosene washing and to clean the residual kerosene discharged directly to the ground. Inspector Trousdell indicated that the washing area, located 200 to 300 feet from Ludlam Avenue proximate the bay shoreline, was cleaned by Soundview Marine and the use of kerosene was ceased.

5.0 VILLAGE OF ASHAROKEN - DESCRIPTION OF FEDERAL AND STATE DATABASE REVIEW AND AGENCIES CONTACTED

The following sections identify information from databases researched by EDR and a listing of the government agencies contacted by URS for this project. The EDR Database Report and associated maps are contained in Appendix D-1.

5.1 U.S. Environmental Protection Agency

5.1.1 Resource Conservation and Recovery Information System

RCRA provides for "cradle to grave" regulations of hazardous waste. Sites listed in the RCRA database have become part of the RCRA program and have obtained a RCRA identification number to generate hazardous waste and/or obtained a permit to transport and/or treat, store and dispose of hazardous waste. One site in the Asharoken project area is included on the RCRA list (Table 10) as of January 1995.

Table 10

Village of Asharoken RCRIS - Small Quantity Generators Identified			
Site Name	**Address**	**City**	**Waste Generated**
Northport Power Station	Waterside & Eatons Neck Rd.	Northport	Caustic or acidic Corrosive hazardous waste Ignitable hazardous waste Spent halogenated solvents used in degreasing

5.1.2 Comprehensive Environmental Response, Compensation and Liability Information Systems List

The CERCLIS list is a compilation of known and suspected uncontrolled or abandoned hazardous waste sites. These sites have been investigated or currently are under investigation by the USEPA for the release, or threatened release, of hazardous substance. No sites on the CERCLIS list as of December 1994 are located in the project corridor in the EDR report.

5.1.3 Emergency Response System

The ERNS is a national database system used to store information on the sudden and/or accidental release of hazardous substances, including petroleum, into the environment. The project corridor was investigated for inclusion on the ERNS list. Due to the ambiguous addresses of reported spills, EDR investigated the project area based on county and zip codes. Twenty-five sites were identified as ERNS sites listed in the database updated April 1995. Six of the ERNS sites are believed to be within the project corridor and one site can be identified as being between the North Shore of Long Island and Norwalk Harbor, Connecticut. Table 11 below identifies the spill sites within the project corridor. The spill sites in Table 11 will not impact the proposed shore improvements due to their locations.

Table 11

Village of Asharoken Emergency Response Notification System	
Site Name	**City, State**
Between Northport, LI and Norwalk Harbor, CT	Northport, NY
Edens Neck Rd. & Waterside Ave.	Northport, NY
Northport Power Station, Waterside Ave.	Northport, NY
Northport Power Station, Waterside Ave.	Northport, NY
Near Northport Power Station	Northport, NY
East Neck and Waterside Rds.	Northport, NY
Northport Power Station (516-757-1800 - Plant Manager, Don Wilk) Eatons Neck Road	Northport, NY

5.1.4 Hazardous Materials Information Reporting System

The HMIRS is a national database system used to store hazardous material spill incidents reported to the Department of Transportation (DOT). No sites have been identified within the project corridor from the HMRIS database updated June 1994.

5.1.5 National Priorities List

The NPL, also known as the Superfund list, is a USEPA listing of uncontrolled or abandoned hazardous waste sites which are targeted for possible long-term remedial action under the Superfund Act. The list is primarily based upon a score which the site receives from the USEPA's Hazardous Ranking System. No sites on the Superfund list as of October 1991 were identified within the project corridor in the EDR report.

5.1.6 RCRA Administrative Action Tracking System

The RAATS list contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. No sites on the RAATS list as of April 1994 have been identified within the Asharoken Project corridor.

5.1.7 Facility Index System

FINDS contains both facility information and "pointers" to other sources that contain more detail. Some of these include RCRIS, CERCLIS and PCS (Permit Compliance System). One site (Table 12) was identified within the corridor of Asharoken based upon a review of the July 1994 FINDS.

Table 12

Village of Asharoken List of FINDS Sites	
Site	**Facility Information/Database Source**
Northport Power Station Waterside Ave. & Eatons Neck Rd.	· RCRIS - SQG · Active water discharge permits · Emission permit under the Clean Air Act

5.1.8 Corrective Action Report

The CORRACTS list identifies hazardous waste handlers with RCRA corrective action activity. No sites on the CORRACTS list as of August 1994 have been identified within the project corridor.

5.2 New York State Department of Environmental Conservation

5.2.1 Leaking Underground Storage Tanks

The New York State Leaking Underground Storage Tank (LUST) report is a comprehensive listing of all leaking storage tanks reported within the State. The EDR report utilized a LUST database dated January 1995. Three LUST sites were located within the Asharoken project corridor. The Asharoken Police Department LUST located at 1 Asharoken Avenue will not impact the proposed shore front improvements. The site is located at a distance greater than a half mile (ASTM Standards) from the proposed project improvements.

Table 13

Village of Asharoken Leaking Underground Storage Tanks			
Site Name	**Address**	**City**	**Facility Status**
Robert Buckner	16 Oelsner Dr.	Northport, NY 11768	Complete/clean
Asharoken Police Dept.	1 Asharoken Ave.	Asharoken, NY	Active spill
Northport Power Station	Waterside Ave. & Eatons Neck Rd.	Northport, NY	Complete/clean

5.2.2 Underground Storage Tanks

The New York State Department of Environmental Conservation maintains a database of Petroleum Bulk Storage Underground Tanks. The project corridor was evaluated for inclusion on the UST list. One site (Table 14) within the Asharoken project corridor was identified on the UST list, updated March 1995. The location of the Arthur McNamara UST is located at a distance greater than a half mile from the proposed shore improvements, therefore, it will not impact the proposed project.

Table 14

Village of Asharoken Underground Storage Tank		
Site Name	**Address**	**City**
Residence Owner: Arthur McNamara 258 Ocean Avenue Northport, NY 11768	256 Ocean Avenue	Northport, NY

5.2.3 Inactive Hazardous Waste Disposal Sites

The New York State Department of Environmental Conservation, Bureau of Hazardous Site Control maintains a Registry of Inactive Hazardous Waste Disposal Sites. Sites may appear in the registry if there is not enough information about past site activities to classify the site. Therefore, inclusion of a site on the list does not necessarily establish the presence of environmental hazards, hazardous materials and/or substances at the location, either formerly or at the present time. The latest data available to EDR was from April 1994. No sites in the Asharoken project corridor were identified in the SHWS database. This was confirmed by contact with Chris Lafemina of the New York State Department of Environmental Conservation (Appendix D-2).

5.2.4 Solid Waste Facilities/Landfill Sites

The list of SWF/LS type records typically contains an inventory of solid waste disposal facilities or landfills in a particular state. No solid waste or landfills were identified in the EDR report. Doug Garberini of the United States Environmental Protection Agency confirmed that no landfills are located in the Asharoken area.

5.3 Unmappable Sites

Unmappable sites include locations with a reported environmental risk that cannot be geocoded, but can be located by city, name or zip code. An ungeocoded record can be excluded if it can be determined to be outside the relevant project corridor. The following is a list of unmappable sites.

5.3.1 Underground Storage Tanks

Eighteen UST sites in the record database are believed to be outside the project corridor (see Appendix D-2). Two UST unmappable sites are believed to be within one mile of the project corridor, and these sites are listed in Table 15. The two UST sites listed in Table 15 will not impact the proposed shore front properties, they are located at a distance greater than a half mile from the proposed projects.

Table 15

Village of Asharoken Unmappable UST Sites with a Potential to be Within the Project Corridor		
Site Name	**Address**	**City**
Northport Power Station	Eatons Neck Road	Northport
Northport Power Station	Waterside Avenue	Northport

5.3.2 Leaking Underground Storage Tanks

Five LUST sites are believed to be outside the project area, and six LUST sites in the record database are believed to be within the corridor site. The table below identifies the potential sites within the Asharoken project corridor.

Table 16

Village of Asharoken Unmappable LUST With a Potential to be Within the Project Corridor			
	Site Name	**Address**	**City**
1	LILCO	8 Eatons Neck Road	Northport
2	LILCO	7A Grand Avenue	Northport
3	LILCO	Waterside Avenue	Northport
4	LILCO	Waterside Road	Northport
5	LILCO	Waterside Avenue	Northport
6	LILCO	Waterside Avenue	Northport

Upon request, EDR was able to generate site reports (Appendix D-1) for all of the above six sites. Site numbers 1-4 and 6 have been completed (spill is cleaned up and approved by NYSDEC, and all paperwork is completed). Site number 5 is an active spill (ongoing remediation), and has contaminated the soil with waste oil. The LUST sites listed in Table 16 are located at a distance greater than a half mile (ASTM Standards) from the proposed project, therefore, they will not impact the proposed shore improvements.

5.3.3 RCRIS Sites

Eight RCRA sites were identified outside the project corridor and one large quantity generator RCRA site was identified as potentially within the Asharoken project corridor (Table 17).

Table 17

Village of Asharoken RCRIS - Large Quantity Generator Unmappable Sites With a Potential to be Within the Project Corridor		
Site Name	**Address**	**City**
Long Island Oyster Farms, Inc.	Eatons Neck Road	Northport

5.3.4 FINDS

Seven unmappable FINDS sites were identified to be outside the project corridor and one site was believed to be within the corridor. The RCRIS site identified in Table 17 is also listed in the FINDS database. The Long Island Oyster Farms, Inc. site located at Eaton Neck Road is a distance greater than a half mile from the proposed shore improvements, therefore, it will not impact the North Shore project. The EPA has been contacted to request additional information for confirmation. No response has been made to date.

5.4 Regional and Local Agencies

The following agencies were contacted for additional information on the Asharoken corridor.

- **NYS Department of Environmental Conservation.** Chris Lafemina from the NYSDEC was contacted on July 11, 1995; he indicated no Superfund sites were listed in the Annual Registry Book for Asharoken.

- **NYS Department of Health.** No response has been made to date.

- **US Coast Guard.** Lieutenant Commander T.V. Skuby responded June 12, 1995 with eleven spills in Asharoken.

- **NYC Department of Health.** The department indicated they have no information concerning the Asharoken area.

- **NYC Department of Environmental Protection.** No information to date has been obtained from the NYCDEP.

- **US Environmental Protection Agency.** Mr. Ernest A. Regna responded on July 6, 1995, he indicated request required specific facilities. On July 13, 1995, URS requested information for Northport Power Station and Long Island Oyster Farm, Inc. Response from Mr. Regna has not been made to date.

- Mr. Stanley Siegel from Hazardous and Solid Waste Programs Branch responded July 12, 1995 with a RCRA Notifiers list for the Zip codes covering the areas located in the Asharoken area. The RCRA Notifiers list confirms the information from the EDR report.

- **STORET Water Quality System.** Information from the database indicated the water quality in the Asharoken area for each parameter was within the corresponding limit. Therefore, further information from STORET is not required.

Documentation of these contacts can be found in Appendix D-2 and contact names and telephone numbers are listed in Section 4.4. Response from these agencies confirmed the findings of the EDR Report. Additional information was not obtained from these agencies regarding the Asharoken project corridor.

6.0 REPORT OF FINDINGS

6.1 Potential HTRW Sites in the Village of Bayville

One potential HTRW site was identified during the site reconnaissance field survey performed on Thursday, June 15, 1995. The vacant property, referred as the Petra Schmitt Property to the north and adjacent to West Harbor Drive, is the location of a proposed storm pond. During a visual inspection, the property appeared to contain concrete rubble, asphalt, branches, logs, stones and miscellaneous construction debris. The brush was extremely overgrown, therefore, a thorough visual inspection could not be conducted.

The Sear-Brown Group performed a Phase I Environmental Site Assessment Report for the Petra Schmitt Property during October 1993 (Appendix D-2). The site visit took place on October 12, 1993 and a subsurface investigation was conducted on October 20, 1993. The Sear-Brown Group also reviewed Aerial Photographs for the years 1986, 1984, 1980, 1976 and 1950; reviewed agency database information provided by EDR; and contacted the local health department and fire marshal. The Sear-Brown Group indicated that no evidence of site contamination was associated with the subject property.

Another potential HTRW site identified during the site reconnaissance field survey performed on Thursday, June 15, 1995, was the Soundview Marine located at 40 Ludlam Avenue. The Soundview Marine site is not considered to have an HTRW impact for the currently proposed alignment but could be a potential HTRW site if the project alignment is altered during the feasibility study. As stated in Section 2.1 one aspect of the proposed alignment is located along Ludlam Avenue from the bay side to the sound side. The current proposed shore front improvements are located behind Soundview Marine (north side) at 40 Ludlam Avenue.Large quantities of marine debris and miscellaneous debris was observed from the exterior boundary of the property. Also, as stated in Section 4.4, the Nassau County Fire Department responded to a kerosene washing complaint. If alternate alignment are considered which cross the Soundview Marine Property, representative soil sampling of the area should be considered to identify any contamination from paints, solvents, or chemicals associated with a marina or fuel storage facility.

6.2 Potential HTRW Sites in the Village of Asharoken

The Northport Power Plant, owned by Long Island Lighting Company, is the largest oil-burning power plant in the northeast. The facility houses various storage tanks for petroleum products and is listed in the LUST databases. The power station is a small quantity generator RCRA site, has an active water discharge permit and has an emission permit under the Clean Air Act. According to the U.S. Coast Guard records, the Northport Power Station is responsible for several spills into the waterways (Appendix D-2).

The Northport Power Station does not directly impact the proposed project elements due to the distance from the proposed shorefront improvements.

7.0 CONCLUSIONS

7.1 Village of Bayville

7.1.1 Petra Schmitt Property

Historically, the Petra Schmitt Property, located along West Harbor Drive (proposed stormwater pond site), has been the location for construction debris. The Sear-Brown Group Environmental Site Assessment of the property stated the property is not an environmental concern.

7.1.2 Soundview Marine

The Soundview Marine site does not impact the currently proposed alignment. If the proposed alignment is to impact the Soundview Marine property, the site should be considered a concern for HTRW contamination.

7.2 Village of Asharoken

7.2.1 Northport Power Station

The Northport Power Station does not directly impact the proposed project due to the nature of the project elements and the distance from the proposed project.

8.0 RECOMMENDATIONS

8.1 Village of Bayville

Based upon information from federal regulatory agencies, state regulatory agencies, previous Environmental Site Assessments and site inspections, this study did not find issues or problems associated with hazardous, toxic and radioactive wastes located within the project corridor of Bayville for the currently proposed alignment. If the alignment is altered to impact the Soundview Marine property, then the Soundview Marine should be considered an HTRW concern. The nature of business and the observed debris on the property at Soundview Marine warrants further investigation during the Feasibility Study. Such investigation would require intrusive soil sampling and testing to quantify the potential impact.

8.2 Village of Asharoken

Based upon the information obtained from federal regulatory agencies, state regulatory agencies, previous Environmental Site Assessments and site inspections, this study did not find issues or problems associated with hazardous, toxic and radioactive wastes (HTRW) which may be located within the project corridor or may affect the project proposed for the village of Asharoken.

Appendix H

Clean Air Act (CAA)

ASHAROKEN STORM DAMAGE REDUCTION FEASIBILITY STUDY AIR QUALITY ANALYSIS

Corporate Headquarters:
451 Presumpscot Street
Portland, Maine 04103

New York
Village Square, 33
Church Street
Fredonia, New York
14063

Pennsylvania
134 Broad Street
Stroudsburg, PA 18360

Prepared for:

U.S. Army Corp of Engineers
New York District
26 Federal Plaza
New York, New York 10278-0090

Prepared by:

Weston Solutions, Inc.
Northern Ecological Associates, Inc.

December 2005

ASHAROKEN STORM DAMAGE REDUCTION FEASIBILITY STUDY AIR QUALITY ANALYSIS

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December 2005

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ABBREVIATIONS AND ACRONYMS

Asharoken Project	Storm Damage Protection and Beach Erosion Control Project
CAA	Clean Air Act
CMSA	Consolidated Metropolitan Statistical Area
CO	carbon monoxide
EF	Emission Factor
ft	feet
g/hp-hr	gram/horsepower-hour
hp	horsepower
hrs	hours of operation
Keyspan	Long Island Lighting Company
kw	kilowatts
lbs	pounds
LF	Average Load Factor
NAAQS	National Ambient Air Quality Standards
NO_2	nitrogen oxide
NO_x	nitrogen oxide
NYSDEC	New York State Department of Environmental Conservation
O_3	ozone
Pb	lead
PCA	Project Cooperation Agreement
PM2.5	2.5 micrometers
PM10	10 micrometers
SIP	State Implementation Plan
SO_2	sulfur dioxide
TPD	tons per day
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOCs	volatile organic compounds
yd^3	cubic yards

1.0 INTRODUCTION

1.1 BACKGROUND

This Air Quality Analysis involved the evaluation of emissions of air contaminants resulting from the Storm Damage Protection and Beach Erosion Control Project for the Village of Asharoken in the Town of Huntington, Suffolk County, New York (Asharoken Project). In particular the Air Quality Analysis evaluated projected emissions from Alternative 6 – Combination Moderate Dune & Beach and Advance Fill. The Air Quality Analysis is based on expected schedule and equipment needs of the project as projected by the U.S. Army Corp of Engineers (USACE), New York District and is conducted in accordance with U.S. Environmental Protection Agency (USEPA) standards, and USACE requirements and methodology coordinated with the New York State Department of Environmental Conservation (NYSDEC), Bureau of Air Quality Planning.

Under the USACE Civil Works Program, the federal action is initiated upon signing the Project Cooperation Agreement (PCA) between the Corps and the non-federal partner. The PCA is a contractual agreement establishing the commitment to construct a project. NYSDEC is the non-federal partner for the Asharoken project. A PCA for construction has not been signed to date.

1.2 PROPOSED ACTION

The proposed project area is located on the north shore of Long Island from Eaton's Neck to near the Long Island Lighting Company (Keyspan) facility in the Village of Asharoken and consists of approximately 2.35 miles of shoreline. The area has been subject to major flooding during storms, causing damage to structures located along Asharoken Beach which is the only land connecting Eaton's Neck with the mainland of Long Island. Continued erosion over the years has resulted in a reduction of the height and width of the beach, which has increased the potential for storm damage.

The project would provide storm damage protection to highly developed areas that are subject to direct wave attack and flooding during major storms and hurricanes. The recommended plan in the Feasibility Report provides for the construction of the project in two sections. In the southeastern 6,200 feet (ft) of the project area approximately 120,000 cubic yards (yd^3) of advanced fill will be placed against existing timber bulkheads to create a berm 50 ft wide. In the northwestern 6,200 ft of the project area approximately 240,000 yd^3 of beachfill material will be placed to create a dune and a berm 50 ft wide.

The Asharoken Project construction activities include dredging, beachfill, and modifying (either shortening or notching) the rock groin located approximately 950 ft southeast of Bevin Road. The project proposes to dredge beach material from one or two off-shore sand borrow area locations and pump sand via a pipeline to the shorefront for grading into a berm and dune system. Construction activities and dune planting/sand fence installation are expected to be completed in four months.

The proposed project would have a 50-year project life. Periodic renourishment of 100,000 yd^3 every 5 years, including the continued sand bypassing by Keyspan at the current rate of 10,000 yd^3 per year, would stabilize the existing 12,400 foot shoreline and provide limited storm wave protection. The source of sand for renourishment cycles may include a combination of dredged material, bypassed material from the updrift beach, and trucked upland source material. The construction duration for a renourishment with 100,000 yd^3 material is estimated to range from one to three months.

2.0 EXISTING CONDITIONS

Air quality is measured by the concentration of pollutants in the atmosphere. Under the federal Clean Air Act (CAA) and its amendments, the USEPA developed criteria which represent the maximum allowable atmospheric concentrations of pollutants that may occur while ensuring protection of public health and welfare, with a reasonable margin of safety. These National Ambient Air Quality Standards (NAAQS) were established for six “criteria” pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter, and lead (Pb). Particulate matter standards incorporate two particulate classes: 1) particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM10), and 2) particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers (PM2.5).

