ESSENTIAL FISH HABITAT ASSESSMENT

WALLOPS FLIGHT FACILITY SHORELINE RESTORATION AND INFRASTRUCTURE PROTECTION PROGRAM

Prepared for

National Aeronautics and Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

In cooperation with

U.S. Department of the Interior, Minerals Management Service and
U.S. Army Corps of Engineers

February 2010

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Attachments

CFR	Code of Federal Regulations
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ELMR	Estuarine Living Marine Resources
FMP	fishery management plan
km	kilometer
MAB	Mid-Atlantic Bight
MARS	Mid-Atlantic Regional Spaceport
mm	millimeters
m^3	cubic meters
NASA	National Aeronautics and Space Administration
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NMFS	National Marine Fisheries Service
PEA	Programmatic Environmental Assessment
ppt	parts per thousand
SRIPP	Shoreline Restoration and Infrastructure Protection Program
USACE	U.S. Army Corps of Engineers
VIMS	Virginia Institute of Marine Science
WFF	Wallops Flight Facility
yd^3	cubic yards

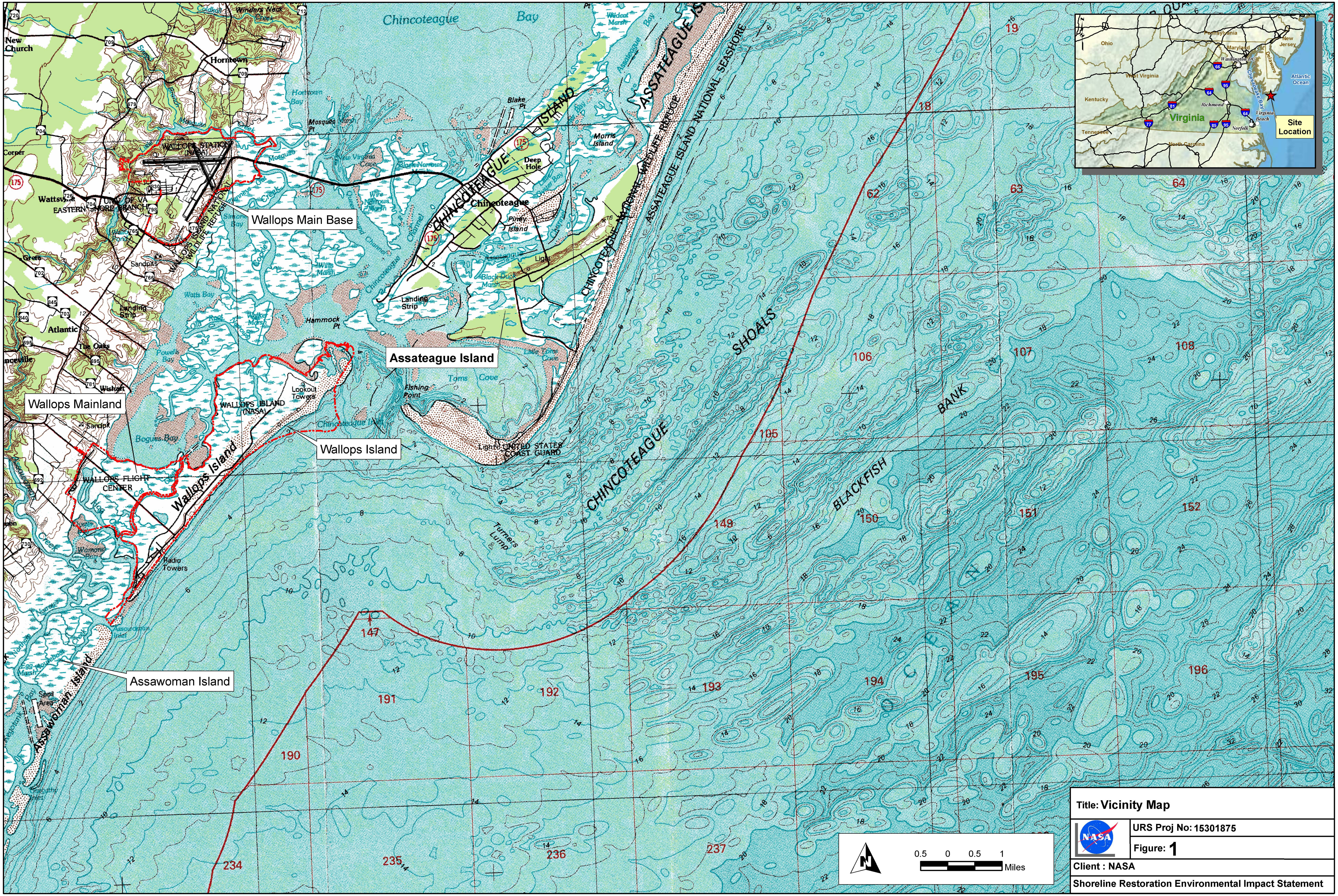
SECTION ONE: INTRODUCTION AND BACKGROUND

The National Aeronautics and Space Administration's (NASA's) Wallops Flight Facility (WFF) Shoreline Restoration and Infrastructure Protection Program (SRIPP) is proposed for Wallops Island, a barrier island located in the northeastern portion of Accomack County, Virginia, on the Delmarva Peninsula (Figure 1). Wallops Island is bounded by Chincoteague Inlet to the north, Assawoman Inlet (which is presently filled in) to the south, the Atlantic Ocean to the east, and estuaries to the west.

Wallops Island has been subject to the effects of shoreline retreat well before NASA's presence on the island was established in the 1940s. Shoreline retreat has been caused by both natural and man-induced processes. The ocean has encroached substantially toward launch pads, infrastructure, and test and training facilities belonging to NASA, the U.S. Navy, and the Mid-Atlantic Regional Spaceport (MARS). Between 1857 and 1994, the southern part of Wallops Island has retreated about 3.7 meters (12 feet) per year on average from 1857 to the present (NASA, 2007). Assawoman Island to the south has been impacted even more, with a shoreline retreat rate between 4.9 and 5.2 meters (16 and 17 feet) per year.

NASA made several attempts since the 1960s to retain sand on the Wallops Island beach and prevent shoreline erosion. Various measures such as the construction of wooden groins and a stone seawall, placement of temporary geotextile tubes (long cylinders composed of durable textile material that are filled with sand), and other structures have been installed along the shoreline to slow down the erosion of sand from the beach, and to help protect onshore assets from wave action. The existing seawall is being undermined because there is little or no protective sand beach remaining and storm waves break directly on the rocks. Currently, the south end of the island is unprotected except for a low revetment around the MARS launch pad and temporary geotextile tubes.

Despite these past efforts, the ocean has continued to encroach substantially toward the valuable infrastructure on Wallops Island and threaten the daily operations of NASA and their tenants, the U.S. Navy and MARS. The U.S. Navy Surface Combat Systems Center is WFF's largest partner. Wallops Island is home to the unique replica of an AEGIS cruiser and its destroyer combat systems as well as the experimental radar deck of the DDG 1000 class destroyer. The Virginia Commercial Space Flight Authority is responsible for the development and operation of MARS, a Federal Aviation Administration-licensed commercial spaceport, which is also at risk from the eroding shoreline.



Title: Vicinity Map

URS Proj No: 15301875

Figure: 1

Client : NASA

Shoreline Restoration Environmental Impact Statement

SECTION TWO: PURPOSE

In accordance with provisions of the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSA) and the 1996 Sustainable Fisheries Act, federal agencies are required to consult with the National Marine Fisheries Service (NMFS) regarding actions that may adversely affect Essential Fish Habitat (EFH).

EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." *Waters* consist of aquatic areas and their associated physical, chemical, and biological properties that are currently utilized by fishes and may include areas historically used by fish. *Substrate* is defined as sediment, hardbottom, structures beneath the waters, and any associated biological communities. *Necessary* means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem. *Spawning, breeding, feeding,* or *growth to maturity* includes all habitat types used by a species throughout its life cycle. Only species managed under a Federal Fishery Management Plan (FMP) are protected under MSA (50 Code of Federal Regulations [CFR] 600). The act requires federal agencies to consult on activities that may adversely influence EFH designated in the FMPs.

As part of the EFH consultation process, federal agencies must develop and submit an EFH assessment to NMFS. The purpose of this assessment is to describe and evaluate activities that may have direct (e.g., physical disruption) or indirect (e.g., loss of prey species) effects on EFH and may be site-specific or habitat-wide. Potential adverse impacts are evaluated individually and cumulatively.

As defined in the MSA, a federal action is one that is authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a federal agency. The Federal action considered in this EFH assessment is the funding and authorization of the Shoreline Restoration and Infrastructure Protection Program (SRIPP) at the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center's (GSFC) Wallops Flight Facility (WFF) on Wallops Island, Virginia. As the project sponsor, NASA is serving as lead agency in the EFH consultation with NMFS. In connected actions, the U. S. Department of Interior, Minerals Management Service (MMS) and U.S Army Corps of Engineers (USACE) would provide authorizations for the project. The MMS would issue a negotiated agreement with NASA for the use of sand from Federal waters on the Outer Continental Shelf. The USACE would provide permit approval for the dredging and placement of fill material in waters of the U.S. under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbor Act of 1899. As such, both agencies are participating in NASA's SRIPP EFH consultation and the effects of their actions are considered in this document.

SECTION THREE: PROPOSED PROJECT

The objective of the SRIPP is to reduce physical damage to Wallops Island infrastructure incurred during normal coastal storms and nor'easters by moving the zone of breaking waves away from vulnerable infrastructure. The SRIPP Proposed Action would include beach nourishment using sand dredged from one of two shoals offshore in Federal waters, and the extension of Wallops Island's existing rock seawall.