Areas that meet the NAAQS standard for a criteria pollutant are designated as being in "attainment". Areas where the criteria pollutant level exceeds the NAAQS are designated as "nonattainment". Ozone nonattainment areas are subcategorized based on the severity of their pollution problem (marginal, moderate, serious, severe, and extreme). Particulate matter and CO nonattainment areas are classified into two categories (moderate and serious). Areas previously designated as nonattainment and subsequently designated as attainment are considered to be "maintenance" areas. When insufficient data exists to determine the attainment status of an area, the area is designated as "unclassifiable (for attainment)".

The proposed Asharoken Project is located in the New York-Northern New Jersey-Long Island Consolidated Metropolitan Statistical Area (CMSA). The New York-Northern New Jersey-Long Island CMSA was previously designated as a severe nonattainment area for O_3 under the 1-hour ozone NAAQS. As of 15 June 2005, the 1-hour O_3 NAAQS was revoked in the New York-Northern New Jersey-Long Island CMSA and was replaced by the 8-hour O_3 NAAQS. Under this new standard the New York-Northern New Jersey-Long Island CMSA is now designated as a moderate nonattainment area for ozone.

As of 5 April 2005, the New York-Northern New Jersey-Long Island CMSA is designated as a nonattainment area for PM2.5. The area was previously designated as a nonattainment area for CO, but now is designated as attainment for CO and therefore, the area is considered to be a maintenance area for CO. The project area is designated as attainment for NO_2, SO_2, PM10, and Pb.

3.0 CLEAN AIR ACT CONFORMITY REQUIREMENTS

Section 176(c) of the federal CAA prohibits Federal entities from taking actions in nonattainment or maintenance areas that would jeopardize the attainment of NAAQS or otherwise not conform to the State Implementation Plan (SIP) for the attainment and maintenance of the NAAQS. The CAA delegates responsibility to each state to achieve and maintain air quality meeting the NAAQS.

Each state is required to develop a SIP, which is its primary mechanism for ensuring that the NAAQS are achieved and maintained within that state. The SIP is a plan which provides for implementation, maintenance and enforcement of the NAAQS, and includes emission limitations and control measures to attain and maintain the NAAQS. Within the state of New York, the authority to regulate sources of air emissions resides with NYSDEC. NYSDEC has developed regulations that incorporate Federal air quality regulations in addition to state pollution control rules promulgated to achieve emission standards and control measures outlined in the SIP.

Conformity to a SIP, as defined in the CAA, means conformity to the SIPs purpose of reducing the severity and number of violations of the NAAQS in order to achieve attainment of such standards. Each Federal agency or department planning to undertake an action is required to determine if its action conforms to the applicable SIP. The USEPA has promulgated two regulations to instruct federal agencies and departments on how and when conformity must be demonstrated, The General Conformity regulations (40 CFR Part 93 Subpart B) and the Transportation Conformity regulations (40 CFR 93 Subpart A). The General Conformity requirements apply to Federal actions except Federal highway and transit actions, which are subject to the Transportation Conformity regulations.

The Asharoken Project is a non-transportation project and is governed by the General Conformity regulations (40 CFR Parts 6, 51, and 93) described in *Determining Conformity of Federal Actions to State or Federal Implementation Plans* (40 CFR Part 93).

To focus General Conformity requirements on those Federal actions with the potential to have significant air quality impacts, the USEPA established threshold de minimis emission rates in the final rule. A conformity demonstration is required for each pollutant when the total direct and indirect emissions from the Federal action exceed the corresponding de minimis level. For some criteria pollutants (and precursors of criteria pollutants) the de minimis levels vary by the severity of the nonattainment area. A conformity determination is required when the annual total of direct and indirect emissions from a Federal action, occurring in a nonattainment or maintenance area, equals or exceeds an annual de minimis level. Table 1 summarizes the current de minimis levels by pollutant.

Table 1. De Minimis Levels for General Conformity.

Pollutant	Nonattainment Area	General Conformity De Minimis Levels (tons per year)
Ozone*	Serious	50
	Severe	25
	Extreme	10
	Other nonattainment areas outside ozone transport region	100
	Marginal and moderate non-attainment areas inside ozone transport region (VOC/NOx)	50/100
Carbon Monoxide**	All	100
Sulfur Dioxide	All	100
Lead	All	25
Nitrogen Dioxide	All	100
PM10	Moderate	100
	Serious	70
PM2.5***	All	0

* Applies to volatile organic compounds (VOCs) and nitrogen oxides (NOx), which react in the presence of sunlight to form ozone. Thus, these ozone precursors (VOC and NOx) are regulated to maintain the ozone NAAQS.

** Applies also to CO maintenance areas.

*** Applies to federal actions taken on or after 5 April 2006 unless the USEPA adopts de minimis levels for PM2.5 in the general conformity regulation prior to that date.

Since the proposed Asharoken Project is located in a moderate ozone nonattainment area, a PM2.5 nonattainment area, and a carbon monoxide maintenance area, all of the following de minimis levels would apply to the project:

- 50 tons per year of volatile organic compounds (VOCs)
- 100 tons per year of nitrogen oxides (NOx)
- 0 tons per year of PM2.5
- 100 tons per year of CO.

The location of the Asharoken project was only recently designated as a nonattainment area for PM2.5 (effective date: 5 April 2005). The CAA provides that the general conformity rule does not apply in areas where criteria air pollutants are first designated nonattainment until one year after the area is designated a nonattainment area. Thus the USACE will need to address PM2.5 emissions from the Asharoken project under the General Conformity regulation if the federal action is taken on or after 5 April 2006. Also, the USEPA has not yet established a de minimis level for PM2.5 in the general conformity regulation but has reported that it plans to do so. Until a de minimis level for PM2.5 is adopted, the USEPA has indicated that the default de minimis level is zero tons of PM2.5 per year.

A Federal action that does not exceed the threshold emission rates (de minimis levels) of criteria pollutants may still be subject to a general conformity determination if the total of direct and indirect emissions from the action exceeds ten percent of the total emissions inventory for a particular criteria pollutant in a nonattainment or maintenance area. If the emissions exceed this 10 percent threshold, the Federal action is considered to be a “regionally significant” activity, and thus, the general conformity rules would apply.

Regional inventories for the applicable nonattainment/maintenance areas for the project are summarized in Table 2, along with the “regionally significant” 10 percent threshold.

Table 2. Regional Emission Inventories and Regional Significance Threshold Levels.

Pollutant	New York Metro Area SIP Emissions (TPD)	10% Regional Significance Criteria (TPD)
VOC[1]	722.8	72.3
NOx[1]	619	61.9
CO[2]	2672	267.2

Note: TPD– tons per day
1) Inventories for 2007, 66 FR 42479 – 42487, August 13, 2001.
2) Inventory for 2007, New York State Department of Environmental Conservation, August 1999.

A regional PM2.5 inventory has not been completed by NYSDEC and approved by the USEPA.

Federal actions for which the projected direct and indirect emissions exceed either the de minimis emission level or are considered to be regionally significant must demonstrate conformity with the SIP. Conformity may be demonstrated by meeting any of the following:

- The action is specifically identified in the approved SIP;

- The emissions from the action along with all other emissions in the area would not exceed the emission budget specified in the SIP;
- The total emissions from the action are fully offset through a revision of a SIP (for ozone, i.e., VOC or NOx), or a similarly enforceable measure (such as use of emission reduction credits) that effects emission reductions equal to the emissions from the action; or
- For CO, air quality modeling demonstrates that the action will not cause or contribute to a violation of any existing NAAQS.

4.0 AIR QUALITY ANALYSIS METHODOLOGY

The following sections identify the emission sources associated with the Asharoken Project and outline the emission estimate methodology for all the direct and indirect sources associated with the project. Detailed emission estimation calculations are presented in Attachment 1.

4.1 DIRECT EMISSIONS (DURING PROJECT)

Direct emissions are the emissions of a criteria pollutant or its precursors that are caused or initiated by a Federal action and occur at the same time or place as the action. For the Asharoken Project, direct emissions are those associated with the exhaust of construction equipment operated at the site and the particulate matter from fugitive dust arising from construction activities including material handling.

Emissions were estimated using USEPA methodologies and emission factors. Emissions from off-road construction equipment and off-highway trucks were obtained from the USEPA Nonroad Engine and Vehicle Emission Study, 1991. Load factors for construction equipment were taken from the USEPA Nonroad vehicle study. Emissions were estimated using the following general equation:

Off-Road Emissions (lbs) = Power Rating (hp) x LF x EF (g/hp-hr) x hrs/ 453.59

Where,

LF = Average Load Factor
EF = Emission Factor (gram/horsepower-hour)
hrs = hours of operation
453.59 = conversion factor from grams to pounds (453.59 gram/pound)

Emissions from marine vessels were calculated using USEPA emission factors for both propulsion and auxiliary engines from the Final Regulatory Impact Analysis Document for marine vessels (USEPA 1999) using appropriate load factors (ICF, 2005). Overall power ratings for the dredge hopper and pumps combined were used along with a single load factor and emission factors for Category 1 marine engines greater than 1000 kilowatts (kw) since data was not available for propulsion and auxiliary engines individually.

Marine Vessel Emissions (lbs) =
Total Power Rating (hp) x LF x EF (g/kw-hr) x hrs/ 1.341/ 453.59

Where,
LF = Average Load Factor
EF = Emission Factor (gram/horsepower-hour)
hrs = Hours of operation
1.341 = Conversion factor from horsepower to kilowatts (1.341 hp/kw)
453.59 = Conversion factor from grams to pounds (453.59 gram/pound)

Calculations showing the emission factors used are provided for construction equipment in Attachment 1. Calculations for particulate matter emissions are shown in Attachment 2.

4.2 INDIRECT EMISSIONS (DURING PROJECT)

Indirect emissions are those not directly generated by the action at the project site, but occur later in time and/or are further removed from the action itself. These may include emissions from vehicles used for the commuting of construction workers or the emissions from highway vehicles used for the delivery of material and equipment to and from the site. Emissions from these sources were not considered. On road vehicle emissions (i.e. trucks, cars) are regulated under the mobile source provisions of the CAA and are therefore, are not included in this analysis. There are no other potential sources of indirect emissions associated with this project.

4.3 POST-CONSTRUCTION EMISSIONS

The conformity analysis should consider emissions that are reasonably definable and related to the project but occurring subsequent to the completion of the construction activities. The anticipated post-construction emissions would include beach renourishment on a five-year cycle in order to maintain the initial construction. The duration of a renourishment project is less than the initial nourishment project duration (1-3 months vs. 4 months) and the volume of material required for the renourishment is less than the material required for the initial nourishment project. As a result the renourishment projects are expected to have lower emissions than the initial nourishment project.

5.0 CONCLUSIONS/DEMONSTRATION OF CONFORMITY

The conformity analysis for the Federal action considers the direct and indirect emissions of the general action. Conclusions of the air quality analysis for the reevaluation are determined by comparing annualized emissions to the General Conformity de minimis thresholds and to the regional significance thresholds.

Table 3 summarizes the maximum annual project emissions, direct and indirect, for the 4-month construction schedule for the project.

Table 3. Maximum Annual Emissions

	Annual Emissions, tons/year
NOx	89.28
VOC	2.96
CO	29.24
PM2.5	5.08

Annual emissions of VOC, NOx, and CO for the Asharoken project are well below the Federal de minimis thresholds of 50 tons per year for VOC, 100 tons per year for NOx, and 100 tons per year for CO established by the General Conformity rule. However, PM2.5 emissions will exceed the default de minimis level of zero tons per year which would apply as of 5 April 2006 in the absence of the USEPA adopting an alternate de minimis level. Therefore, in the absence of regulatory action by the USEPA:

- If the USACE conducts the federal action (PCA signing) prior to 5 April 2006, the Asharoken Project will not have emissions that exceed applicable General Conformity regulation de minimis emission levels since there will not be a need to address PM2.5.
- If the USACE conducts the federal action (PCA signing) on or after 5 April 2006, PM2.5 emissions from the Asharoken Project will exceed the current default de minimis level and the project will need to have a formal conformity determination as outlined in 40 CFR 93.154 since it would be impractical to redesign the project in a manner to eliminate all PM2.5 emissions.

If the formal conformity determination is required, the USACE would need to either 1) develop a plan for reducing PM2.5 emissions from the project and offsetting the remaining Asharoken Project PM2.5 emissions with reductions in PM2.5 emissions from other sources in the local area or 2) depending upon the anticipated project start date, approach NYSDEC about the feasibility of committing to include the Asharoken Project in the PM2.5 SIP. There is currently no PM2.5 SIP, but NYSDEC is working to develop one. Either approach will also require the publication of a statement of conformity and the receipt of public comments including from the USEPA and other interested federal agencies.

The emissions for renourishment projects, which are of shorter duration than the initial nourishment project, will be less than the emissions shown in Table 3 above. For example, a renourishment project with a duration of 1.5 months, placing 100,000 cubic yards of material, and following a similar construction approach to the initial Asharoken Project would be expected to emit approximately 34 tons of NOx, 14 tons of CO, 1 ton of VOC, and 0.7 tons of PM 2.5.

Table 4 summarizes the average daily emissions for the 4-month construction schedule and compares this to the 10 percent regional significance thresholds. For this project average daily emissions were determined by dividing the total emissions by the number of days in the period assuming a seven-day work week. Emissions from the Asharoken Project are extremely small compared to the regional inventories, and the project is not considered to be regionally significant.

Table 4. Average Daily Emissions

	Tons per Day	
	Average Daily Emissions	Regional Significance Threshold
NOx	0.73	61.9
VOC	0.02	72.3
CO	0.24	267.2
PM2.5	0.04	-

Projected emissions from the 4-month construction schedule for the Asharoken Project are not regionally significant for VOC, NOx, or CO. As stated in section 3.0 a regional inventory has not yet been completed by NYSDEC for PM2.5.

Project construction will be primarily scheduled for late fall and winter months due to non-air quality environmental window constraints. Therefore project air quality impacts would occur outside of the ozone season (May 1 - September 30) as determined by NYSDEC and would not affect summertime ozone concentrations.

6.0 REFERENCES

ICF Consulting, Best Practices in Preparing Port Emission Inventories, Prepared for USEPA Sector Strategies Program, June 2005.

Midwest Research Institute, *Improvement of Specific Emission Factors* (BACM Project No. 1), MRI Project No. 3855, 1996.

State of New York Department of Environmental Conservation, New York State Implementation Plan - Carbon Monoxide Redesignation Request and Maintenance Plan for the New York Metropolitan Area, August 1999.

66 FR 42479 – 42487, Approval and Promulgation of Implementation Plans; New York Reasonable Further Progress Plans and Transportation Conformity Budgets for 2002, 2005 and 2007, August 13, 2001 proposed approval and approved 67 FR 5170 -05194 February 4, 2002.

United States Army Corps of Engineers (USACE) *Construction Equipment Ownership and Operating Expense Schedule, Region I*, August 1995.

United States Army Corps of Engineers (USACE) *Construction Equipment Ownership and Operating Expense Schedule, Region I*, September 1997.

United States Army Corps of Engineers (USACE) *Construction Equipment Ownership and Operating Expense Schedule, Region I*, June 1999.

United States Army Corps of Engineers (USACE) *Construction Equipment Ownership and Operating Expense Schedule, Region I*, August 2001.

United States Environmental Protection Agency (USEPA) *Compilation of Air Pollution Emission Factors, AP-42, Fifth Edition, Volume 1: Stationary Point and Area Sources*, Section 3.3 Gasoline and Diesel Industrial Engines, October 1996.

United States Environmental Protection Agency (USEPA) *Green Book Nonattainment Areas for Criteria Pollutants*, http://www.epa.gov/oar/oaqps/greenbk/, last updated February 20, 2003.

United States Environmental Protection Agency (USEPA) *Nonroad Engine and Vehicle Emission Study – Report*, November 1991.

United States Environmental Protection Agency (USEPA) *Procedures Document for National Emissions Inventory, Criteria Air Pollutants*, 1985-1999, March 2001.

Attachment 1

Backup Emission Factors/Emission Calculations – Marine and Construction Equipment

Table 1-1
List of Projected Construction Equipment and Operating Hours
Asharoken Borrow Investigation and Air Quality Analysis

Equipment	Engine Horsepower hp	Operating hours
FORK LIFT, 4,000-8,000 LBS	68	2920 (1)
LITE SET, 4L/ 500W, 4KW-GEN,TRLR	4	1460 (2)
DOZER,CWLR, D-8R PS,W/BLADE	305	2920 (1)
GENERATOR, PORTABLE (< 10 KW)	25	2920 (1)
WELDER, GASOLINE	40	730 (3)
HOPPER DREDGE PLANT	4100	2716 (4)

(1) Operating hours based on around the clock operation, 24 hrs per day, 30.42 days per month for 4 months
(2) Operating hours based on 12 hours of light requirements per day and continuous operation for 4
(3) Operating hours assumed 8 hours of welding per day.
(4) Estimated working time of dredge with booster pump is based on historic 93% efficiency (0.93 X 730Hrs/mth X 4 months)

Table 1-2
List of Standard Emission Categories and Factors
Asharoken Borrow Investigation and Air Quality Analysis

Equipment	Emission Factor Category	Engine/Fuel	Load Factor (LF)	Emission Factors (g/bhp-hr) [1] VOC	CO	NOx	PM	SOx	Reference
FORK LIFT, 4,000-8,000 LBS	Rough Terrain Forklifts	Diesel	48%	1.68	10	8	1.6	0.93	NEVES, November 1991
LITE SET, 4L/ 500W, 4KW-GEN,TRLR	Generator Sets < 50 hp	Diesel	74%	1.22	5	8	1	0.93	NEVES, November 1991
DOZER,CWLR, D-8R PS,W/BLADE	Crawler Tractors	Diesel	58%	1.26	4.2	10.3	1.11	0.85	NEVES, November 1991
GENERATOR, PORTABLE (< 10 KW)	Generator Sets < 50 hp	Diesel	74%	1.22	5	8	1	0.93	NEVES, November 1991
WELDER, GASOLINE	Welding Sets, < 50 hp (gasoline)	Gasoline	45%	19.95	670.70	0.81	0.22	0.85	NEVES, November 1991
HOPPER DREDGE PLANT	Commercial Marine, Category 1, > 1000 Kw	Diesel	69%	0.20	1.8643	9.69	0.2237	0.4698	Final RIA Document, Control of Emissions from Marine Diesel Engines, November 1999
				(0.27)	(1.5)	(13.0)	(0.3)	(0.63)	

(1) Original referenced category 1 marine emission factors in units of g/kw-hr are provided in parantheses. Conversion into units of g/bhp-hr allows for use of engine power in hp and use of construction emission factor formula.

Emissions (ton) = Power Rating (hp) x EF (g/bhp-hr) x Load Factor x Hours / (453.59 g/lb) / (2000 lb/ton)

Table 1-3
Summary of Estimated Total Emissions
Asharoken Borrow Investigation and Air Quality Analysis

Equipment	Emissions (tons) VOC	CO	NOx	PM	SOx
FORK LIFT, 4,000-8,000 LBS	0.17	1.04	0.83	0.17	0.10
LITE SET, 4L/ 500W, 4KW-GEN,TRLR	0.01	0.02	0.04	0.00	0.00
DOZER,CWLR, D-8R PS,W/BLADE	0.71	2.37	5.81	0.63	0.48
GENERATOR, PORTABLE (< 10 KW)	0.07	0.30	0.48	0.06	0.06
WELDER, GASOLINE	0.29	9.71	0.01	0.00	0.01
HOPPER DREDGE PLANT	1.70	15.79	82.11	1.89	3.98
TOTAL	2.96	29.24	89.28	2.76	4.63

Attachment 2

Estimate of Particulate Emissions

The proposed Asharoken Project is located in an area designated as attainment for PM10 and nonattainment for PM2.5. Construction equipment and fugitive particulate matter emissions for both PM10 and PM2.5 were determined as indicated below.