In 2007 and 2008, the USACE conducted sediment sampling to identify potential offshore borrow sites with compatible grain size and adequate volume for use as beach fill (Figure 2). Three offshore shoals in Federal waters, referred to as Unnamed Shoals A and B, and Blackfish Bank Shoal were identified as potential borrow sites (Figure 3). The evaluation of the sediment grain size and bathymetry, conducted by the USACE, concluded that Shoals A and B would provide adequate sand volumes and appropriately-sized sediment (grain size coarser that the median 0.20 mm grain size of the existing beach) for nourishment of the beach throughout the SRIPP's 50-year design life. Blackfish Bank Shoal, initially identified as a potential sand source, was eliminated as a potential borrow site for the SRIPP due to; (1) potential adverse impacts to Assateague Island due to increased wave energy from lowering of the shoal, and (2) concerns expressed during scoping over potential impacts to commercial and recreational fishing.

Borrow Sites

Offshore Shoals

The southwest end of Unnamed Shoal A is located approximately 11 kilometers (km) (7 miles) east of Assateague Island and approximately 18 km (11 miles) northeast of the north tip of Wallops Island. The total predicted volume of Unnamed Shoal A is approximately 31 million m^3 (40 million yd^3). This shoal covers an area of approximately 700 hectares (1,800 acres).

The southwest end of Unnamed Shoal B is located approximately 19 km (12 miles) east of Assateague Island and approximately 26 km (16 miles) northeast of the north tip of Wallops Island. The total predicted volume of Unnamed Shoal B is approximately 57 million m^3 (75 million yd^3). This shoal covers an area of approximately 1,600 hectares (3,900 acres).

North Wallops Island

The north Wallops Island borrow site is a beach area where sand has accreted as a result of the longshore transport system. Based on habitat constraints, the total potential area for sand removal is approximately 60 hectares (150 acres).

Initial Beach Nourishment

Under the SRIPP Proposed Action, 2.4 million m^3 (3.2 million yd^3) of sand would be placed along 6.8 km (4.2 miles) of shoreline during the initial nourishment. The beach fill would extend 21 meters (70 feet) from the present shoreline in a 1.8-meter-high (6-foot-high) berm, and then would slope underwater for an additional 52 meters (170 feet) seaward; the total distance of the fill profile from the current shoreline would be 73 meters (240 feet). During storm events, the new beach would provide a surface to dissipate wave energy and provide additional sediment in the nearshore system. In addition, Wallops Island's existing rock seawall would be extended up to 1,400 meters (4,600 feet) to the south.

Placement of the initial fill would bury existing intertidal benthic community along an approximate 4,300 m (14,000 ft) length of the seawall. The mean tidal range is approximately 1.1 m (3.6 ft); therefore approximately 0.5 ha (1.2 ac) of hard-bottom, intertidal habitat would be permanently buried. In addition, approximately 91 ha (225 ac) the subtidal benthic community along the existing seawall would be buried during the initial fill placement.

A new beach would be formed in front the seawall and a beach benthic community would become established. Sand for the initial beach nourishment would be dredged from an approximate 520 hectare (1,280 acre) area of Unnamed Shoal A. Assuming sand would be dredged from the entire 1,280 acre area, approximately two feet of material would be removed to obtain the required volume for the initial placement.

Renourishment Events

Under the SRIPP Proposed Action, subsequent beach re-nourishment cycles would vary throughout the expected 50-year life of the SRIPP as determined by the proposed monitoring program. The exact locations and magnitude of renourishment cycles may fluctuate due to the frequency and severity of storm activity and subsequent shoreline erosion. The renourishment cycle is anticipated to require approximately 616,000 m^3 (806,000 yd^3) of sand approximately every 5 years.

During each nourishment cycle, approximately 140 ha (347 ac) of benthic habitat on Shoal A or Shoal B would be adversely impacted assuming a uniform dredging depth of approximately 0.6 m (2 ft). Nine renourishment cycles are anticipated under Alternative One.

The length of a beach fill is a key parameter in determining how long the fill will last. A “full” beach fill loses much less of a percentage of its volume in a given time interval than a shorter, or “reduced” fill (USACE, 2006). At Wallops Island, a rectangle-shaped fill’s half-life (the time it would take for the fill to lose 50 percent of its volume) is estimated to be 8.7 years for the full 6.8 km (4.2 mile) fill. The topography and bathymetry of the beach would be monitored on a regular basis to determine sand movement patterns and to plan when renourishment is needed.

Renourishment fill volumes could be dredged from Unnamed Shoal A, Unnamed Shoal B, or a combination of one of these two shoals and the north Wallops Island borrow site. It is anticipated that approximately half of the fill volume for each renourishment cycle could be provided by the north Wallops Island borrow site.

Sand Removal Methods – North Wallops Island

Excavation depth for sand removal in the north Wallops Island proposed borrow site area is expected to be limited to about 1 meter (3.5 feet) below the ground surface due to tidal fluctuations and the high permeability of the soil (USACE, 2009b). Based on target depth of sediment removal, the area to be excavated would vary. For example, excavating to a depth of 1 meter (3.5 feet) would require a 70-acre area to provide a renourishment volume of 308,000 m^3 (403,000 yd^3).

Sand from north Wallops Island would be removed from land using a pan excavator. Because this excavator runs on several rubber tires with a low tire pressure, it can work in areas of the beach where typical equipment may be bogged down in unstable sand. The pan excavators would stockpile the sand, which would be loaded onto dump trucks that would transport the fill material up and down the beach. Bulldozers would then be used to spread the fill material once it is placed on the beach. All heavy equipment would access the beach from existing roads and established access points. No new temporary or permanent roads would be constructed to access the beach or to transport the fill material to renourishment areas.