Particulate matter emission factors for the exhaust from heavy duty construction equipment used on site were taken from the Nonroad Engine and Vehicle Emission Study (USEPA 1991) and AP-42 (USEPA 1996) and are detailed along with the gaseous pollutant calculations in Attachment 1. Since particulate matter from combustion processes are typically very fine, it was assumed that particulate matter emissions from the heavy-duty construction equipment exhaust were entirely PM2.5.

In addition to calculating emissions from construction equipment and vehicular exhaust, particulate emissions from fugitive dust from construction activities including grading and excavation were determined. Since fugitive dust emissions are generated on-site, they are directly related to the project and considered direct emissions. It was conservatively assumed that an area up to 100 ft wide by 2000 ft long (total of 4.6 acres) will be disturbed at any given time due to construction activities (bulldozing along dune and fill area) during the entire project. Updated PM10 emission factors (Midwest Research Institute 1996) were used for these operations. Emissions were determined by applying the emission factor of 0.11 ton/acre-month for each month of construction activity. Additional emissions due to handling of the advanced fill (120,000 yd^3) and beach fill (240,000) were included using a recommended emission factor of 0.059 ton/1000 yd^3 of on-site cut/fill. Total fugitive dust particulate emissions were estimated as

Uncontrolled Fugitive Dust Emissions = (4.6 acres x (0.11 tons/acre-month) x 4 months)
+ (360 x (1000 yd^3) x (0.059 tons/ 1000 yd^3 off-site fill))
= 23.26 tons

The sand/fill material moved and handled on-site is dredged material and will most likely be moist during handling events. A typical watering/moisture control factor of (50%) was assumed to account for the control due to the moisture content of the material. Therefore, controlled emissions are estimated as

Controlled Fugitive Dust Emissions = Uncontrolled x (1 - % Efficiency/100)

Controlled Fugitive Dust Emissions = 23.26 x (1 – 50/100)
= 11.63 tons

PM2.5 emissions were calculated by multiplying the PM10 emissions by the particulate size adjustment factor of 0.2 for construction activities (USEPA, 2001). Estimated maximum fugitive dust PM2.5 emissions are 2.32 tons over the entire 4-month project.

A summary of the total particulate emissions for the 4-Month Construction Schedule is provided in Table A2-1.

Table A2-1. Total Particulate Emissions for the Asharoken, New York Storm Damage Reduction Project.

	Emissions, tons
Construction	
PM10	2.76
PM2.5	2.76
Fugitive	
PM10	11.63
PM2.5	2.32
Total	
PM10	14.39
PM2.5	5.08

Emissions have been estimated using project planning information developed by the New York District, consisting of anticipated equipment types and estimates of the horsepower and operating hours of the diesel engines powering the equipment. In addition to this planning information, conservative factors have been used to represent the average level of engine load of operating engines (load factors) and the average emissions of typical engines used to power the equipment (emission factors). The basic emission estimating equation is the following:

$$\mathbf{E = hrs \times LF \times EF}$$

Where:

E = Emissions per period of time such as a year or the entire project.
hrs = Number of operating hours in the period of time (e.g., hours per year, hours per project).
LF = Load factor, an estimate of the average percentage of full load an engine is run at in its usual operating mode.
EF = Emission factor, an estimate of the amount of a pollutant (such as NO_x) that an engine emits while performing a defined amount of work.

In these estimates, the emission factors are in units of grams of pollutant per horsepower hour (g/hphr). For each piece of equipment, the number of horsepower hours (hphr) is calculated by multiplying the engine's horsepower by the load factor assigned to the type of equipment and the number of hours that piece of equipment is anticipated to work during the year or during the project. For example, a crane with a 250-horsepower engine would have a load factor of 0.43 (meaning on average the crane's engine operates at 43% of its maximum rated power output). If the crane were anticipated to operate 1,000 hours during the course of the project, the horsepower hours would be calculated by:

$$\mathbf{250\ horsepower \times 0.43 \times 1{,}000\ hours = 107{,}500\ hphr}$$

The emissions from diesel engines vary with the age of an engine and, most importantly, with when it was built. Newer engines of a given size and function typically emit lower levels of pollutants than older engines. The NO_x emission factors used in these calculations assume that the equipment pre-dates most emission control requirements (known as Tier 0 engines in most cases), to provide a reasonable "upper bound" to the emission estimates. If newer engines are actually used in the work, then emissions will be lower than estimated for the same amount of work. In the example of the crane engine, a NO_x emission factor of 9.5 g/hphr would be used to estimate emissions from this crane on the project by the following equation:

$$\mathbf{\frac{107{,}500\ hphr \times 9.5\ g\ NO_x/hphr}{453.59\ g/lb \times 2{,}000\ lbs/ton} = 1.1\ tons\ of\ NO_x}$$

As noted above, information on the equipment types, horsepower, and hours of operation associated with the project have been obtained from the project's plans and represent current best estimates of the equipment and work that will be required. Load factors have been obtained from various sources depending on the type of equipment. Marine engine load factors are primarily from a document associated with the New York and New Jersey Harbor Deepening Project (HDP): "Marine and Land-Based Mobile Source Emission Estimates for the Consolidated Schedule of 50-Foot Deepening Project, January 2004," and from EPA's 1998 Regulatory Impact Analysis (RIA): "EPA Regulatory Impact Analysis: Control of Commercial Marine Vessels." Land-side nonroad equipment load factors are from the documentation for EPA's NONROAD emission estimating model, "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, EPA420-P-04-005, April 2004."

Emission factors have also been sourced from a variety of documents and other sources depending on engine type and pollutant. The NO_x emission factors for marine engines have been developed primarily from EPA documentation for the Category 1 and 2 standards (RIA, "Control of Emission from Marine Engines, November 1999) and are consistent with emission factors used in documenting emissions from the HDP, while the VOC emission factors for marine engines are from the Port Authority of New York and New Jersey's "2010 Multi-Facility Emissions Inventory" which represent the range of marine engines operating in the New Jersey harbor and coastal region in terms of age and regulatory tier level. Nonroad equipment NO_x emission factors have been derived from EPA emission standards and documentation, while the nonroad VOC emission factors have been based on EPA's Diesel Emissions Quantifier (DEQ, accessed at: *www.epa.gov/cleandiesel/quantifier/*), run for moderately old equipment (model year 1995). On-road vehicle emission factors have also been developed from the DEQ, assuming a mixture of Class 8, Class 6, and Class 5 (the smallest covered by the DEQ) on-road trucks.

As noted above, the emission factors have been chosen to be moderately conservative so as not to underestimate project emissions. Actual project emissions will be estimated and tracked during the course of the project and will be based on the characteristics and operating hours of the specific equipment chosen by the contractor to do the work.

The following pages summarize the estimated emissions of pollutants relevant to General Conformity, NO_x, VOC, $PM_{2.5}$, SO_2, and CO in sum for the project and by calendar year based on the schedule information also presented (in terms of operating months per year). Following this summary information are project details including the anticipated equipment and engine information developed by the New York District, the load factors and emission factors as discussed above, and the estimated emissions for the project by piece of equipment.

U.S. Army Corps of Engineers
Asharoken, Long Island Beachfill and Seawall
General Conformity Related Emission Estimates
DRAFT
6 October 2015

	Hours	Category	Horsepower (approx.)	Load Factor	hphrs
10 - Breakwaters and Seawalls					
Groin Construction					
Mobilization/demobilization					
Hydraulic excavator, attachment, material handling, grapple, (add 100,000 lb hydraul	64	Excavator	350	0.59	13,216
Hydraulic excavator, crawler, 160, 000 lb	8	Excavator	450	0.59	2,124
Hydraulic excavator, crawler, 160, 000 lb	14	Excavator	450	0.59	3,688
Loader, front end, crawler	8	Skid Steer Loader	225	0.21	378
Marine equipment, boats & launches, 14' tender, 7' beam	64	Marine	80	0.59	3,021
Excavation					
Hydraulic excavator, crawler, 160, 000 lb	14	Excavator	450	0.59	3,688
Geotextile					
Hydraulic excavator, crawler, 160, 000 lb	27	Excavator	450	0.59	7,081
Marine equipment, boats & launches, 14' tender, 7' beam inboard engine	27	Marine	80	0.59	1,259
Blanket stone					
Hydraulic excavator, crawler, 160, 000 lb	89	Excavator	450	0.59	23,693
Loader, front end, crawler	89	Skid Steer Loader	225	0.21	4,217
Core stone					
Hydraulic excavator, crawler, 160, 000 lb	26	Excavator	450	0.59	6,967
Loader, front end, crawler	26	Skid Steer Loader	225	0.21	1,240
Armor stone					
Hydraulic excavator, attachment, material handling, grapple	155	Excavator	350	0.59	31,956
Hydraulic excavator, crawler, 160, 000 lb	155	Excavator	450	0.59	41,086
Loader, front end, crawler	155	Skid Steer Loader	225	0.21	7,312
17 - beach replenishment					
Mobilization and demobilization					
Shore equipment					
Loader, front end, crawler	168	Skid Steer Loader	225	0.21	7,938
Tractor, crawler (dozer), 310 hp	168	Dozer		0.59	0
Hydraulic beach fill					
Shore crew					
Grading					
Loader, front end, crawler	1,261	Skid Steer Loader	225	0.21	59,563
Loader, front end, wheel	1,261	Rubber tired loader	175	0.59	130,157
Small tools	1,261	Other diesel engines	25	0.59	18,594
Tractor, crawler (dozer), 310 hp	1,261	Dozer	310	0.59	230,564
Survey vessel & crew (monthly costs)					
Marine equipment, boats & launches, 23' little giant, w/cabin tri-hull	1,261	Marine	150	0.59	111,563
Tender (monthly costs)					
Marine equipment, boats & launches, 14' tender, 7' beam, inboard engine	4,790	Marine	80	0.59	226,066
Timber pedestrian dune walkover					
Price per linear foot					
Crane, mechanical, lattice boom, crawler, dragline/clamshell, 2.5 cy	28	Crane	225	0.43	2,742
Man-lift, line-truck, aerial platform 24"	17	Other diesel engines	100	0.59	985
Pile hammer, double acting, diesel, 18, 100 ft-lbs	28	Other diesel engines	50	0.59	836
Post driver, 8" (203 mm) max dia post, 30, 000 lb	5	Other diesel engines	50	0.59	148
Mob/demob					
Crane, mechanical, lattice boom, crawler, dragline/clamshell, 2.5 cy	24	Crane	225	0.43	2,322
Pile hammer, double acting, diesel, 18, 100 ft-lbs	24	Other diesel engines	50	0.59	708
All non-road equipment hours and hp-hours	**12,475**	hours	hp-hrs:		**943,109**
				NO_x	**CO_2**
Approximate non-road emission factors, g/hphr				9.5	562
Approximate non-road emissions from the project, tons				**9.9**	**584**

U.S. Army Corps of Engineers
Asharoken, Long Island Beachfill and Seawall
General Conformity Related Emission Estimates
DRAFT
6 October 2015

On-road:	On-road truck activity assume travel at 35 mph average speed				
	Truck, highway, 8, 600 gvw, 4x4 (suburban)	1,261	On-road		
	Truck option, flatbed, 8'	5	On-road		
	Truck, highway, 25, 000 lb	5	On-road		
		1,271	hours	miles:	44,471
				NO_x	**CO_2**
Approximate on-road emission factors, g/mile				15.4	1,824
Approximate on-road emissions from the project, tons				**0.8**	**1**

	NO_x	**CO_2**
Overall estimated emissions, tons	**10.6**	**585**

RECORD OF NON-APPLICABILITY (RONA)

Project Name: Asharoken, Storm Damage Reduction and Erosion Contro.
Reference: USACE Asharoken, – Alternative 4, SHLRR Equipment Report, March 6, 2015
USACE Asharoken, Storm Damage Reduction and Erosion , September 10, 2015

Project/Action Point of Contact: Howard Ruben

Begin Date: October 2017

End Date: November 2018

1. The project described above has been evaluated for Section 176 of the Clean Air Act. Project related emissions associated with the federal action were estimated to evaluate the applicability of General Conformity regulations (40CFR§93 Subpart B).

2. The requirements of this rule do not apply because the total direct and indirect emissions from this project are significantly less than the 100 tons trigger levels for NO_x (total less than 11 tons), $PM_{2.5}$, and SO_2 for each project year and significantly below the 50 tons trigger level for VOC (40CFR§93.153(b)(1) & (2)), as VOCs are typically a fraction of total NOx emissions. The estimated emissions for the project for each pollutant are provided below.

Applicable General Conformity Emissions

	Year of Construction Activity	
Pollutant	**2017**	**2018**
NOx	2.28	8.35

3. The project conforms with the General Conformity requirements (40CFR§93.153(c)(1)) and is exempted from the requires of 40 CFR §93 Subpart B.

Sincerely,

Peter Weppler
Chief, Environmental Analysis Branch

Appendix I

404(b)1

CLEAN WATER ACT
SECTION 404(b) (1) GUIDELINES EVALUATION
North Shore of Long Island, Asharoken, Suffolk County, New York
Coastal Storm Risk Management Feasibility Study

INTRODUCTION

This document presents a Section 404(b) (1) guidelines evaluation for the for storm damage erosion reduction project at Asharoken Beach, New York. The recommended plan includes beach fill using suitably sized sand, and retention structures in the form of 3 (western) terminal groins. Best management practices will be fully utilized to ensure that turbidity and sedimentation are limited to the area immediately adjacent to the project site and minimized to the greatest extent possible. This evaluation is based on the regulations presented in 40 CFR 230, Section 404(b) (1): Guidelines for Specification of Disposal Sites for Dredged or Fill Material. The regulations implement Sections 404(b) and 401(1) of the Clean Water Act, which govern disposal of dredged and fill material inside the territorial seas baseline [§230.2(b)].

As stated in Section 230.10(a) (4): For actions subject to NEPA, where the Corps of Engineers is the permitting agency, the analysis of alternatives required for NEPA environmental documents, Including supplemental Corps NEPA documents, will in most cases provide the information for the evaluation of alternatives under these Guidelines. The EA, to which this evaluation is an appendix, provides the documentation necessary to attest that the project is fully in compliance with the Section 404(b) (1) guidelines. The EA provides a full project description and location, description of existing conditions, alternatives analysis, and description of potential impacts as a result of the project and the project's construction. The analysis provided within the EA that will be also be used during the application process for the NYDEC State Water Quality Certificate under Section 401(1), documents that the implementation of this erosion/shore protection plan will not cause or contribute to significant degradation of the waters of the United States, as is demonstrated in the following sections and tables.

1.0 PROJECT DESCRIPTION

Location: The Proposed Project is located in Village of Asharoken, Town of Huntington, Suffolk County, New York. The project beach and study area is located along the north shore of Long Island from Eaton's Neck Point to the northwest and Long Island Lighting Company (LILCO) Northport Power Station to the southeast.

The proposed plan for Asharoken Beach includes the dredging and placement of approximately 600,000 CY of fill material to rebuild the beach with a 50' wide berm along approximately 2.4 miles of beach and the construction of three rock groins on the Western end of the project to retain sand and decrease erosion. The sand used for the initial 600,000 placement will be dredged from a nearby offshore borrow area (delineated as borrow area "A") located about ½ mile offshore of the western section of the project

beach. Dredging is to be conducted on what can be described as the side of a sand ridge (average depth of about 30') such that the ridge will become narrower as opposed to making a depression.
Periodic nourishment is anticipated at a frequency of 80,000 CY every 5 years with the nourishment sand trucked in from an outside source. Post storm nourishment is estimated at 25,000 CY every 5 years. Another re-nourishment source will be the continuation of annually placing sand (10,000 CY) dredged from the LILCO power station inlet to the east, "by passed" to the project site.

Beach fill will cover approximately 75 acres of intertidal and littoral near shore benthic habitat seaward of mean high tide limit. The dredge footprint at the borrow area (Area "A") and will cover an area of about 55 acres to resulting in a bathymetry change of about 10'. Average depth of the dredge foot print will be increased from about 35 to 45 feet (MHW). The project will also the require the construction of 3 tapering stone groins (152', 132', 112' X 64'), with a cumulative foot print area (berm, intertidal and littoral lands) of about 0.58 acres. Dredging will be conducted during the fall to minimize potential impacts to stationary or slow moving early life stages of various fish species. The shore-normal groins will extend from the base of the dune to approximately Mean Lower Low Water. The groins will be rubble mound structures, comprised of armor, core, and bedding stones.

General Characteristics of Fill Material: The material dredged from the offshore borrow area is approximately 90% sand, which eliminates concerns regarding the use of fine grain material from external sources, which would have to be tested for contaminants to ensure its acceptability. This material is grain size compatible with the past and present beach sand.

Description of Proposed Discharge Site:

All dredged material will be placed on the project beach in pre-designated locations according to the project design.

The project site is @ 12,400 feet along the north shore of Long Island located at Asharoken beach. The site is bordered by Long Island Sound in the north, the Northport power station to the east, Northport Bay in to the south and Bevin Road/Eaton's Neck to the west. The study site is a low-lying, crescent-shaped partially developed tombolo which extends from the power station channel west to Bevin road on Eaton's neck. The Beach is bordered landward by Asharoken Avenue the sole route to or from Eaton's neck or Asharoken Blvd and is considered an essential evacuation route. Most of the eastern portion of the site contains residences north and south of the road. South of the road and residences are vegetated areas of marine and scrub forest and salt marsh bordering Northport Bay

Time and Duration of Disposal: The dredging and placement of fill material will take place during the fall and winter (October – December) of 2017. Construction of the groins will be completed by April 1.

General construction durations for each phase of the project are estimated to be:

Groins @ 182 days

Beach Fill @ 107 day

DISPOSAL METHOD: Excavated material will be moved via pipeline to the proper onsite beach disposal areas and re-distributed and regarded according to plan design via the use of land based equipment.

2.0 FACTUAL DETERMINATIONS

Review of Compliance – Section 230.10(a)-(d)

	YES	NO
a. The discharge represents the least environmentally damaging practicable alternative and, if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose.	X	
b. The activity does not appear to: 1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of the CWA; 2) jeopardize the existence of Federally listed threatened and endangered species or their habitat; and 3) violate requirements of any Federally designated marine sanctuary.	X	
c. The activity will not cause or contribute to significant degradation of waters of the U.S. including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic and economic values.	X	
d. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem.	X	

Technical Evaluation Factors (Subparts C-F)

		N/A	NOT SIGNIFICANT	SIGNIFICANT
a. Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C)				
	1) Substrate		X	
	2) Suspended particulates/turbidity		X	
	3) Water column impacts		X	
	4) Current patterns and water circulation		X	
	5) Normal water circulation		X	
	6) Salinity gradients		X	
b. Potential Impacts on Biological Characteristics on the Aquatic Ecosystem (Subpart D)				
	1) Threatened and endangered species		X	
	2) Fish, crustaceans, mollusks, and other organisms in the aquatic food web		X	
	3) Other wildlife (mammals, birds, reptiles and amphibians)		X	
c. Potential Impacts on Special Aquatic Sites (Subpart E)				
	1) Sanctuaries and refuges	X		
	2) Wetlands		X	
	3) Mud Flats	X		
	4) Vegetated Shallows	X		
	5) Coral reefs	X		
	6) Riffle and pool complexes	X		
d. Potential Effects on Human Use Characteristics (Subpart F)				
	1) Municipal and private water supplies	X		
	2) Recreational and commercial fisheries		X	

	3) Water-related recreation			X
	4) Aesthetic impacts		X	
	5) Parks, national and historic monuments, national seashores, wilderness areas, research sites and similar preserves			X

Evaluation and Testing – Subpart G

A. THE FOLLOWING INFORMATION HAS BEEN CONSIDERED IN EVALUATING THE BIOLOGICAL AVAILABILITY OF POSSIBLE CONTAMINANTS IN DREDGED OR FILL MATERIAL. (CHECK ONLY THOSE APPROPRIATE.)			
	1) Physical characteristics		X
	2) Hydrography in relation to known or anticipated sources of contaminants		X
	3) Results from previous testing of the material or similar material in the vicinity of the project		X
	4) Known, significant sources of persistent pesticides from land runoff or percolation		N/A
	5) Spill records for petroleum products or designated hazardous substances (Section 311 of CWA)		N/A
	6) Public records of significant introduction of contaminants from industries, municipalities or other sources		X
	7) Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities		N/A
	8) Other sources (specify)		N/A
List appropriate references – See Environmental Assessment			
		YES	**NO**
b. An evaluation of the appropriate information factors in 3a above indicates that there is reason to believe the proposed dredged material is not a carrier of contaminants, or that levels of contaminants are substantively similar at extraction and disposal sites and not likely to require constraints.		**X**	

4. Disposal Site Delineation - Section 230.11(f)

A. THE FOLLOWING INFORMATION HAS BEEN CONSIDERED IN EVALUATING THE BIOLOGICAL AVAILABILITY OF POSSIBLE CONTAMINANTS IN DREDGED OR FILL MATERIAL. (CHECK ONLY THOSE APPROPRIATE.)			
	1) Depth of water at disposal site		Yes
	2) Current velocity, direction, variability at disposal site		Yes
	3) Degree of turbulence		Yes
	4) Water column stratification		Yes
	5) Discharge of vessel speed and direction		Yes
	6) Rate of discharge		Yes
	7) Dredged material characteristics (constituents, amount, and type of material, settling velocities)		Yes
	8) Number of discharges per unit of time		Yes
	9) Other factors affecting rates and patterns of mixing (specify)		Yes
List appropriate references – See Environmental Assessment			
		YES	**NO**
b. An evaluation of the appropriate information factors in 4a above indicated that the disposal sites and/or size of mixing zone are acceptable.		X	

Actions to Minimize Adverse Effects (Subpart H)

	YES	**NO**
All appropriate and practicable steps have been taken, through application of recommendation	X	

of Section 230.70-230.77 to ensure minimal adverse effects of the proposed discharge.		