Offshore Dredging Operations

Dredging of Unnamed Shoals A and B would be accomplished using a trailer suction hopper dredge (equipped with a turtle deflector), which is a ship capable of dredging material, storing it onboard, transporting it to the placement area, and pumping it on-shore. The hopper dredge fills its hoppers by employing large pumps to create suction in pipes that are lowered into the water to remove sediment from the shoal bottom (the process very closely resembles that of a typical vacuum cleaner). The hopper dredges likely to be used typically remove material from the bottom of the sea floor in layers up to 0.3 meters (1 foot) in depth (Williams, USACE, personal comm.).

Once the dredge hopper is filled, the dredge would transport the material to a pump-out station which would be temporarily anchored in the nearshore environment to deliver the sand and water slurry contained in the hopper dredge to the beach. The distance from Unnamed Shoal A to a theoretical average location for a pump-out station placed at a water depth of 9 meters (30 feet), which is reached approximately 1,830 meters (10,000 feet) offshore, is approximately 22 km (14 miles). The corresponding transit distance from Unnamed Shoal B and the theoretical pump-out station is approximately 30 km (19 miles).

The dredge would then mix the sand with water to form a slurry and pump the slurry from its discharge manifold through a submerged or floating pipeline. Discharge at the beach would occur at a fixed point in tandem with contouring of the deposited sand by bulldozers. Based on previous offshore dredging operations along the east coast, it is assumed that dredgers with a hopper capacity of approximately 3,000 m^3 (4,000 yd^3) would be used; however, because this volume is a slurry and not all sand, it is assumed that the actual volume of sand that each dredge would transport during each trip would be approximately 2,300 m^3 (3,000 yd^3).

Because of overflow from the hopper dredge at the offshore borrow site(s) during dredging and losses during pump-out and placement, a larger volume of material would need to be dredged to meet the targeted fill volume. Based on information from other shoreline restoration projects, sediment losses during dredging and placement operations may be up to 25 percent. Based on a conservative 25% loss during operations, dredge volumes for the offshore borrow sites are shown below in Table 1.