Factual Determination – Section 230.11

A REVIEW OF APPROPRIATE INFORMATION, AS IDENTIFIED IN ITEMS 2-5 ABOVE, INDICATES THERE IS MINIMAL POTENTIAL FOR SHORT OR LONG-TERM ENVIRONMENTAL EFFECTS OF THE PROPOSED DISCHARGE AS RELATED TO:		
	YES	**NO**
a. Physical substrate at the disposal site (review Sections 2a, 3, 4 and 5 above)	X	
b. Water circulation, fluctuation and salinity (review Sections 2a, 3, 4 and 5)	X	
c. Suspended particulates/turbidity (review Sections 2a, 3, 4 and 5)	X	
d. Contaminant availability (review Sections 2a, 3 and 4)	X	
e. Aquatic ecosystem structure, function and organisms (review Sections 2b, 2c, 3 and 5)	X	
f. Proposed disposal site (review Sections 2, 4 and 5)	X	
g. Cumulative effects on the aquatic ecosystem	X	
h. Secondary effects on the aquatic ecosystem	X	

Findings of Compliance or Non-Compliance

	YES	**NO**
The proposed disposal site for discharge of dredged or fill material complies with Section 404(b) (1) guidelines.	X	

In summary, the implementation of the recommended plan to construct shore protection measures at Asharoken Beach;

Will have no adverse effects in regard to the discharge of pollutants on human health or welfare, including but not limited to effects on municipal water supplies, plankton, fish, shellfish, wildlife, and special aquatic sites.

Will have no significant adverse effects of the discharge of pollutants on life stages of aquatic life and other wildlife dependent on aquatic ecosystems, including the transfer, concentration, and spread of pollutants or their byproducts outside of the disposal site through biological, physical, and chemical processes;

Will have no significant adverse effects of the discharge of pollutants on aquatic ecosystem diversity, productivity, and stability.

Will have no significant adverse effects of discharge of pollutants on recreational, aesthetic, and economic values.

Appendix J
FONSI

I. NAME OF ACTION

North Shore of Long Island, Asharoken, Suffolk County, New York Coastal Storm Risk Management Feasibility Study

II. DESCRIPTION OF ACTION

The proposed plan for the North Shore of Long Island, Asharoken, Suffolk County, New York Coastal Storm Risk Management Feasibility Study includes the dredging and placement of approximately 600,000 cy of sand from an offshore borrow area in Long Island Sound along 2.4 miles of shoreline, to rebuild berm and dune. Periodic re-nourishment is anticipated at a frequency of 80,000 CY every 5 years (as needed) with the re-nourishment sand trucked in from a certified outside source. Post storm nourishment is estimated at 25,000 CY every 5 years. Most of the project site may be considered developed and shore protection structures are present including bulkheading and rip-rap of private residences adjacent to areas of maritime forest and shrub, salt marsh and open water bay habitats. Construction is scheduled to begin in October 2017 and be completed by April of 2018.

The features of the project include the following:

- Placement of 600,000 CY of sand will construct construct a 50 - 100 foot wide berm/dune (location dependent) between Bevin Road to the west and the Northport Power Plant jetty to the east on the shoreline of Long Island sound. Again, depending on location crest of the dune /berm elevation will vary from +9.0 NAVD to +15 ft NAVD. Initial fill will cover approximately 75 acres of upper beach, intertidal and sub-tidal areas.

- Construction and re-establishment of three stone groins in the western section of the project reach fronting a critical erosion area. The groins will taper n length from east to west with respective lengths of 120’, 100’, and 80’. The cumulative footprint of the base of the 3 groins will be 0.58 acres of intertidal and sub-tidal near-shore bottom.

- Dredging of 600,000 CY of sand will remove surface sediments from approximately 55 acres of sound bottom within the designated borrow area? The average depth of the dredged area will be increased from 35’ to 45’. Most of the bottom area to be dredged consists of the sides of a sand ridge above ambient bathymetry and dredging is not expected to result in a significant depression in relations to surround bottom surface.

- The cumulative volume of re-nourishment sand needed for the lifetime of the project is estimated to be 800,000 cubic yards (upland).

III. ANTICIPATED ENVIROMENTAL IMPACTS

A full assessment of impacts associated with the No Action Alternative and Proposed Action were evaluated in the attached *Environmental Assessment: Asharoken Beach, Storm Damage Reduction and Erosion Control Project, Asharoken NY.* No long-term, adverse impacts are anticipated as a result of implementing the proposed plans. Implementation of the recommended plan would result in changed topography and elevation along the shoreline with the placement of fill, and will lower the elevation of areas of the sand shoal that make up the borrow area. However, a significant depression is not anticipated Construction of the project will create a significant change of view shed that will include a higher, wider berm and beach which will cover most of the existing beach and intertidal. Three new groins will also be present. The new view shed will be an improvement to the existing eroded beach front.

A temporary increase in turbidity is expected during construction as a result of the placement of fill. This turbidity plume will be highly localized due to the course nature of the fill sand and further minimized through the use of best management practices appropriate for this operation. No significant adverse impacts to water quality are anticipated from placement operations of this course material. Implementation of the selected plan may result in the temporary displacement of fish and mobile invertebrate species and terrestrial wildlife. Non sessile marine species and terrestrial species are expected relocate to undisturbed adjacent habitats during construction and will not be significantly affected.

Placement of sand will cause direct mortality to those marine organisms that cannot disperse to other areas. Most of the mortality will occur to various intertidal and nearshore marine invertebrate species but may also include the eggs and other early life stages of some fish species which may be buried or otherwise adversely impacted by filling. These impacts cannot be avoided but are considered short term as most of the biota will generally recover in as little as 3 to 6 months but may take up to one year depending on the season of completion and the particular pre-existing species diversity. Because this project is likely to utilize a cutterhead dredge instead of a hopper the magnitude of entrainment and resulting mortality is anticipated to be less than what would be expected if a hopper dredge were used. The area to be affected by placement operations consists of approximately 75 acres from MHW seaward.

In the action component required prior to placement, 55 acres of sound bottom will be affected by dredging at SBBA. Adult finfish are expected to avoid entrainment in the dredge however some mortality may occur but it will not constitute a significant impact to any species. There will be an analogous loss of benthic communities by the removal of sand via dredging. Again, this is course material as previously discussed, and no impacts to water quality are anticipated. The dredged areas will recover relatively quickly taking from 1 to 2.5 years also depending on the season when the dredging is occurring and the types of benthic communities affected. Because the borrow area is surrounded by similar bottom habitats regional in dimension, the temporary loss of the benthic communities themselves as well as the temporary loss of use of this habitat by other species will be compensated for by the availability of compatible, favorable habitat adjacent to the disturbed areas. Because no significant depression is anticipated as a result of sand removal from the ridge, no future depth/temperature/ density related water quality issues are anticipated

The project placement site (nearshore) and the borrow area are considered essential fish habitat (EFH) areas, supporting National Marine Fisheries Service (NMFS) designated EFH species appropriate to these geographic locations. The in water actions and their resulting impacts discussed in the above environmental impact sections are applicable to EFH habitat and related species concerns. No long term adverse affects on habitat or EFH species are anticipated from implementing the project.

Several different state and federally listed bird species seasonally utilize beach habitats regionally. Piping plovers are known to nest within the central area of the project beach. The construction window for the project is October through March, piping plovers will have migrated out of the area prior to the start of project construction will prevent any implementation related. The resulting enlarged beach and berm will represent an improvement of habitat to piping plovers. The adult Rufus red knot may seasonally forage on the Asharoken beach. However this would only occur in the spring, after construction has been completed. During spring red knots primarily feed on the eggs of horseshoe crabs and the re-nourished beach is not expected to have a negative effect on crab spawning or the availability of eggs. Neither of the two state and federally listed species discussed above are expected to be adversely affected by project implementation.

Several species of state and federally protected whales and sea turtles may be seasonally present in the region from May through November. Whales are not expected to be in vicinity of the project site but sea turtles may be. However, turtles would be migrating out of the western sound by November. None the less, protection of these species will be upheld by implementation of recommended NMFS protocols and best management practices that will include on board observers, regulated dredging and transit speeds and the installation of the draghead sea turtle deflector device to prevent entrainment if a hopper were to be used. Since it is most likely that a cutter head pipeline dredge will be employed, significant direct impacts to sea turtles would not expected. Since turtles will be migrating out of the western sound during construction the loss of prey items in a limited fixed area due to dredging, an indirect impact, is not expected to be significant.

The Atlantic sturgeon may be present in the vicinity of the project site year round. As with sea turtles, if a hopper dredge were employed a draghead deflector device would be installed and sturgeon/turtle observers would be on board the dredge. Best management practices would include daily load observation reports and weekly testing of the deflectors (proper) alignment. As with turtles no significant direct impacts would be expected from the use of a hopper dredge. Indirect impacts to sturgeon as with turtles would include a limited temporary loss of prey items along with temporary localized increases in turbidity. Mobile sturgeon would move away from these disturbances and forage elsewhere.

There are no known incidences of State or Federally listed plants occurring at the project site.

No culturally sensitive areas will be disturbed at either the placement site or the borrow area.

There are now known HTRW sites within the project area. Best management practices including the project Hazardous Materials Management Plan will guard against any impacts related to project construction activities and materials.

During construction, there would be temporary but minor adverse impacts to the recreation, aesthetic, and scenic resources of the sites due to the presence of construction equipment and project activity. Furthermore, there are no anticipated adverse impacts to surface water or ground water resources.

Heavy equipment used during construction may contribute to a temporary increase in noise levels and a decrease in air quality; however noise levels would not increase beyond those cited in local ordinances. Air impacts are expected to be minor, as the project site is contained within a Non- Attainment area. Both will be limited to the duration of construction.

These temporary impacts would ultimately lead to positive long term improvements. Project related benefits include protection of property and infrastructure, greatly increased opportunities for passive recreation, aesthetic, scenic resources and educational opportunities.   The restored berm may also offer suitable nesting habitat piping plovers as well as offer expanded stop over habitat to migrating shorebirds

IV. CONCLUSIONS

The use of Best Management Practices (BMP) during construction will be implemented through all phases of construction and include measures to be implemented prior to, during and after completion of the project.

- To minimize depth related impacts to water quality such as the potential for low oxygen, excavation will be conducted along the side of a ridge which is expected to all but eliminate typical impacts related to creating a deep pit with steep side slopes.

- To minimize impacts to sensitive early life stages of important aquatic organisms dredging will be conducted during specific seasonal window (October to mid-January) as regulated by the NYSDEC.

- Use of a cutterhead pipeline dredge is the expected method of dredging to be used for this project.   Other than the direct impact to sediment born organisms and a temporary localized no other significant impacts to water quality or biota are anticipated.   If used hopper dredges would be equipped with state of the art turtle and sturgeon deflectors to decrease the probability of impacting or taking either species.

- Qualified individuals will be placed on board all dredges to monitor for the presence of any ESA species in the vicinity of the dredge as well as monitor for ESA takes due to entrainment.

- Plover monitors will be made available to provide protection and guidelines if this species arrive at the project site in March.

- All construction activities will be guided by USFWS and NMFS recommendations.

- The dredging contractor will submit a QA/QC plan including a HASP plan that will include all contingencies of environmental protection including HTRW issues and noise.

- A pre and post construction benthic characterization program as requested by the NYSDEC will be implemented to assess the any impacts to the project site habitats.

- A piping plover management/protection plan to prevent/minimize impacts to plovers will be implemented during construction and following completion in coordination with the town of Asharoken as with all the appropriate local, state, and federal resources agencies.

Given that there are no anticipated long-term, adverse impacts associated with the implementation of the recommended plan, a Finding of No Significant Impact (FONSI) has been determined for this action. Furthermore, as the recommenced plan would have no negative impacts on the quality of the environment, an Environmental Impact Statement in not required.

Date:_________________

____
David A. Caldwell
Colonel, Corps of Engineers
District Engineer

North Shore of Long Island, Asharoken, New York Coastal Storm Risk Management Feasibility Study

Appendix K

Pertinent Correspondence

November 2015

STATE OF NEW YORK
DEPARTMENT OF STATE
ONE COMMERCE PLAZA
99 WASHINGTON AVENUE
ALBANY, NY 12231-0001
WWW.DOS.NY.GOV

ANDREW M. CUOMO
GOVERNOR

CESAR A. PERALES
SECRETARY OF STATE

October 19, 2015

Mr. Peter Weppler
Chief, Environmental Analysis Branch
U.S. Department of the Army
Corps of Engineers, New York District
26 Federal Plaza
New York, NY 10278-0090

Re: F-2015-0794 (DA) – U.S. Army Corps of Engineers, New York District (Corps)submission of a consistency determination for the Village of Asharoken – Shoreline Protection Project, Asharoken Avenue, Village of Asharoken, County of Suffolk.
Receipt of Consistency Determination, Request for Additional Information, and Notification That Review Has Not Begun

Dear Mr. Weppler:

On October 13, 2015 the Department of State (DOS) received the Corps' policy analysis and request for a consistency determination regarding the consistency of the above-referenced proposal with the New York State Coastal Management Program. However, DOS has not been provided with the information required pursuant to 15 CFR Part 930.39. Therefore, pursuant to 15 CFR Part 930.41(a), the DOS 60-day review period pursuant to 15 CFR Part 930.41 has not begun.

In your submission, you have provided an analysis of the NYS Coastal Management Program (NY CMP) coastal policies, as well as the Town of Huntington's Local Waterfront Revitalization Program (LWRP) policies. The Town of Huntington's LWRP has not yet been submitted for federal approval to NOAA's Office for Coastal Management (OCM) and therefore those policies do not apply. The proposal is located within the Long Island Sound Coastal Management Program (LIS CMP) boundary and the 13 policies of the LIS CMP apply to this proposal. Please provide an analysis of the LIS CMP policies, accompanied by the determination that the "proposal will be conducted in a manner consistent to the maximum extent practicable with the LIS CMP." This statement acts as your consistency determination with which DOS will either concur or object to as a result of our review. A copy of the LIS CMP policies are attached for your reference.

The policy analysis currently provided does not discuss the effects on coastal policy due to the mining of sand from Long Island Sound. Please provide an analysis of the anticipated effects on each policy from the mining of sand from the borrow area and the potential effects to adjacent areas from the removal of sand from the littoral system, as well as a discussion as to why the mining of sand from the underwater lands within Long Island Sound is necessary. Please also be advised that groins and beach fill are both structural measures. Please discuss the need for structural measures over non-structural measures within your policy analysis.

Additionally, your submission did not contain a copy of the Environmental Analysis (EA) that is referred to in the submitted policy analysis, or project plans or drawings. We have compiled all of the early coordination project materials that have been shared with Barry Pendergrass of the Hazards Unit, however, we need confirmation that the draft tentatively selected plan, or draft TSP, is the chosen alternative moving forward. Please also provide a copy of the EA as mentioned in the policy analysis.

The DOS decision-making review period will begin when the Corps provides DOS with the information required by 15 CFR Part 930.39. This information is necessary for the DOS to adequately assess the effects of the proposal on the coastal area and its uses, and to provide comprehensive data and information sufficient to support the Corps' consistency determination.

If you have any questions or need any other assistance regarding this matter, please contact me at (518) 474-1734 or e-mail: Jennifer.Street@dos.ny.gov.

Sincerely,

Jennifer L. Street
Coastal Resources Specialist
Office of Planning and Development

Cc: COE/NY District – Howard Ruben – via email only
NYSDEC Central Office – Matthew Chelbus – via email only

Ruben, Howard NAN02

From: Ruben, Howard NAN02
Sent: Wednesday, April 16, 2014 10:29 AM
To: Susan McCormick (sdmccorm@gw.dec.state.ny.us); Matthew Chlebus
Cc: Weppler, Peter M NAN02; Pinzon, Ronald R NAN02
Subject: FW: Monitoring Discussion w/ NYSDEC (UNCLASSIFIED)
Attachments: LISspawning.xls

Classification: UNCLASSIFIED
Caveats: NONE

Sue and Matt,

Below is the email that was sent to the region regarding summer spawners in LI Sound and the request to expand the Asharoken dredging window to include the month of September. Attached is the LIS summer spawner table that the region supplied to us.

Thanks

Howard Ruben
Environmental Analyst
CENAN-PL_EA, Rm 2131
26 Federal Plaza NY, NY
917 790 8723

-----Original Message-----
From: Weppler, Peter M NAN02
Sent: Wednesday, March 19, 2014 3:15 PM
To: Ruben, Howard NAN02; 'Dawn McReynolds'; Steve Zahn; George Hammarth; Smith, Robert J NAN02
Subject: RE: Monitoring Discussion w/ NYSDEC

Good Afternoon NYSDEC!

As part of discussion on Friday, we want to offer the following also in regards to Asharoken - As we were evaluating the Asharoken's proposed construction schedule, we seeking to accomplish this in one work season. In order to accomplish this, the District will be requesting that DEC as part of its WQC add the month of September to the October 1 - January 14 dredging work window. The available data indicates that early life history stages of only a few species might be affected during September. To allow for this one time dredging in Long Island Sound for the Asharoken Project, the District suggests conducting a single season egg/early life stage demersal monitoring program (monitoring will bracket the month of September (2014) as a means to evaluate expected impacts to early life stages from dredging within the LIS. This data and monitoring methods can be used as a protocol for evaluating any future dredging projects proposed for NYS LIS waters.

Please read below the background for our request -

The New York District appreciates the need for the January 15th through May winter flounder no dredging window due to this species importance and declining stock assessment within New York State waters. Expanding the no dredge window to include the State's list of "summer spawners" effectively limits the available dredging season for the Asharoken project to an open window of October 1 through January 14th, 106 days. Even with two dredges, completing the project in one season may be unlikely. Expanding the available dredging period into September offers a more realistic possibility as this period is at the end of the spawning season of most of the Long Island Sound (LIS) summer spawning species. It is the District's consensus that such an opportunity would be dependent on approximating the likelihood or lack there-of, of impacts to summer spawning species that possess life history/spawning characteristics similar to winter flounder, that would put them at reasonable risk from hopper dredging impacts.

The District evaluated the potential for local (vicinity of Asharoken) early life stages to be significantly impacted by dredging operations based on the same parameters used to classify winter flounder as having a high potential for significant impacts. This determination utilized multiple factors, not just spawning period and included spawning habitat characteristics (temperature, salinity, depth), and the presence or absence of demersal eggs, juveniles and adults, as described by the appropriate NOAA fisheries technical documents and other referenced sources.