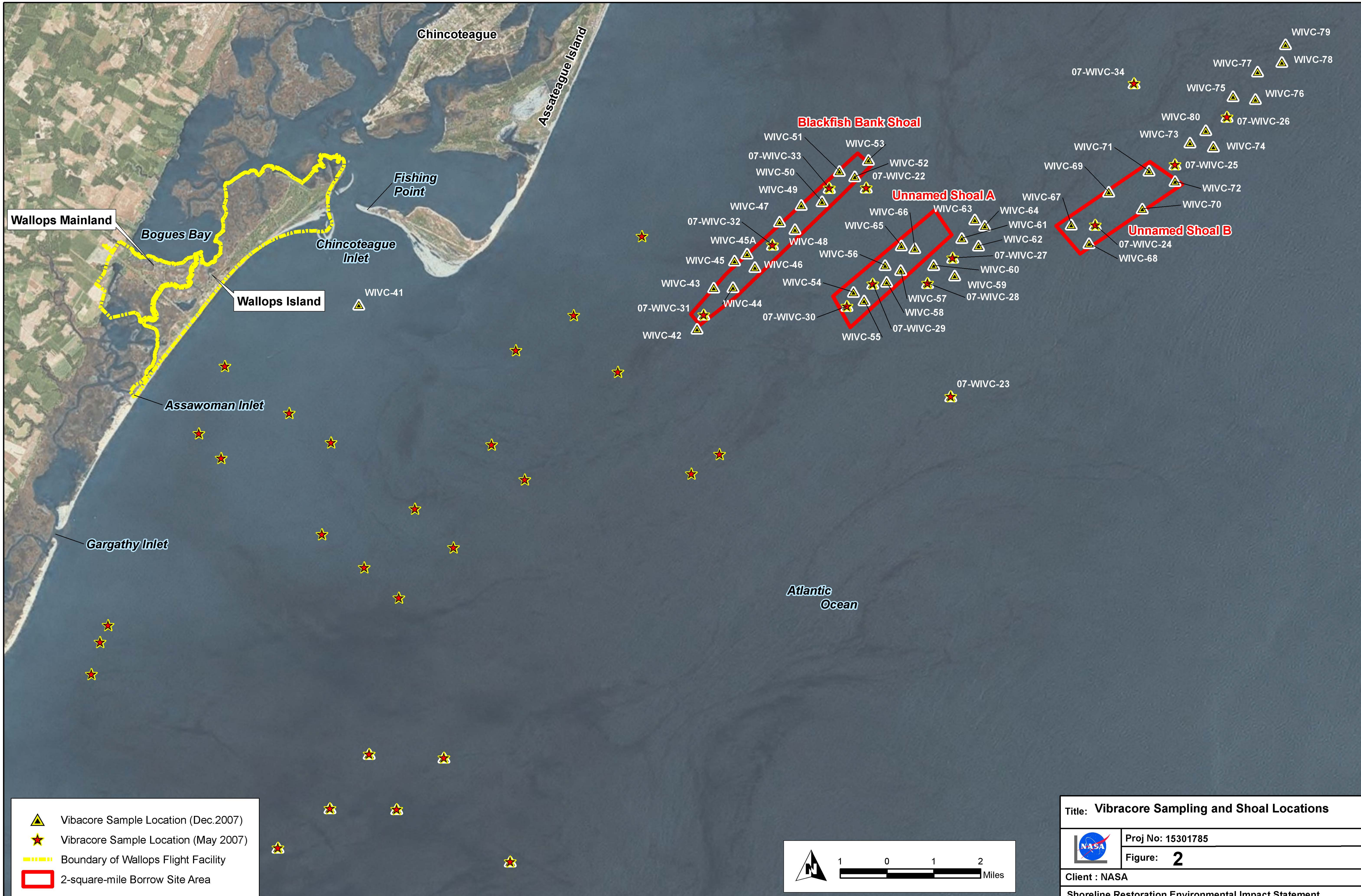
Table 1: Maximum Sand Removal Volumes

Nourishment Event	Possible Sources of Fill[1]	Volume of Sand Removed m^3 (yd^3)
Initial Nourishment	Shoal A	3,057,500 (3,998,750)
Single Renourishment Event	Shoal A or Shoal B	770,000 (1,007,500)
	North Wallops Island	308,000 (403,000)
Project Lifetime	Shoal A	9,990,000(13,066,250)

Nourishment Event	Possible Sources of Fill[1]	Volume of Sand Removed m^3 (yd^3)
	Shoal B	6,933,000 (9,067,500)
	North Wallops Island	2,773,000 (3,627,000)

[1]The north Wallops Island Borrow Site could provide up to about half of the renourishment fill per cycle
Source: USACE, 2009

The dredges would operate for 12 to 24 hour stretches. There would be approximately 1,000 to 1,100 dredge trips from the offshore borrow sites to the Wallops Island shoreline for the initial beach fill and approximately 240 to 270 dredge trips for each renourishment fill. Two dredges would be in use at the same time and would accomplish about 3 round trips per day. Assuming 10 percent downtime for the dredges due to weather, equipment failure, etc., the initial fill activities would take approximately 216 days, or about 7 months. Renourishment activities (assuming all fill is dredged from one of the proposed offshore shoals) would take approximately 50 days, or about 2 months. Under the Proposed Action, the initial fill plus the total fill volume over nine renourishment events would result in approximately 7,992,000 m^3 (10,453,000 yd^3) of sand being placed on the shoreline. The topography and bathymetry of the beach would be monitored on a regular basis to determine sand movement patterns and plan when renourishment is needed.



Title: Vibracore Sampling and Shoal Locations

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Figure: 2

Client : NASA

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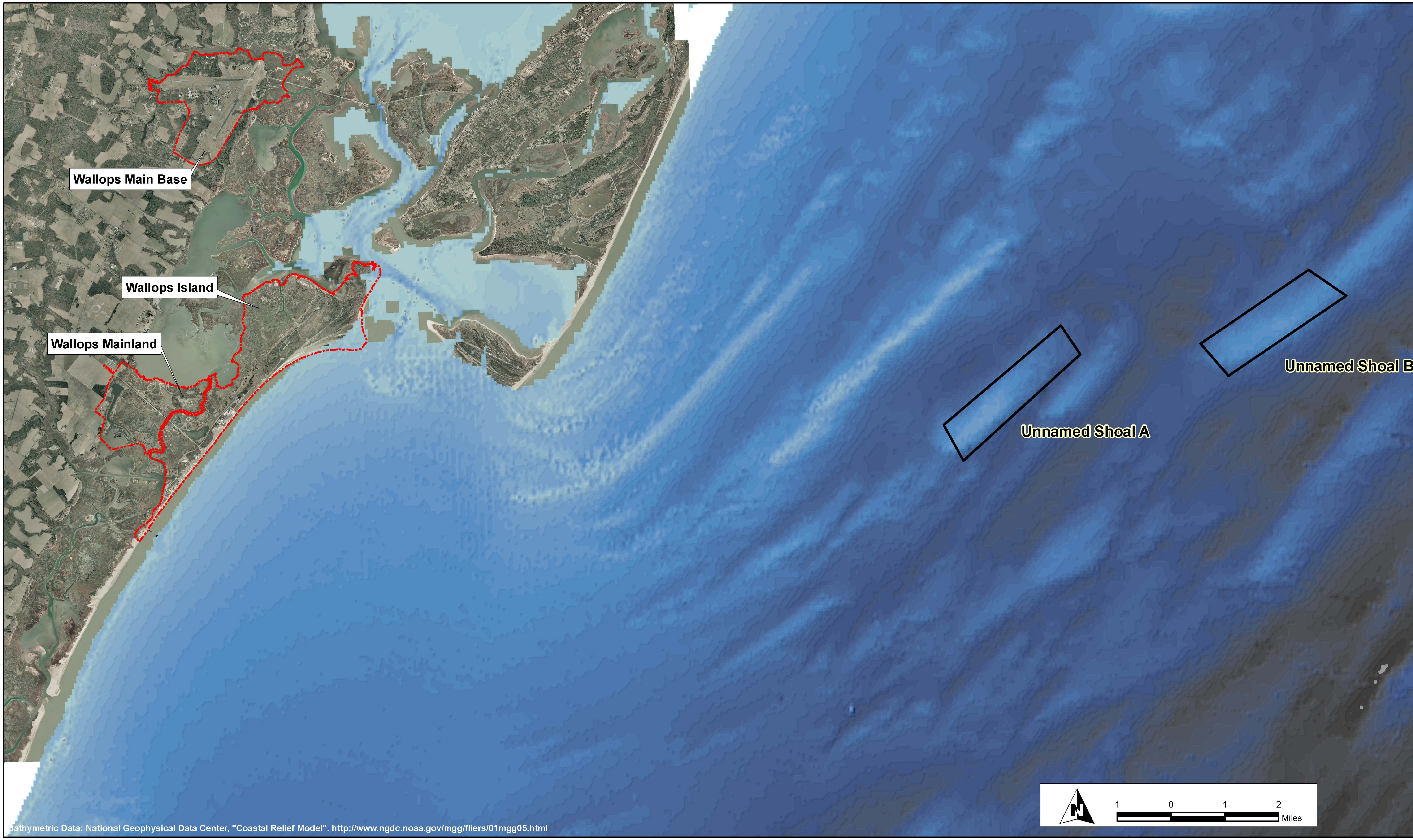