The State species list consisted of 39 species. Review of these species' reproductive life histories and habitat requirements were conducted via Bigelow and Schroeder 2002, Able and Fahay 1998, and the NOAA/Connecticut Long Island Trawl surveys 1984 -1994 and 2010 - 2012, as well as individual NOAA Tech reports. After review, the following was surmised. Some species do not spawn in the LIS, some spawn outside the window including September, most do not have demersal eggs or juveniles and many species (adults and juveniles) were rarely captured in the western LIS, especially in the fall. The District's evaluation resulted in the list of 12 species below as being those species with spawning characteristics and life histories similar enough to winter flounder to justify at least some potential for being impacted during spawning by the proposed offshore dredging operations for the Asharoken project. Three species from the list below stand out as having a moderate to high potential for impacts to early life stages; they consist of the blue claw crab, long fin squid and summer flounder.

** Section 7 (ESA) will require use of the dredge deflector head for sea turtles and Atlantic sturgeon which will add a significant level of protection to demersal adults and juvenile stages and is likely to add some degree of protection for demersal eggs.

List of species with potential to sustain impacts to various life stages from hopper dredging (during September).

Atlantic Herring - Spawning in the LIS is highly unlikely according to spawning habitat preferences (salinity and depth), however, Atlantic herring are known to be year round spawners in northeast Atlantic, with peaks in the spring and fall. (NOAA Technical Memorandum NMFS-NE-126/148). Atlantic Herring have demersal eggs and pelagic larvae and juveniles. There is a moderate to high commercial interest. Eggs present?

Blue Claw Crab - This species spawns in the LIS. Females carry the eggs, which are released and hatch into swimming larvae. September is the end of their spawning season. Adults and juveniles are demersal and somewhat structure oriented. Blue Claw Crab are commercially and recreationally important. There is a possible presence of adults and juveniles. Adults are wary, fast swimmers and are likely to avoid the draghead.

Clearnose Skate - This species does not spawn in the LIS There is a possibility of the presence of egg cases and hatching in LIS. Adults and juveniles are unlikely to be very abundant in the Western LIS, especially in September (NOAA Technical Memorandum NMFS-NE-174/148). No individuals were captured by USACE during Asharoken 2003 fall monitoring. There is low commercial or recreational interest, however, the Clearnose Skate is an EFH species. September is the last month of spawning season. There is a possible presence of demersal adult and juveniles.

Fourspot Flounder - This species potentially spawns in the LIS According to habitat requirements, Fourspot are probably not common in the Western LIS. Previous capture studies bear this out (NOAA Technical Memorandum NMFS-NE-148). Referenced spawning temperatures are not compatible with LIS temperatures during mid-summer to early fall. Commercial and recreational interest is unknown. Eggs are buoyant. Juveniles/adults are dermersal with a possible presence in the LIS.

Goose Fish - This species potentially spawns in LIS but the possibility is unlikely. Juveniles and adults are rare in LIS especially in Western LIS according to past Connecticut capture studies (NOAA Technical Memorandum NMFS-NE-127 & 148). This is possibly due to temperature/depth incompatibility. None were captured by USACE in September 2003. There is moderate commercial and low recreational interest. September is the last month of spawning season. Egg strands are buoyant and float at surface. Juveniles and adults are demersal and possibly present.

Hogchoker - This species spawns in the LIS. The eggs are buoyant and the species is common. There is little to no commercial/recreational interest. Juveniles and adults are demersal and probably present.

Long Fin Squid- This species spawns in the LIS. The eggs are demersal consisting of gelatinous masses. According to NOAA Technical Memorandum (NMFS-NE-193 & 148) the species can be abundant in September offshore of Asharoken. There is high commercial interest. Egg masses may be present.

Northern Sea Robin - This species spawns in the LIS. The eggs are eggs and the juveniles and adults are demersal. The species is common. There is little commercial/recreational interest. Juveniles and adults are probably present. (NOAA Technical Memorandum NMFS-NE-148)

Red Hake - This species spawns in the LIS. Eggs are pelagic, highly buoyant, and float near the surface (NOAA Technical Memorandum NMFS-NE- 133 & 148). This species has low commercial and recreational interest. Juveniles and adults are bottom oriented, and are likely present.

Silver Hake - This species has the potential to spawn in the LIS. Eggs are pelagic/buoyant. Few eggs were caught in LIS. The abundance of adults are low in Western LIS (NOAA Technical Memorandum NMFS-NE-186 & 148). There is low commercial/recreational interest. Juveniles and adults can be bottom oriented.

Winter Skate- This species does not spawn in the LIS. Egg capsules may be present. LIS capture data showed very low abundance of adults or juveniles in the fall (Sept/Oct) in Western LIS (NOAA Technical Memorandum NMFS-NE-179 & 148) Juveniles and adults are demersal and possibly present.

Summer Flounder - This species spawns in the LIS. Eggs are buoyant. Juveniles and adults are demersal and probably present (NOAA Technical Memorandum NMFS-NE-148).

Thanks,
Peter

Peter Weppler
Chief, Coastal Ecosystem Section
U.S. Army Corps of Engineers - Planning
26 Federal Plaza - Room 2151
New York, NY 10278-0090
Tel: 917-790-8634

Ruben, Howard NAN02

From: McReynolds, Dawn (DEC) [dawn.mcreynolds@dec.ny.gov]
Sent: Tuesday, November 25, 2014 3:47 PM
To: Chlebus, Matthew J (DEC); Weppler, Peter M NAN02; Ruben, Howard NAN02; Pinzon, Ronald R NAN02
Cc: Star, Eric (DEC); Hammarth, George (DEC); Deonarine, Sarah (DEC); McCormick, Susan D (DEC)
Subject: [EXTERNAL] RE: Asharoken Dredging Windows

Hi all- This is what I sent months ago in response to the first request. Most recent document does not seem to address these comments. Thanks

Pete- Thanks for the submission outlining proposed sampling related to Sept fishery window relief for the Asharoken project. We offer the following comments on the proposal. While I would like to see some geographically informative fishery window related information gathered for this and other projects there are some issues we see with the current proposal. See comments below. When you have some time, I would like to discuss the possibility of looking broader at this issue (getting good geographic fishery monitoring data to inform Corp projects windows) . Please send to Howard as my new email system does not seem to have his email.

Thanks Dawn
PS new email : dawn.mcreynolds@dec.ny.gov

1) Use of a singular (Sept) monitoring of short duration and subsequent use of this data to inform other WLIS dredge projects. Single season of data is not representative and would not characterize all years well. This cannot account for any of the natural variation in a species response to temp, advecting forces inter specific interactions and spawning abundance.
(3) Evaluation of only demersal species. Species with similar traits to winter flounder. Our mandate is not only bottom associated species. Sampling should also evaluate pelagic sensitive life stages (eggs, larvae and yoy).
(3) WLIS trap survey data combined with life history information indicated that the life stages of a number of other commercially and recreationally important species could be present and vulnerable :

* American Lobster - very limited ability to avoid dredges as adults, small individuals will be burrowed and highly susceptible to mortality from dredges and may be unable to avoid plume and contamination effects.
* Black sea bass - adults capable of avoidance, YOY settling in Aug-October and will utilize any kind of structure or relief including piles and divots in substrate. YOY susceptible to plumes and increased predation when avoiding dredge disturbance. Peconic Bay Small Mesh trawl Survey PBSMT data
* Tautog - adults capable of avoidance, YOY settle in June on structure and relief, susceptible in a similar fashion to sea bass. PBSMT data
* Bluecrab - limited dredge avoidance.
* Whelk - Susceptible to dredge mortality, egg cases laid in spring and fall.
* Oyster toadfish - Highly demersal/burrowing, local reproduction (no dispersal phase), YOY show up in July and August. Dredge avoidance is probably very limited. Able and Fahay 2010
* Red Hake - Spawning between LI and Martha's Vineyard occurs in the Fall w/ a 2 month larval period. Newly settled YOY benefit from structure including sand wave troughs. Able and Fahay 2010.
* Spotted Hake - Spawning begins late summer, estuary ingress occurs as early as October. Small individuals may burrow making them susceptible to dredge mortality. Able and Fahay 2010.

*   Scup - Demersal, but more mobile and capabale of dredge avoidance. YOY show up late June, early July. PBSMT data
*   Squid Eggs - susceptible to dredge activity, including displacement and smothering by suspended material.
*   Windowpane - There is spawning in the spring and fall and both cohorts may occur in LIS, documented from GSB. Most fall spawned YOY colonize the inner shelf and not the estuaries. Prefer sandy bottom. Able and Fahay

A longer time series of data such as the CTDEEP trawl survey may be the best available source for identification for what species are present in the LIS at this time. Although it does not specifically catch YOY.

Monitoring- if the purpose is to provide data on the presence and abundance of species and life stages potentially vulnerable to dredging in Sept, then monitoring should span Aug, Sept and Oct and span multiple years so as to evaluate variability . Sampling gear could include: benthic sled to capture the demersal eggs and newly settled yoy, plankton net to capture more pelagic eggs larvae, small mesh trawl to sample yoy with limited avoidance ability and small mesh unbaited trap work to capture cryptic and structure oriented species

Dawn McReynolds
Marine Habitat Section Head
Bureau of Marine Resources
205 Belle Mead Road
E. Setauket, NY 11733
Phone: (631) 444-0452
Email: Dawn.McReynolds@dec.ny.gov

-----Original Message-----
From: Chlebus, Matthew J (DEC)
Sent: Monday, November 03, 2014 4:04 PM
To: Weppler, Peter M NAN02; Ruben, Howard NAN02; Pinzon, Ronald R NAN02
Cc: Star, Eric (DEC); Hammarth, George (DEC); Deonarine, Sarah (DEC); McReynolds, Dawn (DEC)
Subject: RE: Asharoken Dredging Windows

Ron/Pete/Howard,

Please respond directly to Dawn and keep me cc'ed.

Thanks,

Matt

-----Original Message-----
From: McReynolds, Dawn (DEC)
Sent: Tuesday, October 28, 2014 2:12 PM
To: Chlebus, Matthew J (DEC)
Cc: Star, Eric (DEC); Hammarth, George (DEC); Deonarine, Sarah (DEC)
Subject: RE: Asharoken Dredging Windows

Matt -My comments on sampling and species etc were not incorporated into this. Did they ever see it? I sent quite a while ago. I think they should see that and address before I even review this.

Dawn McReynolds
Marine Habitat Section Head
NYSDEC Bureau of Marine Resources

From:	Daniel Marrone - NOAA Federal
To:	Ruben, Howard NAN02
Subject:	Re: [EXTERNAL] Re: Draft BA Asharoken storm damage reduction project (UNCLASSIFIED)
Date:	Wednesday, October 07, 2015 2:11:49 PM

Hi Howard,
One other thing I forgot to mention on the phone is that you may want to include shortnose sturgeon in your document. Below is some information describing shortnose sturgeon presence in the area.

Shortnose sturgeon (Acipenser brevirostrum) occur in rivers and estuaries along the East Coast of the U.S. and Canada (SSSRT 2010). There are 19 documented populations of shortnose sturgeon ranging from the St. Johns River, Florida (possibly extirpated from this system) to the Saint John River in New Brunswick, Canada. Shortnose sturgeon are a large, long lived, benthic fish species that mainly occupy the deep channel sections of large rivers, but will forage where food is accessible. They feed on a variety of benthic and epibenthic invertebrates including mollusks, crustaceans (e.g., amphipods, isopods), and oligochaete worms in soft-sediment habitat (Dadswell 1979 in NMFS 1998).

In some areas, including the Gulf of Maine, nearshore coastal migrations and movements between river systems have been documented. For example, approximately 70% of shortnose sturgeon tagged in the Penobscot River made regular seasonal movements out of the river, with some fish spending up to a year outside of the river (Zydlewski et al. 2011).

Only a few of these types of nearshore coastal movements have been documented in the New York Bight. Three shortnose sturgeon adults tagged in the Hudson River have been recaptured in the Connecticut River and one Hudson River origin shortnose sturgeon was captured in both the Connecticut and Housatonic rivers (Savoy 2004 in SSSRT 2010). In fall 2014, a shortnose sturgeon was caught in the Merrimack River (MA) carrying a tag implanted in the Connecticut River in 2001 (pers. comm. Savoy, 2014). Genetic information is not yet available so we do not know the river of origin of this fish. At this time, the available tagging and tracking information is too limited to determine if Hudson River and Connecticut River shortnose sturgeon are making regular movements outside of their natal rivers. The documented movements of very few Hudson River fish outside of the river since the mid-1990s is thought to be a reflection of the rarity of these types of movements. However, the documented occurrence of Hudson River shortnose sturgeon in the Connecticut River, the capture of a shortnose sturgeon in the Housatonic River, and the movement of a shortnose sturgeon from the Connecticut River to the Merrimack River, indicate that occasional shortnose sturgeon may be present in nearshore coastal waters and rivers between the Hudson and Connecticut rivers.

No shortnose sturgeon have been captured or detected on telemetry arrays along the south coast of Long Island. Based on known movement patterns, we expect any shortnose sturgeon moving between the Hudson River and the Connecticut River to travel through the East River and in the nearshore coastal waters of northern Long Island Sound with occasional movements into small coastal rivers and estuaries. The range of shortnose sturgeon in this area is expected to include nearshore waters, accessible estuaries, and small rivers on the northern coast of Long Island Sound between the East River and the Connecticut River.

On Wed, Sep 30, 2015 at 11:18 AM, Ruben, Howard NAN02 <Howard.Ruben@usace.army.mil <mailto:Howard.Ruben@usace.army.mil> > wrote:

> Classification: UNCLASSIFIED
> Caveats: NONE
>
> Hello Daniel, thanks for the prompt reply. If you could get your feedback to me by the middle of next week that would be great! Again what is most important to me at this time would be an a general assessment of any the Service feels would occur to pertinent species in regard to the project construction . Thanks again.

Howard Ruben

Coastal Ecosystems Section
CENAN-PL_EA, Rm 2131
26 Federal Plaza NY, NY
917 790 8723 <tel:917%20790%20%20%208723>

-----Original Message-----
From: Daniel Marrone - NOAA Federal [mailto:daniel.marrone@noaa.gov <mailto:daniel.marrone@noaa.gov>]
Sent: Tuesday, September 29, 2015 5:38 PM
To: Ruben, Howard NAN02
Subject: [EXTERNAL] Re: Draft BA Asharoken storm damage reduction project (UNCLASSIFIED)

Hi Howard,
I am happy to take a look a look at this and provide any comments I see fit. Can you give me a time frame on when you would like any comments?
Thanks,
Dan

On Thu, Sep 24, 2015 at 5:43 PM, Ruben, Howard NAN02 <Howard.Ruben@usace.army.mil <mailto:Howard.Ruben@usace.army.mil> > wrote:

Classification: UNCLASSIFIED
Caveats: NONE

Good day Daniel,

Please review this draft EFH transmittal letter and EFH assessment for the Asharoken Project. I have included a data file that contains the most pertinent technical data for the preferred plan. It is possible that our Asharoken draft Hurricane Sandy Limited Re-evaluation Report including the EA and related NEPA documents may be sent out for public review as early as October 13. I of course to do not expect a BO within this time frame, I would greatly appreciate any feed back you can relay to me regarding the expectations of your agency regarding assessment of the project's potential impacts to the appropriate ESA species. I would like to have a handle on where the plan stands in regard to this prior to the release of the draft report and NEPA documents to the public. I am usually in the office and will be glad to discuss any aspect of the project or the District's draft BA.   Please let me know if you wish to speak with me and let me know when would be a convenient time to call. Thanks for all your assistance.

Howard Ruben

Coastal Ecosystems Section
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26 Federal Plaza NY, NY
917 790 8723 <tel:917%20790%208723> <tel:917%20790%20%20%208723>

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

STATE OF NEW YORK
DEPARTMENT OF STATE
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99 WASHINGTON AVENUE
ALBANY, NY 12231-0001
WWW.DOS.NY.GOV

ANDREW M. CUOMO
GOVERNOR

CESAR A. PERALES
SECRETARY OF STATE

October 19, 2015

Mr. Peter Weppler
Chief, Environmental Analysis Branch
U.S. Department of the Army
Corps of Engineers, New York District
26 Federal Plaza
New York, NY 10278-0090

Re: F-2015-0794 (DA) – U.S. Army Corps of Engineers, New York District (Corps)submission of a consistency determination for the Village of Asharoken – Shoreline Protection Project, Asharoken Avenue, Village of Asharoken, County of Suffolk.
Receipt of Consistency Determination, Request for Additional Information, and Notification That Review Has Not Begun

Dear Mr. Weppler:

On October 13, 2015 the Department of State (DOS) received the Corps' policy analysis and request for a consistency determination regarding the consistency of the above-referenced proposal with the New York State Coastal Management Program. However, DOS has not been provided with the information required pursuant to 15 CFR Part 930.39. Therefore, pursuant to 15 CFR Part 930.41(a), the DOS 60-day review period pursuant to 15 CFR Part 930.41 has not begun.

In your submission, you have provided an analysis of the NYS Coastal Management Program (NY CMP) coastal policies, as well as the Town of Huntington's Local Waterfront Revitalization Program (LWRP) policies. The Town of Huntington's LWRP has not yet been submitted for federal approval to NOAA's Office for Coastal Management (OCM) and therefore those policies do not apply. The proposal is located within the Long Island Sound Coastal Management Program (LIS CMP) boundary and the 13 policies of the LIS CMP apply to this proposal. Please provide an analysis of the LIS CMP policies, accompanied by the determination that the "proposal will be conducted in a manner consistent to the maximum extent practicable with the LIS CMP." This statement acts as your consistency determination with which DOS will either concur or object to as a result of our review. A copy of the LIS CMP policies are attached for your reference.

The policy analysis currently provided does not discuss the effects on coastal policy due to the mining of sand from Long Island Sound. Please provide an analysis of the anticipated effects on each policy from the mining of sand from the borrow area and the potential effects to adjacent areas from the removal of sand from the littoral system, as well as a discussion as to why the mining of sand from the underwater lands within Long Island Sound is necessary. Please also be advised that groins and beach fill are both structural measures. Please discuss the need for structural measures over non-structural measures within your policy analysis.

Additionally, your submission did not contain a copy of the Environmental Analysis (EA) that is referred to in the submitted policy analysis, or project plans or drawings. We have compiled all of the early coordination project materials that have been shared with Barry Pendergrass of the Hazards Unit, however, we need confirmation that the draft tentatively selected plan, or draft TSP, is the chosen alternative moving forward. Please also provide a copy of the EA as mentioned in the policy analysis.

The DOS decision-making review period will begin when the Corps provides DOS with the information required by 15 CFR Part 930.39. This information is necessary for the DOS to adequately assess the effects of the proposal on the coastal area and its uses, and to provide comprehensive data and information sufficient to support the Corps' consistency determination.

If you have any questions or need any other assistance regarding this matter, please contact me at (518) 474-1734 or e-mail: Jennifer.Street@dos.ny.gov.

Sincerely,

Jennifer L. Street
Coastal Resources Specialist
Office of Planning and Development

Cc: COE/NY District – Howard Ruben – via email only
NYSDEC Central Office – Matthew Chelbus – via email only

Classification: UNCLASSIFIED
Caveats: NONE

Steve,

I know your very busy, and as discussed I am not anticipating the arrival of a draft FWCAR by the 10/13 date we have been kicking around (of course that would be great). However, assuming this will be the case, can you send me a short letter (preferred) or email stating that we have been in close coordination regarding the pending project FWCAR, and describe what you assume will be the general thrust of the FWCAR with appreviated recommendations etc.? I need a place holder in the ESA (plover) sections. Thanks

Howard Ruben

Coastal Ecosystems Section
CENAN-PL_EA, Rm 2131
26 Federal Plaza NY, NY
917 790 8723

-----Original Message-----
From: Sinkevich, Steve [mailto:steve_sinkevich@fws.gov]
Sent: Wednesday, September 16, 2015 10:45 AM
To: Ruben, Howard NAN02
Cc: Terra Gulden-Dunlop
Subject: [EXTERNAL] Re: Asharoken Storm Damage Reduction Feasibility Study (UNCLASSIFIED)

Howard: I take it you'd like Draft FWCAR in that document or can it wait? The FIMP is heating up as well. Is there an expectation that Section 7 will be wrapped up when document released? Time of year restrictions and plover management would have to be addressed.

On Tue, Sep 15, 2015 at 5:57 PM, Ruben, Howard NAN02 <Howard.Ruben@usace.army.mil> wrote:

Classification: UNCLASSIFIED
Caveats: NONE

Hello all, sorry for the multiple mail out, just trying to save some time.

Within the next sixty days the District is expecting to release the Asharoken Draft Feasibility Report including all pertinent NEPA documentation (EA, EFH, Sec 7 Coordination, CZM determination etc) for Agency review of the project. With the many personnel changes that have occurred in the past several years I want make sure my distribution list is up to date. If you would, please send me the names of your respective agency's primary addressee ("letter addressed to") as well as those staff members that should also receive copies for. Thank you for your assistance.

Howard Ruben

Ruben, Howard NAN02

From: Sinkevich, Steve [steve_sinkevich@fws.gov]
Sent: Thursday, October 01, 2015 11:48 AM
To: Ruben, Howard NAN02
Cc: Terra Gulden-Dunlop
Subject: Re: [EXTERNAL] Re: Asharoken Storm Damage Reduction Feasibility Study (UNCLASSIFIED)

Howard: I spoke to my supervisor, looks like we won't be able to provide an interim letter due to concern with being held to recommendations provided without full analysis and the precedent of sending out interim letters prior to completion of complete documents. The good news is, while we won't be able to get it to you by 10/13, we are making significant progress on the FWCA and should have the draft to you soon after that. LIFO biologist Terra Gulden-Dunlop (met her at your office few weeks ago) is completing the bulk of the FWCA while I'll be handling ESA. Please include Terra on any future correspondence/e-mails, thanks. Sorry if this an inconvenience, we'll get you the report as soon as we can.

On Tue, Sep 29, 2015 at 10:17 AM, Ruben, Howard NAN02 <Howard.Ruben@usace.army.mil> wrote:

Classification: UNCLASSIFIED
Caveats: NONE

Hi Steve, thanks for the quick reply. Ultimately how far back you want to go is up to you. As for me, this project has taken so many twists and turns that I would think that sticking to the most recent plans and history would be the way to go. Thanks for the hand here, hope all is well by you.

Howard Ruben

Coastal Ecosystems Section
CENAN-PL_EA, Rm 2131
26 Federal Plaza NY, NY
917 790 8723

-----Original Message-----
From: Sinkevich, Steve [mailto:steve_sinkevich@fws.gov]
Sent: Tuesday, September 29, 2015 9:33 AM
To: Ruben, Howard NAN02
Cc: Terra Gulden-Dunlop
Subject: Re: [EXTERNAL] Re: Asharoken Storm Damage Reduction Feasibility Study (UNCLASSIFIED)

Howard: I'm checking with my supervisor, will let you know.

I found earlier versions of our draft FWCAR from 2005 & a prelim final from 2008 for a beachfill & dune project. The prelim final incorporated Corps comments on the draft. Wondering if we want to include Corps comment letter as Appendix for this present project/draft FWCA or just start with clean slate? Either way, will reference previous efforts in the report.

On Mon, Sep 28, 2015 at 10:58 AM, Ruben, Howard NAN02 <Howard.Ruben@usace.army.mil> wrote:

Acoustic Mapping for Borrow Area Habitat Characterization and Evolution off Asharoken

Roger D Flood
SoMAS, Stony Brook University
October 1, 2015 to September 30, 2017

Prepared for USACE; October 5, 2015

Project Description

We propose to conduct several acoustic surveys of a potential borrow site in Long Island Sound near Asharoken that is to be used for beach replenishment. The acoustic surveys will be conducted using a wide-swath multibeam sonar system that collects high-quality acoustic backscatter data suitable for seabed classification and surveys will be done both before and after dredging occurs in order to characterize natural spatial and temporal variability in the area as well as the impacts of sediment disturbance related to dredging. The acoustic surveys will be done in conjunction with sediment and faunal sampling activities. In addition to any more routine sediment size sampling, we request that high-resolution grain size studies (laser size analysis at appx. 0.2 phi intervals) also be done on the benthic habitat samples. We plan to use sonar and associated sediment sampling techniques that have been used to characterize benthic habitat in other areas in New York waters. The acoustic surveys and associated sampling of benthic habitat and sediment will allow a direct assessment of the nature of the disturbance this activity has on the benthic habitat and will allow an assessment of post-activity habitat recovery.

We propose to conduct five acoustic surveys. The first two surveys will occur before dredging for beach replenishment occurs and all surveys will cover an area at least twice as large as the proposed borrow area. If dredging is to occur in October, 2017 then one survey is planned for summer, 2016 and a second survey is planned for summer, 2017. The 2016 bathymetry and backscatter results will be used to define the sites to be sampled for sediment characteristics and benthic habitat in fall, 2016. The 2017 survey will determine how the site has changed as a result of natural properties over the prior year, information that is necessary to understand any variations in benthic fauna between the proposed 2016 and 2017 benthic faunal and sediment surveys. A third survey should be done immediately after dredging activities have ceased in order to provide a direct measurement of the disturbed bed sediment bed elevation and backscatter characteristics and thus of how the dredging has affected the sea bed. The fourth and fifth surveys will occur about one and two years after dredging activities have ceased and will document how the sediment surface has evolved since the bed was disturbed in terms of both sediment elevation and backscatter. These latter two post-dredge surveys will be done in conjunction with sampling for sediment and benthic fauna.

Acoustic Mapping:

We propose to use the 28-foot SoMAS Stony Brook vessel R/V Donald W. Pritchard to collect this shallow water acoustic data in the study area known as Asharoken Borrow Area A. We will use the Stony Brook EM 3000D multibeam echosounder, or a sonar with similar characteristics, which operates at 300 kHz. The EM3000D is a wide-swath, a survey-grade multibeam bathymetric system that collects quantitative backscatter in addition to precision bathymetry. Water depths will be collected with respect to heights determined by RTK GPS (Trimble SPS 651 using NYS DOT corrections) supplemented by NOAA tidal data and water-level data we plan to collect at Eatons Neck. Sound velocity data will be collected during the survey and sound velocity casts will be collected at regular intervals. Data will primarily be processed using SwathEd programs from the University of New Brunswick. Processing software from CARIS, Fledermaus and SonarWiz is also available to the project. These other software programs provide additional processing options for the backscatter data that can be used to more completely quantify seabed character.

Deliverables include depth grids and backscatter images (multibeam and side-scan sonar) gridded a 1 m in formats compatible with GIS software. Depth will be referenced to NAVD88 and grids will be projected in WGS 84 UTM Zone 18N. Survey maps will be created using GIS software.

Budget Justification

We provide potential costs for the first of the proposed surveys. While we expect similar costs for later studies, we anticipate some modification of the budget and rates over time. We plan that each Asharoken study include vessel time budgeted as 6 days of R/V Pritchard ship time (12-hour rate) which will include two days for equipment installation and calibration, two half-day transits, two days of survey, and a possible third day should weather conditions prove unsuitable during part of the survey. Materials, Supplies and Other costs include daily costs for using and maintaining equipment, leasing needed equipment (e.g., a motion sensor), vessel haulage, fuel and docking costs, and for processing supplies. Materials, Supplies and Other costs also include computer supplies (disk drives, software licenses), equipment calibration, truck use for mobilization and demobilization, insurance and shipping associated with the leased equipment.

Per-survey abor costs include 1.0 months of PI Roger Flood, 4.5 months (one semester) of graduate student assistance and one month of undergraduate lab assistance. Fringe benefits are calculated at approved rates and graduate student tuition, which is exempt from indirect costs, is included as required. Travel is budgeted for field work and for local project meetings. We plan to do the laser size analyses on a Malvern size analyzer on the Stony Brook campus and we include the appropriate per-sample rate. Indirect costs are charged at an effective rate of 34% of modified total direct costs. The effective rate is calculated at 25% of the budget on-campus at 58% and 75% of the budget off-campus at 26%.

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF
Environmental Analysis Branch

October 8, 2015

Mr. Barry Pendergrass
New York State Department of State
One Commerce Plaza, 99 Washington Ave
Albany, NY 12231-0001

Dear Mr. Pendergass:

With the passage of the Hurricane Sandy Disaster Relief Appropriations Act of 2013 (Public Law 113-2), the U.S. Army Corps of Engineers has been given the authority and funding to complete ongoing coastal storm damage risk reduction projects and studies in the Northeast. As part of the planning process for Asharoken Federal Shoreline Protection Project, the New York District (District) will be completing the Feasibility Study and Environmental Assessment. The project proposes measures along the 2.4 miles of Long Island Sound shoreline which forms Asharoken Beach located in the Village of Asharoken, Town of Huntington, Suffolk County N.Y.

The proposed plan for includes the dredging and placement of approximately 600,000 cy of clean (sand) fill dredged from a nearby borrow area in Long Island Sound, as well as re-establishing three rock groins, and providing periodic sand nourishment to reduce erosion affecting Asharoken Beach. The project will provide long-term storm damage protection for Asharoken Avenue and associated infrastructure and property. The closure of Asharoken Avenue becomes a serious impediment to the residents of Asharoken and nearby Eaton's Neck. The loss of access creates a multitude safety hazards including the loss of fire, police, ambulance and other emergency services.

The District is currently anticipating advertising the construction contract in summer of 2017 in order to award the contract in by September 2017. The purpose of this letter is to submit the Districts Coastal Zone Management (CZM) evaluation to the New York State Department of State (DOS) in regard to obtaining the DOS CZM Determination for the Asharoken Storm Damage Reduction Project. Please find enclosed the District's CZM Evaluation addressing the aforementioned project's compliance with applicable State Local CZM policies.

The N.Y. District greatly appreciates your assistance with this essential regulatory process and looks forward to our continued collaboration. If you have any questions, or need additional project information, please contact the project biologist, Mr. Howard Ruben (howard.ruben@usace.army.mil) 917 790 8723.

Sincerely,

Peter Weppler, Chief
Environmental Analysis Branch

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF
Environmental Analysis Branch

October 7, 2015

Ms. Karen Green
National Oceanographic & Atmospheric Admin
Habitat and Conservation Division
James J. Howard Marine Science Lab
Highlands NJ 07732

ATTN: Melissa Alvarez, Habitat and Conservation Division, James J. Howard Marine Science Lab, Highlands NJ 07732

Dear Ms. Green:

With the passage of the Hurricane Sandy Disaster Relief Appropriations Act of 2013 (Public Law 113-2), the U.S. Army Corps of Engineers has been given the authority and funding to complete ongoing coastal storm damage risk reduction projects and studies in the Northeast. As part of the planning process for Asharoken Federal Shoreline Protection Project, the New York District (District) will be completing the Feasibility Study and Environmental Assessment. The project proposes measures along the 2.4 miles of Long Island Sound shoreline which forms Asharoken Beach located in the Village of Asharoken, Town of Huntington, Suffolk County N.Y.

The proposed plan for includes the dredging and placement of approximately 600,000 cy of clean (sand) fill dredged from a nearby borrow area in Long Island Sound, as well as re-establishing three rock groins, and providing periodic sand nourishment to reduce erosion affecting Asharoken Beach. The project will provide long-term storm damage protection for Asharoken Avenue and associated infrastructure and property. The closure of Asharoken Avenue becomes a serious impediment to the residents of Asharoken and nearby Eaton's Neck. The loss of access creates a multitude safety hazards including the loss of fire, police, ambulance and other emergency services.

The District is currently anticipating advertising the construction contract in summer of 2017 in order to award the contract in by September 2017. The purpose of this letter is to initiate Essential Fish Habitat consultation with the Service regarding the Asharoken Storm Damage Reduction Project.

Please find enclosed the District's Draft Essential Fish Habitat Evaluation addressing the aforementioned Asharoken project and potential impacts EFH species and habitat in regard to implementation of the project. The EFH addresses direct, indirect and cumulative impacts to the following species from dredging in the western Long Island Sound and placement of sand along the beaches in each project area, and from construction of groins along/near the shoreline.

The District appreciates your assistance in completing this essential regulatory consultation If you have any questions, or need additional project information, please contact the project biologist, Mr. Howard Ruben at howard.ruben@usace.army.mil or 917 790 8723.

Sincerely,

Peter Weppler, Chief
Environmental Analysis Branch

cf:

Melissa Alvarez-NOAA-F

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

October 8, 2015

REPLY TO
ATTENTION OF
Environmental Analysis Branch

Mr. Mark Murray-Brown
Section 7 Coordinator
Protected Resources Division
NOAA National Marine Fisheries Service
Greater Atlantic Regional Fisheries Office
55 Great Republic Drive
Gloucester, MA 01930

Dear Mr. Murray-Brown,

With the passage of the Hurricane Sandy Disaster Relief Appropriations Act of 2013 (Public Law 113-2), the U.S. Army Corps of Engineers has been given the authority and funding to complete ongoing coastal storm damage risk reduction projects and studies in the Northeast. As part of the planning process for Asharoken Federal Shoreline Protection Project, the New York District (District) will be completing the Feasibility Study and Environmental Assessment. The project proposes measures along the 2.4 miles of Long Island Sound shoreline which forms Asharoken Beach located in the Village of Asharoken, Town of Huntington, Suffolk County N.Y.

The proposed plan for includes the dredging and placement of approximately 600,000 cy of clean (sand) fill dredged from a nearby borrow area in Long Island Sound, as well as re-establishing three rock groins, and providing periodic sand nourishment to reduce erosion affecting Asharoken Beach. The project will provide long-term storm damage protection for Asharoken Avenue and associated infrastructure and property. The closure of Asharoken Avenue becomes a serious impediment to the residents of Asharoken and nearby Eaton's Neck. The loss of access creates a multitude safety hazards including the loss of fire, police, ambulance and other emergency services.

The District requests to initiate informal consultation under Section 7 of the Endangered Species Act with NMFS. Please find enclosed the District's Determination of Effects statement addressing the aforementioned Asharoken project and potential impacts to listed species during and after construction of the project. The Determination of Effects statement addresses direct, indirect and cumulative impacts to the following species from dredging in the western Long Island Sound and placement of sand along the beaches in each project area, and from construction of groins along/near the shoreline:

Based on all of the information presented, the proposed action may affect, but is not likely adversely affect any of the species under the jurisdiction of the National Marine Fisheries Service. It is requested that your office concur with the District's determination. The District appreciates your assistance in completing this consultation as expeditiously as possible. If you have any questions, or need additional project information, please contact the project biologist, Mr. Howard Ruben (howard.ruben@usace.army.mil) 917 790 8723.

Sincerely,

Peter Weppler, Chief
Environmental Analysis Branch

cf:
Daniel Morone-NOAA-F

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
26 FEDERAL PLAZA
NEW YORK, N.Y. 10278-0090
November 19, 2015

Reply to
Environmental Analysis Branch

Ruth Pierpont, Director
New York State Office of Parks, Recreation & Historic Preservation
Historic Preservation Field Service Bureau
Peebles Island, P.O. Box 189
Waterford, New York 12188-0189

Re: Village of Asharoken Coastal Storm Risk Management Project
Suffolk County, New York
02PR02928

Dear Ms. Pierpont:

The U.S. Army Corps of Engineers, New York District (District) has identified a tentatively selected plan for the coastal storm risk management for the Village of Asharoken, Suffolk County, New York (Attachment 1). This tentatively selected plan includes sand placement along 12,400 linear feet of beach and the rehabilitation of three groins (Attachments 2 and 3). The sand for the beach would be taken from an offshore borrow area, identified as Borrow Area A. The Area of Potential Effect (APE) was determined to consist of: 1) the near shore sand placement and groin rehabilitation, from the intersection of Eatons Neck Road and Bevin Road south to the western groin of the Long Island Power Authority (LIPA) Northport Power Station; and 2) Borrow Area A (Attachments 4 and 5).

In 2003, the District completed a survey and associated report entitled *Remote Sensing Survey Tidal Zone, Near Shore and Borrow Pit Project Areas, Village of Asharoken, Suffolk County, New York* (Attachments 6-10). The report identified: 1) four potentially eligible National Register properties within the upland portion of the APE (Square Nos. 18, 17, 22 and 23, see Attachments 8 and 9); 2) seven targets were identified buried within the tidal zone along the portion of the APE where sand would be placed (Round Nos. 13, 14, 16, 29, 32, 35, and 36; see Attachments 7 through 10) and 3) no targets were identified within the Borrow Area A. The results of this survey were coordinated with your office, which indicated concurrence with the determinations and requested revisions to the final report (Attachment 11). The final report was submitted to your office in May 2004.

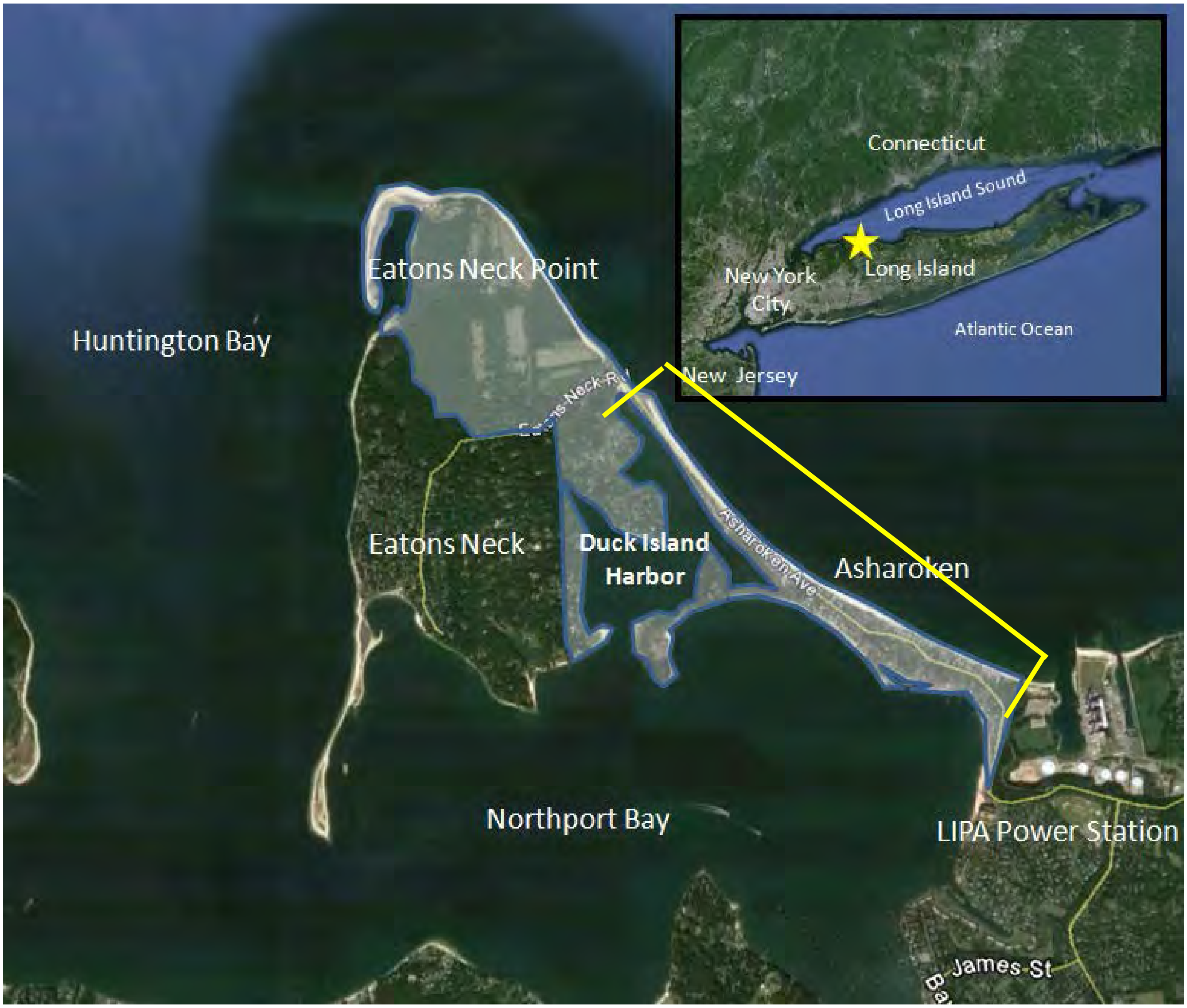
The four potentially eligible properties are located upland from the project area and the construction of the beach berm and dune as well as the rehabilitation of three groins would not have an effect on these properties. The seven targets within the near shore area are located within the area designated for sand placement. As these targets are already buried, the placement of additional sand should not have an adverse effect on them. Also, there will be no adverse effect to historic properties as a result of the use of the borrow area. As previously coordinated with your office, the District will periodically conduct a walk-over of the beach after sand placement and provide an update to your office.