Depth in Meters Below Mean Sea Level

0	-6	-12	-18	-24	-30
-1	-7	-13	-19	-25	-31
-2	-8	-14	-20	-26	-32
-3	-9	-15	-21	-27	
-4	-10	-16	-22	-28	
-5	-11	-17	-23	-29	

Shoal Location

WFF Boundary

Title: Offshore Bathymetry

URS Proj No: 15301785

Figure: 3

Client : NASA

Shoreline Restoration Environmental Impact Statement

SECTION FOUR: EFH CONSULTATION HISTORY

In 2006 and 2007, NASA prepared a Draft SRIPP Programmatic Environmental Assessment (PEA) to assess a wide variety of shoreline protection and sediment management alternatives at WFF. On April 17, 2007, NASA submitted an EFH assessment that considered the potential effects of offshore dredging and beach nourishment on Wallops Island. In response to the 2007 EFH assessment, the NMFS provided EFH conservation recommendations in a memorandum (NMFS, 2007) (Attachment A). The Draft PEA was never finalized but is serving as a basis for the development of the current SRIPP Programmatic Environmental Impact Statement (PEIS).

In March 2009, during the preparation of the SRIPP EIS, NASA submitted an updated Description of Proposed Action and Alternatives to NMFS for review. In a letter dated June 18, 2009, NMFS responded with comments on the SRIPP (Attachment B). NMFS suggested that EFH consultation be re-initiated and the initial EFH assessment under the PEA be updated because the proposed alternatives had changed substantially and 2 years had passed since the initial EFH assessment was submitted for the SRIPP.

SECTION FIVE: BENTHIC HABITATS OF THE OFFSHORE SHOALS

The nearshore Atlantic Ocean seafloor east of Wallops Island is relatively uniform and flat and does not contain large shoals that would provide suitable quantities of sand for beach fill (Hobbs et al., nd). Figure 4 shows the nearshore bathymetry of the seafloor east of Wallops Island adjacent to the shoreline.

The bathymetry of the seafloor in the region east of Assateague Island extending southward to the area east of northern Assawoman Island is extremely complex with many ridges running diagonal to the shore (Figure 5). Fishing Point extends from the southern end of Assateague Island approximately 6 km (4 miles) east of the northern end Wallops Island shoreline. Shallow shoals extend several miles further seaward. The area east of Wallops Island and south of the Chincoteague shoals is characterized by a slow and steady increase in depth seaward from the shoreline. In contrast, the bathymetry in the sand ridge complex area east of Assateague Island, including the Chincoteague Shoal, Blackfish Bank Shoal and Unnamed Shoals A and B has a wider range in depth. These sand ridges trend from northeast to southwest, and the shoal crests generally get deeper further offshore. The potential offshore borrow sites are located on separate sand ridges.

Depth in the sand ridge complex area ranges from an average of about 1 meter (4 feet) near the shoreline to about 30 meters (100 feet) deep about 21 km (13 miles) off shore in the vicinity of Unnamed Shoal B (Figure 20). The top of the Chincoteague Shoal ranges from 6.5 meters (21 feet) to about 2 meters (7 feet) below sea level. Depth between Chincoteague Shoal and Blackfish Bank Shoal drops to about 15 meters (50 feet). Blackfish Bank Shoal ranges in depth from 9 to 4 meters (30 to 13 feet). Moving eastward, depth drops to about 21 meters (70 feet) between Blackfish Bank and Unnamed Shoal A; Unnamed Shoal A has a depth of 12 to 7.5 meters (40 feet to 25 feet). Between Unnamed Shoals A and B, the depth ranges from to 23 to 12 meters (75 to 40 feet). Unnamed Shoal B ranges in depth from about 15 meters (50 feet) up to a high point of 9 meters (29 feet).

Title:	Seawall Extension and Beach Fill Overview
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	Figure: 4
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Shoreline Restoration Environmental Impact Statement	

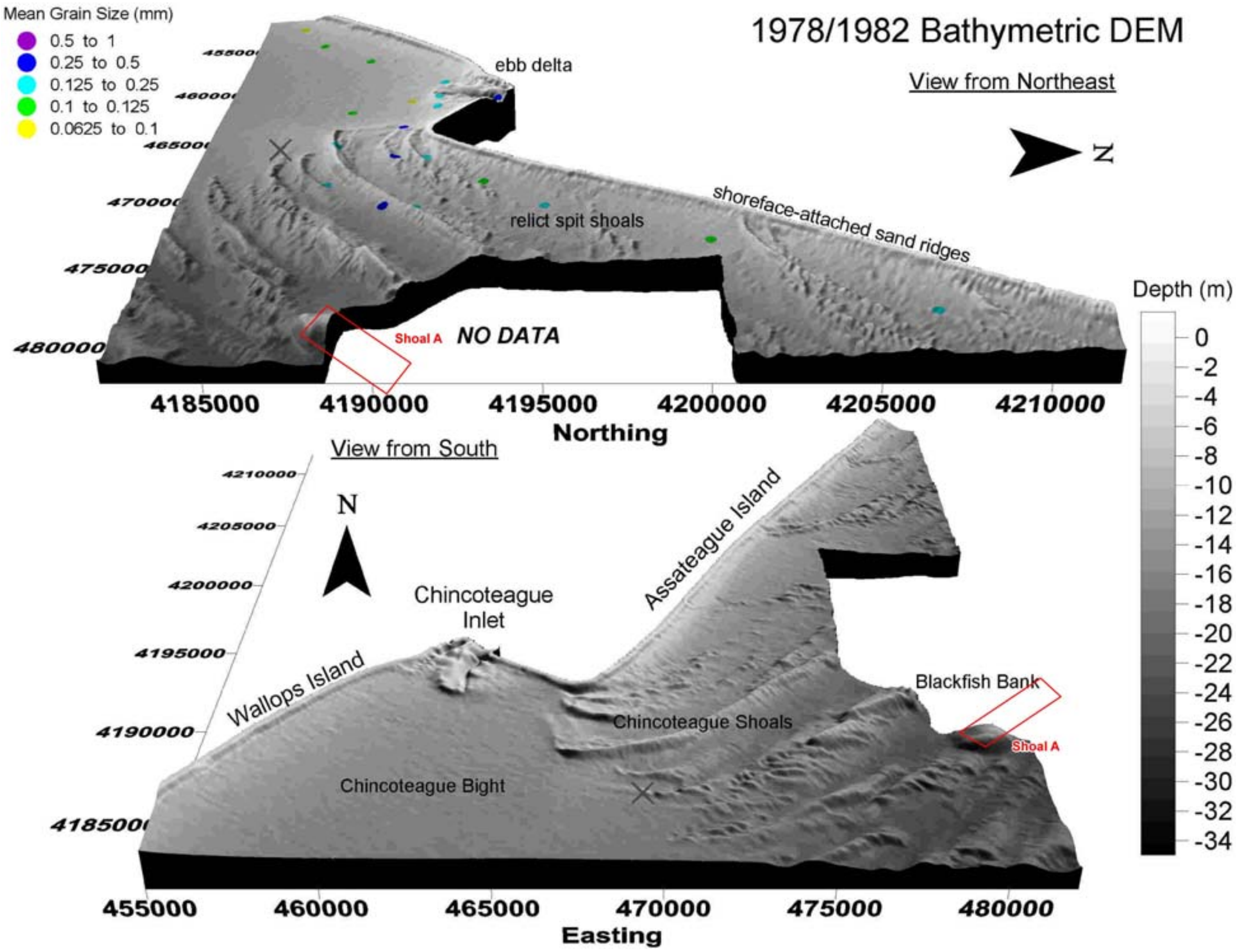

Figure 5: Bathymetry off Assateague Island

Source: Wikel, 2008. Bathymetric Digital Elevation Model (DEM) was created from 1978 and 1982 hydrographic surveys from the National Oceanic and Atmospheric Administration – National Geophysical Data Center.

Recent relevant studies which have been conducted include an assessment of the fauna on the sand shoals offshore of Ocean City, Maryland (Slacum et al. 2006), which is located approximately 64 km (40 miles) north of the SRIPP project area. Fifty-seven taxa of finfish were collected using a combination of small otter trawls, large commercial trawls, and gill net sets. Cutter and Diaz (2000) conducted beam trawls to characterize demersal, juvenile fish on shoals offshore of Ocean City, Maryland.