Based on the current project plans, the District has determined the project would have no adverse effect on historic properties within the APE. The District has met the requirements required by Section 106 of the National Historic Preservation and 36 CFR Part 800, its implementing regulation. Please provide comments in accordance with Section 106 of the National Historic Preservation Act, as amended. If you or your staff require additional information or have any questions, please contact Nancy Brighton, Project Archaeologist, at (917)790-8703.

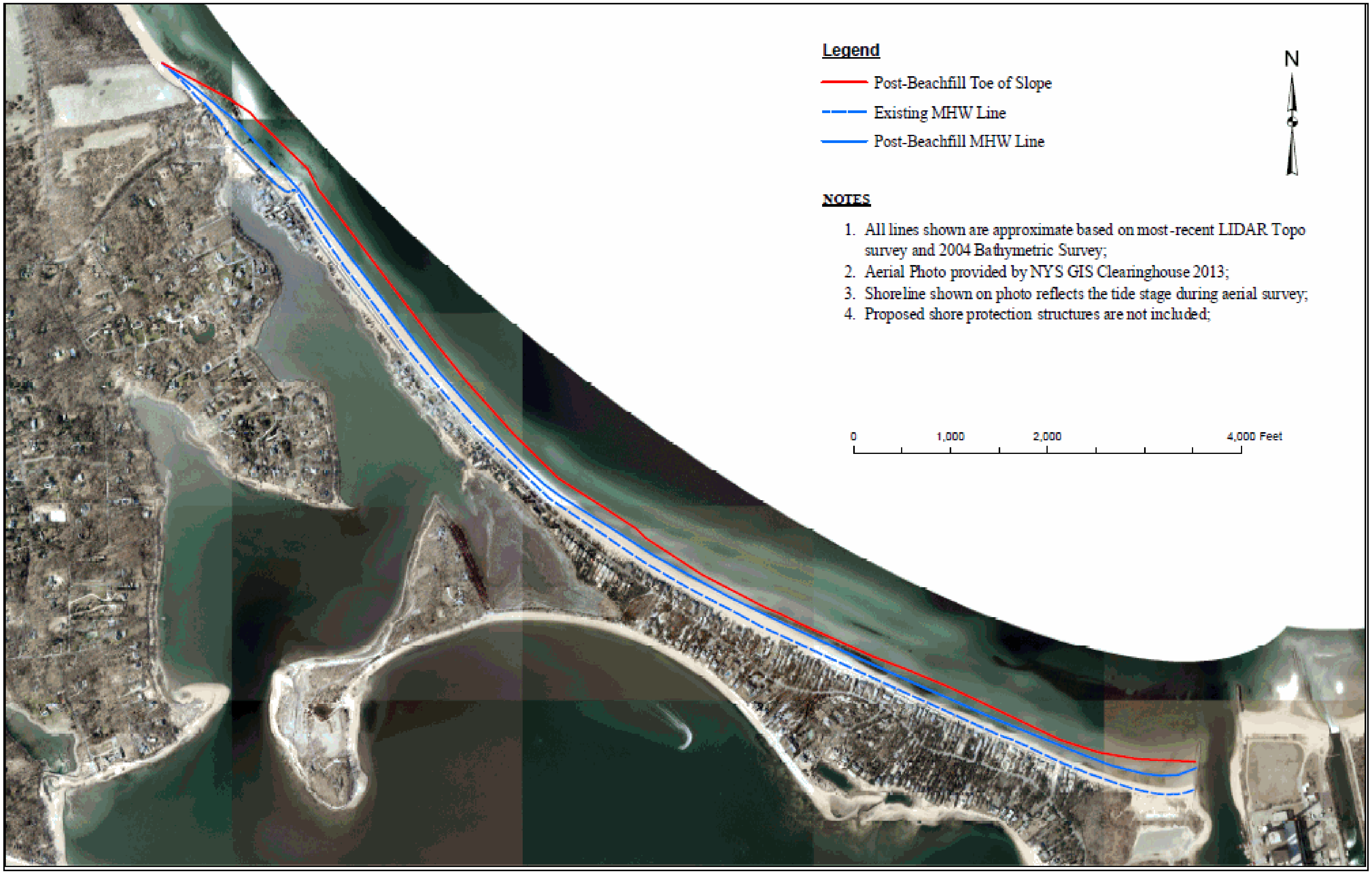
Sincerely,

Peter Weppler
Chief, Environmental Analysis Branch

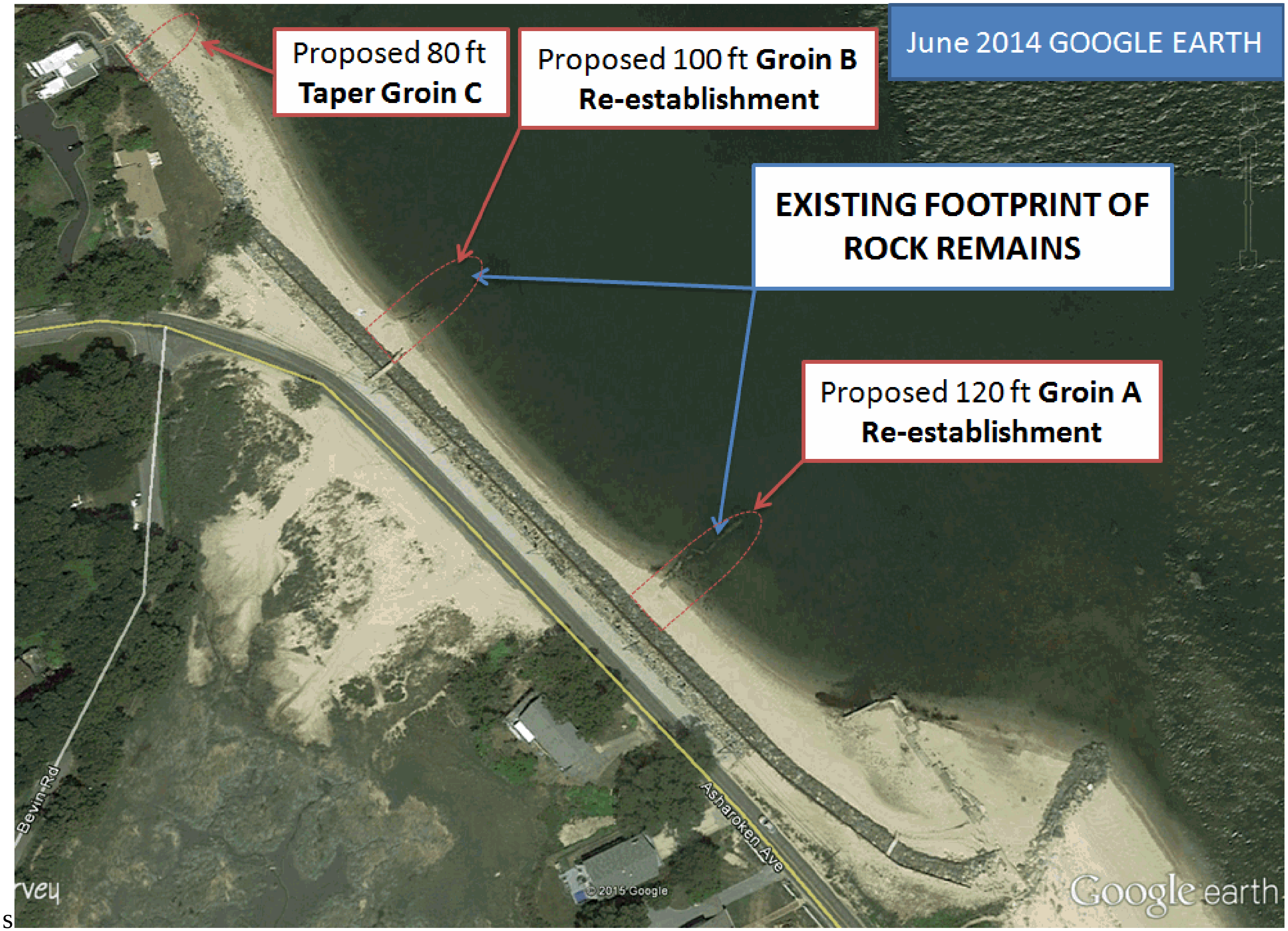
Attachments



Attachment 1: Location of the Asharoken Coastal Storm Risk Management Project



Attachment 2: Location of the sand placement area, Asharoken Coastal Storm Risk Reduction Project



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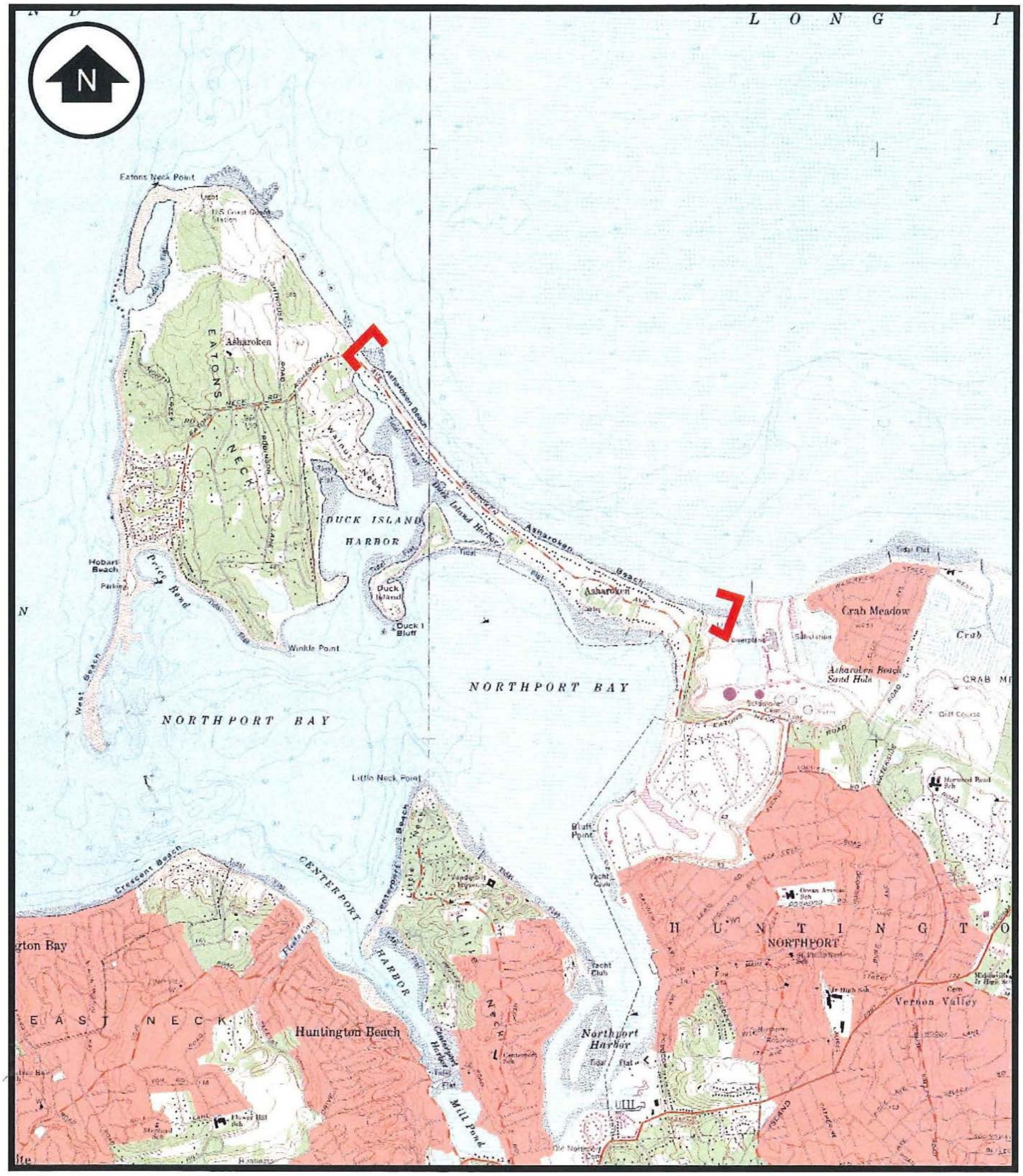
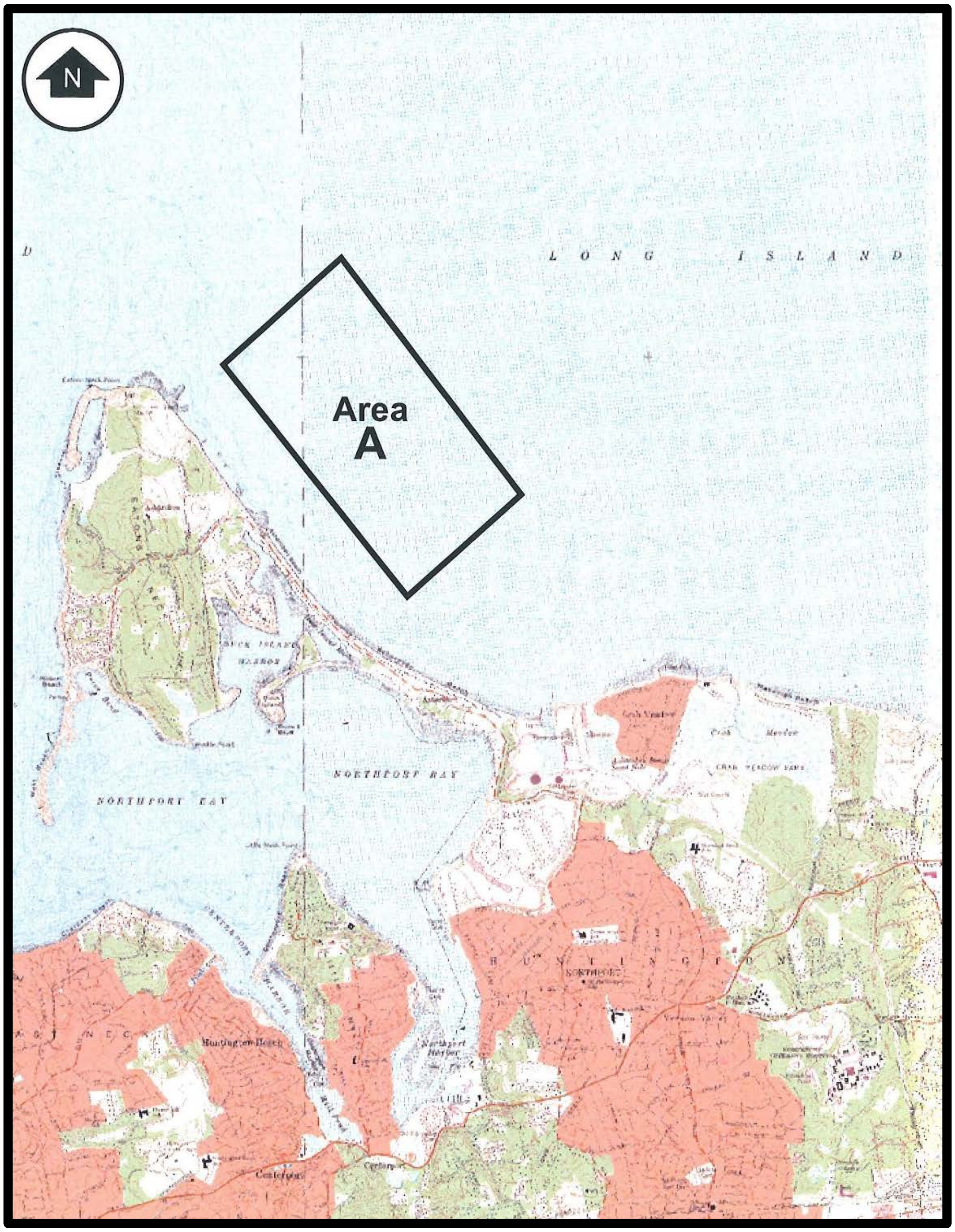
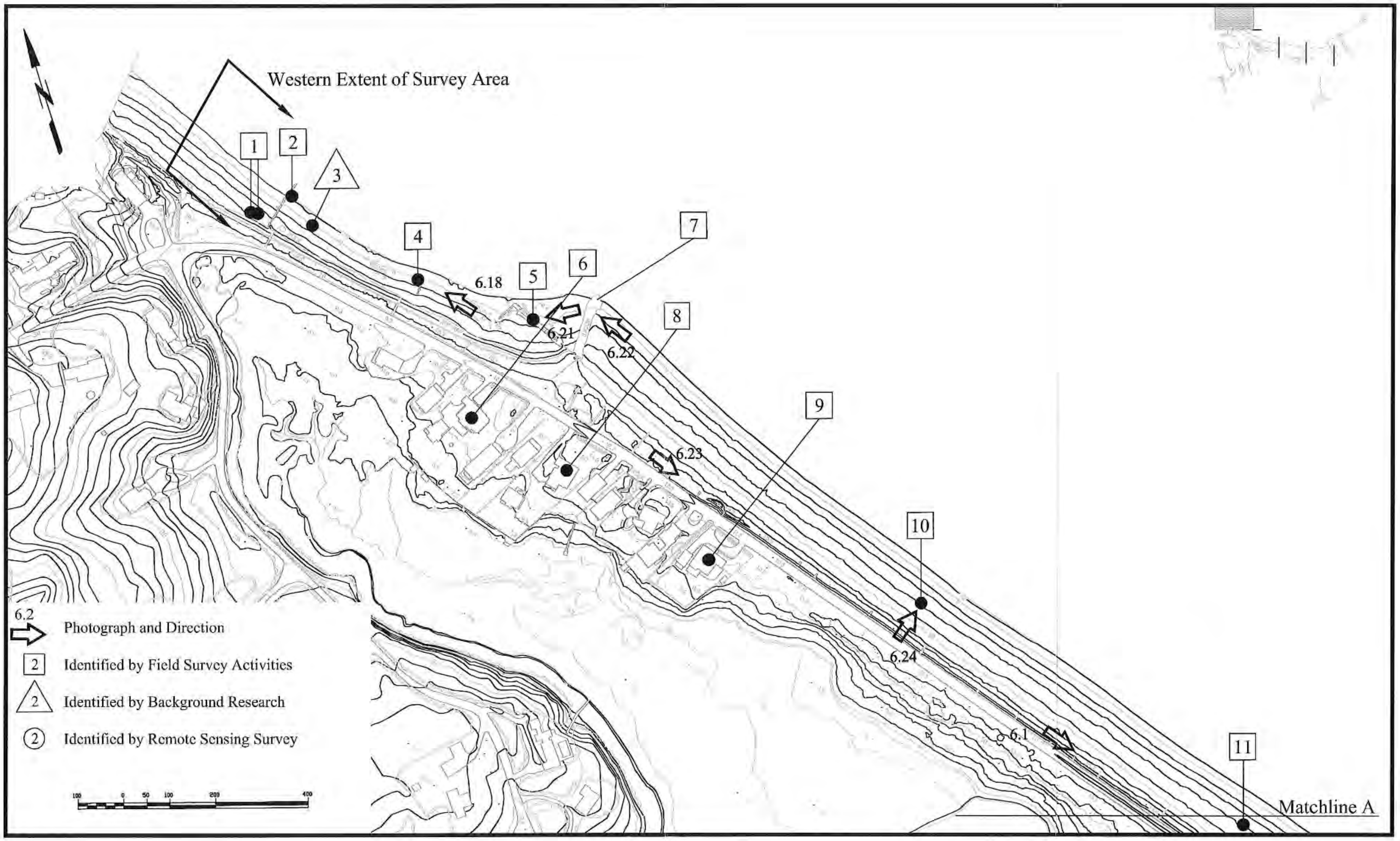
Attachment 3: Location of the groin rehabilitation at the northwest end of the project area, Asharoken Coastal Storm Risk Reduction Project



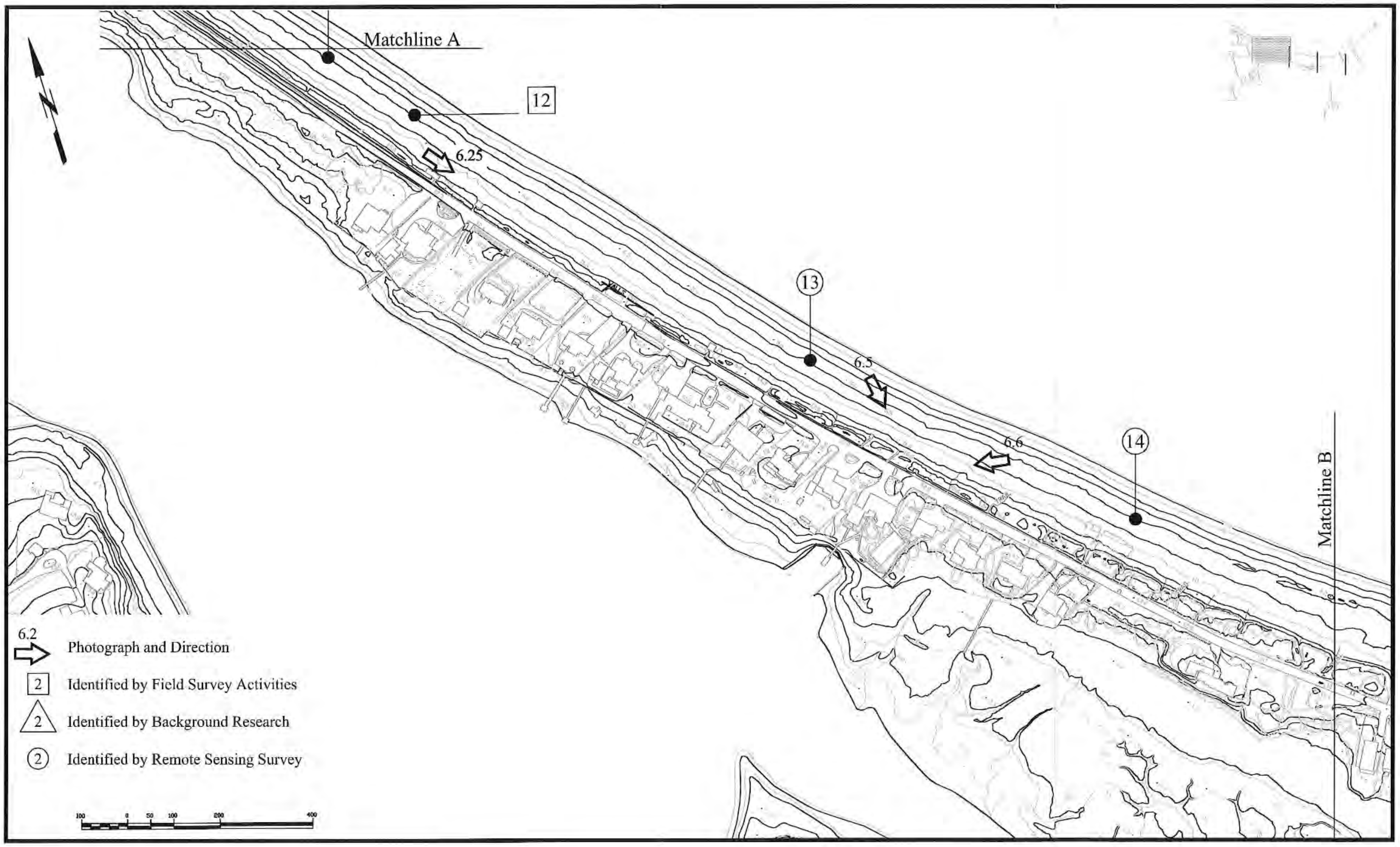
Attachment 4: Area of Potential Effect for the groin rehabilitation and sand placement, Asharoken Coastal Storm Risk Management Project (USGS 7.5' Topographic Series, Lloyd Harbor, NY-CT Quadrangle [1967] and Northport, NY Quadrangle [1967{photorevised 1979}])



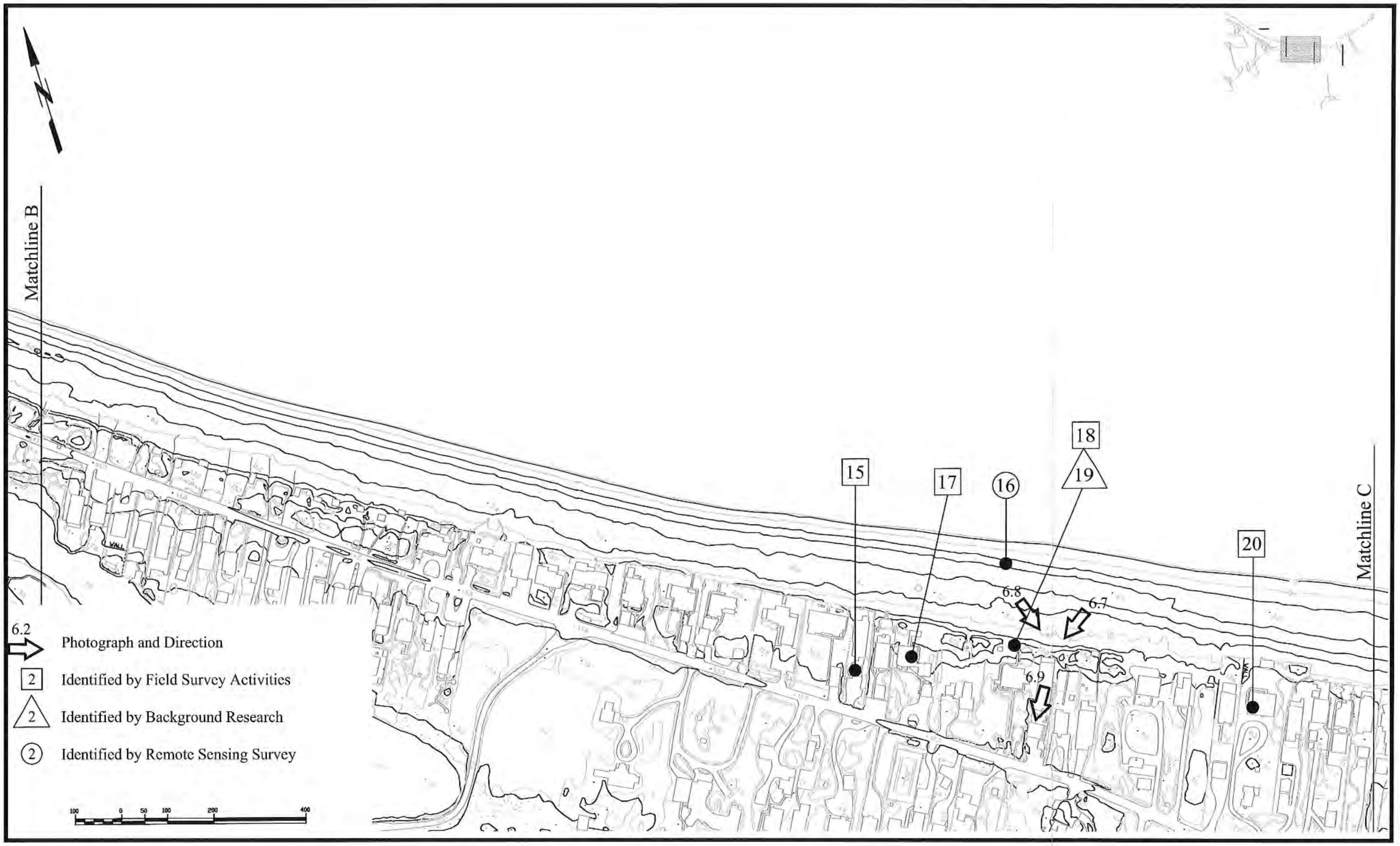
Attachment 5: Area of Potential Effect, Borrow Area A, Asharoken Coastal Storm Risk Management Project (USGS 7.5' Topographic Series, Lloyd Harbor, NY-CT Quadrangle [1967] and Northport, NY Quadrangle [1967{photorevised 1979}])



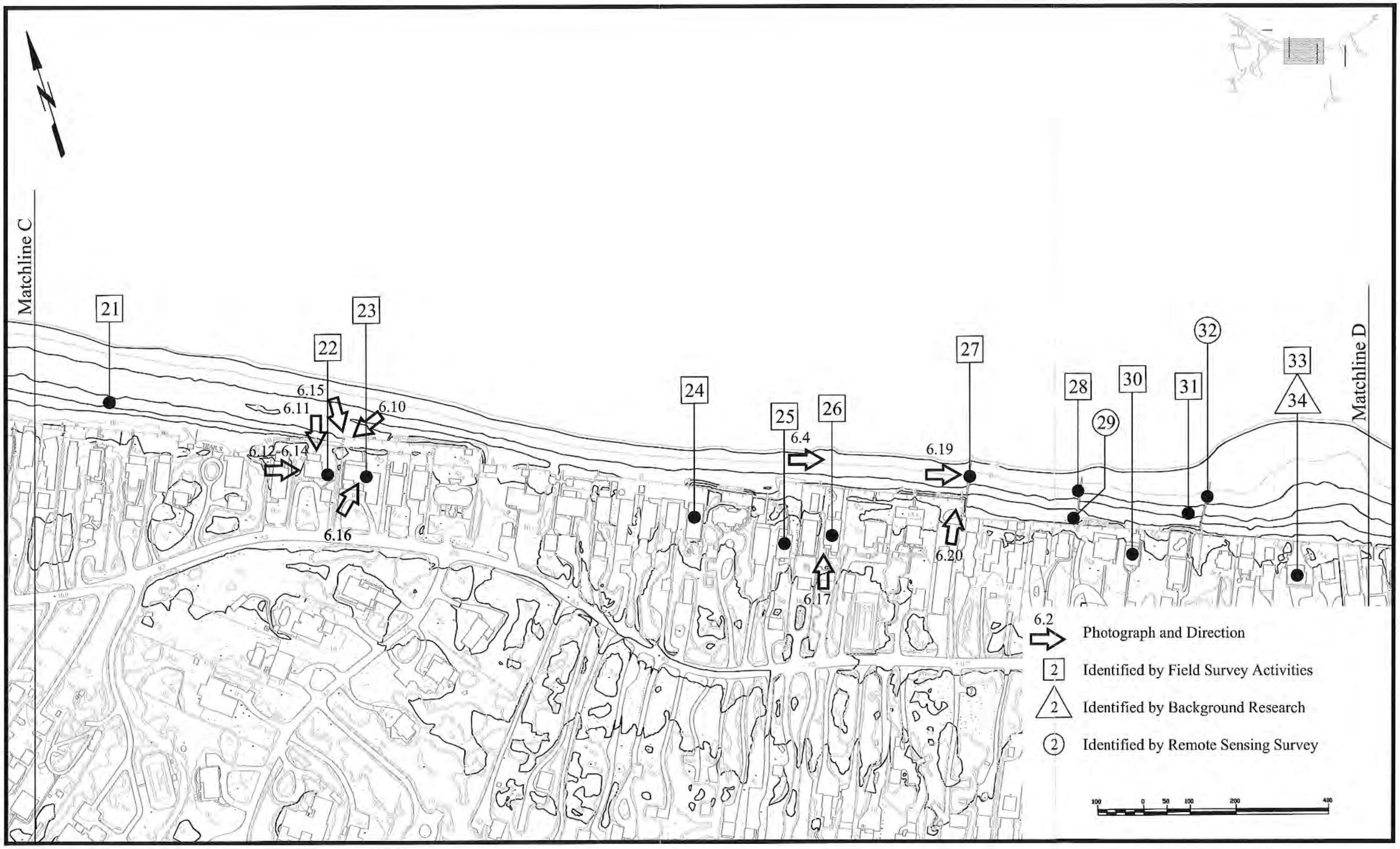
Attachment 6: Cultural Resources mentioned in the 2004 report. The seven remote sensing targets are Round Numbers 13, 14 16, 29, 32, 35, and 36. The potentially eligible structures are Square Numbers 17, 18, 22 and 23. The groin rehabilitation area is located from the western boundary line to the eastern groin (Square No. 7) (Hunter Research/Dolan Research 2004).



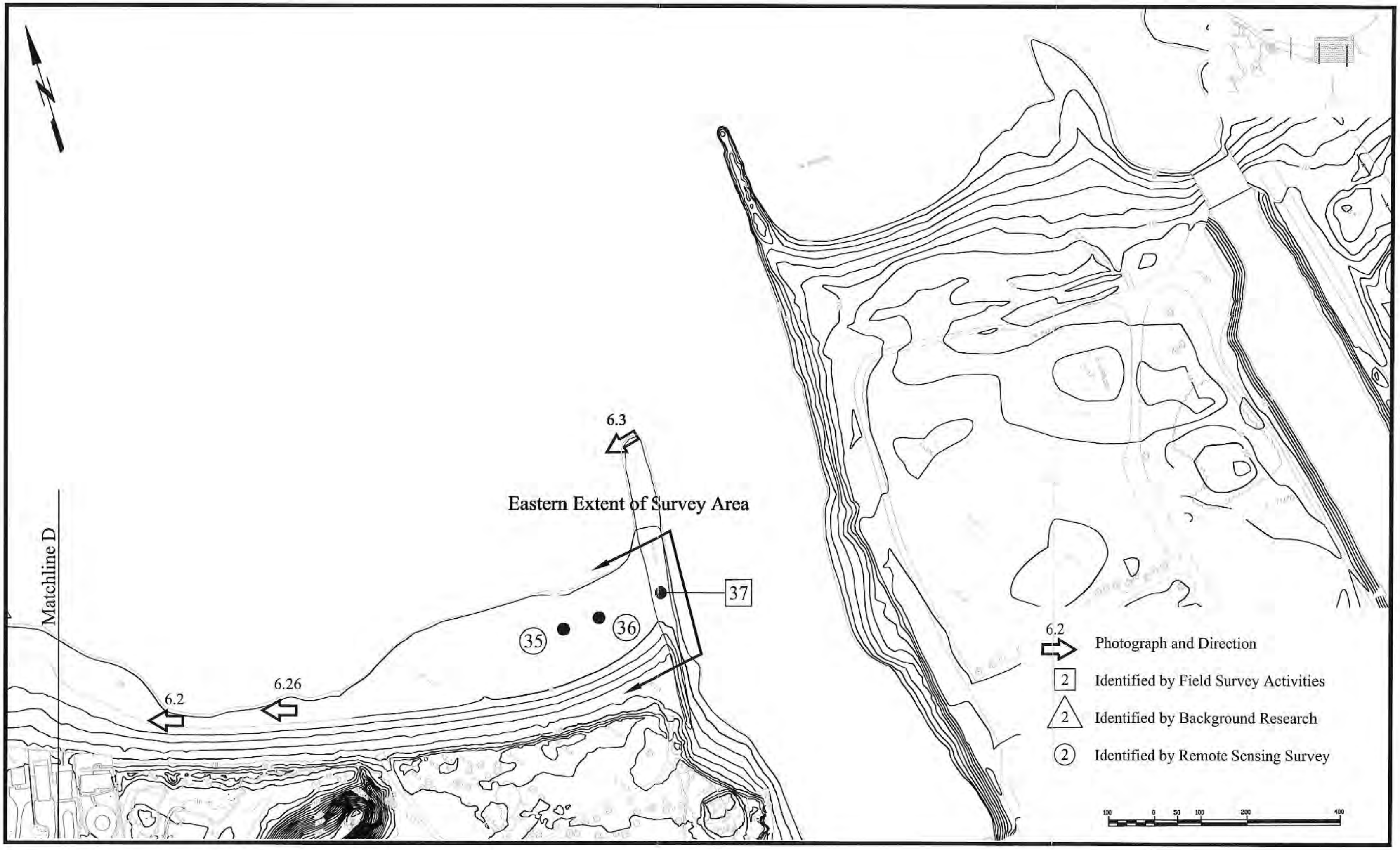
Attachment 7: Cultural Resources mentioned in the 2004 report. The seven remote sensing targets are Round Numbers 13, 14 16, 29, 32, 35, and 36. The potentially eligible structures are Square Numbers 17, 18, 22 and 23. The groin rehabilitation area is located from the western boundary line to the eastern groin (Square No. 7) (Hunter Research/Dolan Research 2004).



Attachment 8: Cultural Resources mentioned in the 2004 report. The seven remote sensing targets are Round Numbers 13, 14 16, 29, 32, 35, and 36. The potentially eligible structures are Square Numbers 17, 18, 22 and 23. The groin rehabilitation area is located from the western boundary line to the eastern groin (Square No. 7) (Hunter Research/Dolan Research 2004).



Attachment 9: Cultural Resources mentioned in the 2004 report. The seven remote sensing targets are Round Numbers 13, 14 16, 29, 32, 35, and 36. The potentially eligible structures are Square Numbers 17, 18, 22 and 23. The groin rehabilitation area is located from the western boundary line to the eastern groin (Square No. 7) (Hunter Research/Dolan Research 2004).



Attachment 10: Cultural Resources mentioned in the 2004 report. The seven remote sensing targets are Round Numbers 13, 14 16, 29, 32, 35, and 36. The potentially eligible structures are Square Numbers 17, 18, 22 and 23. The groin rehabilitation area is located from the western boundary line to the eastern groin (Square No. 7) (Hunter Research/Dolan Research 2004).

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

Bernadette Castro
Commissioner

February 20, 2004

Christopher Ricciardi
New York District Corps of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0090

Dear Mr. Ricciardi:

Re: CORPS
Proposed Shore Replenishment and Associated Dredging
Villages of Bayshore and Asharoken
Nassau and Suffolk Counties, NY
02PR01730 and **02PR02928**

Thank you for requesting the comments of the State Historic Preservation Office (SHPO) with regard to the potential for this project to affect significant cultural/historical resources. SHPO has received Cultural Resource Reports for both of these projects that appear to be related. Therefore we are providing one letter to cover our response to both projects. We have received and reviewed the reports "*Draft Report, Cultural Resource and Remote Sensing Survey, Tidal Zone and Near Shore Project Areas, Village of Bayville, Nassau County, New York*" and "*Cultural Resource and Remote Sensing Survey, Tidal Zone Near Shore and Borrow Pits Project Areas, Village of Asharoken, Suffolk County, New York*" prepared by Hunter Research, Inc, Dolan Research, Inc., Enviroscan, Inc and Northern Ecological Associates, Inc. in December 2003. Based on these reviews SHPO offers the following comments:

1. In general we concur with the recommendations of the reports regarding the identified cultural resources, including the identified potential wrecks.

2. SHPO would note that there are an undetermined number of eligible properties adjacent to these project areas, including the Rube Goldberg House and the Laura Stewart House. It does not appear that the proposed project will have an effect on these properties.

3. It appears that the borrow area for each of these replenishment areas will be the sites off of Asharoken. While the report on the examination of those borrow areas is included as an appendix in both reports, it is not well referenced within the text of the Draft Reports. SHPO recommends that the Final Reports be revised to better reference the existence and results of the borrow area examinations.

Please contact me at extension 3291 if you have any questions regarding these comments.

Sincerely

Douglas P. Mackey

Douglas P. Mackey
Historic Preservation Program Analyst
Archaeology