A video survey was conducted in July (NASA, 2009a) of the benthic habitat of the two unnamed sand shoals as part of baseline data collection for the PEIS. Video was collected at 40 stations at each of the shoals (80 stations total). The stations were established along 8 transects aligned across the approximate crest of each shoal with 5 stations per transect. The survey concluded that the proposed dredge area and the immediate area surrounding it are comprised of unconsolidated sand with no hard substrate present. In addition, a sub-bottom profile survey conducted in June and July (NASA, 2009b) for the offshore cultural resource investigation reached the same conclusion.

In general, results of the video survey indicated that sediment on the crests and topographically higher portions of the shoals were dominated by physical features such as ripple marks (Photos 1 and 2). The deeper portions of the shoals were dominated by shell fragments and hash as well as biological features such as tubes and feeding cones created by benthic organisms (Photo 3). Dominant epifaunal benthos included sand dollars (*Echinarachinus parma*) (Photo 4), hermit crabs (*Pagurus* spp.), crabs (*Libinia* spp., *Cancer* spp.) (Photo 5), moon shell (*Polinices* spp.) (Photo 6) and whelk (*Busycon* spp.). Fish were rarely seen at any of the stations; those that were observed were primarily (*Prionotus* spp.) (Photo 7).

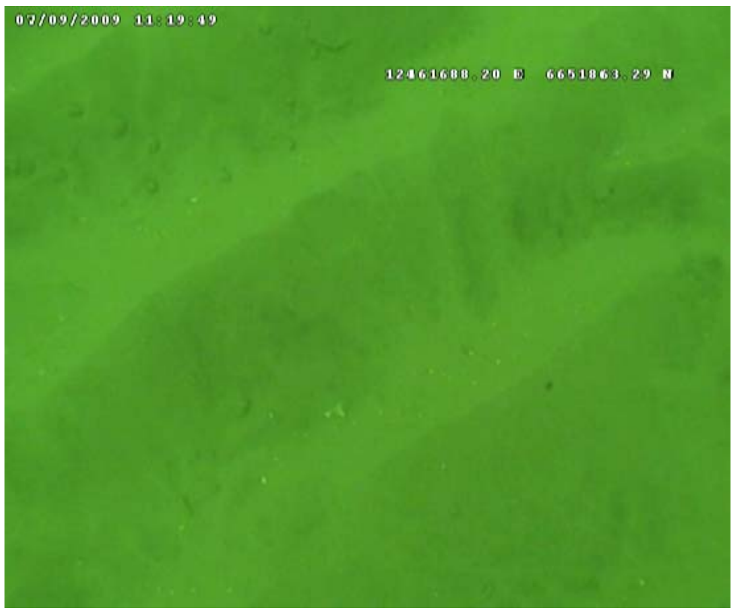

Photo 1: Station #20 from Unnamed Shoal B at a depth of approximately 45 ft depicting well-defined ripple marks and low shell content.

Photo 2: Station #39 from Unnamed Shoal B at a depth of approximately 56 ft with defined bedforms and low shell content.

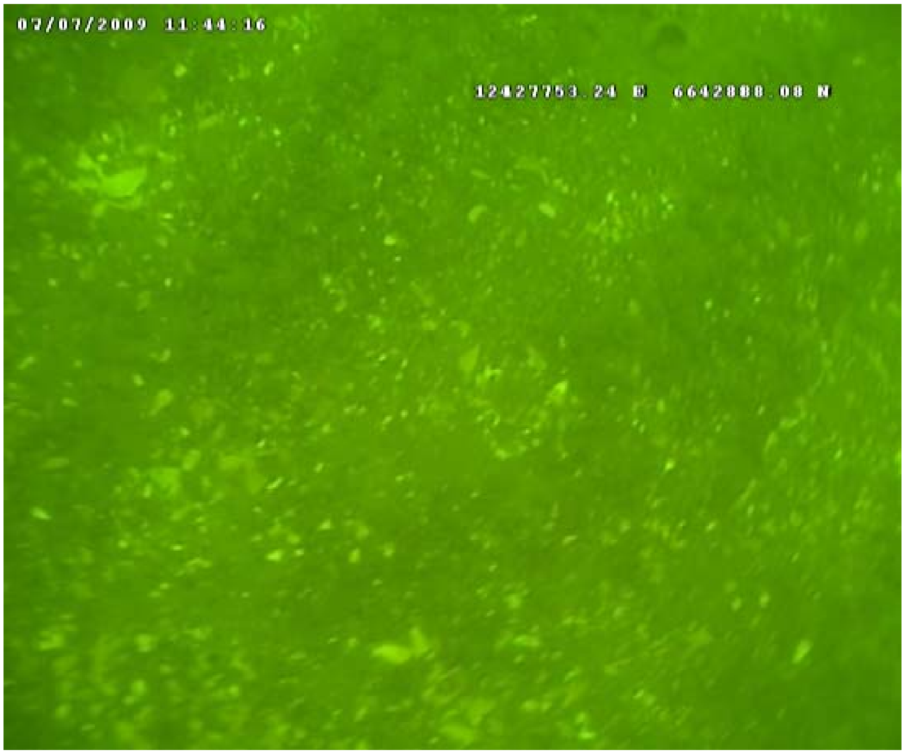

Photo 3: Station #2 from Unnamed Shoal A at a depth of 55 ft with high shell content and lack of surface bedforms

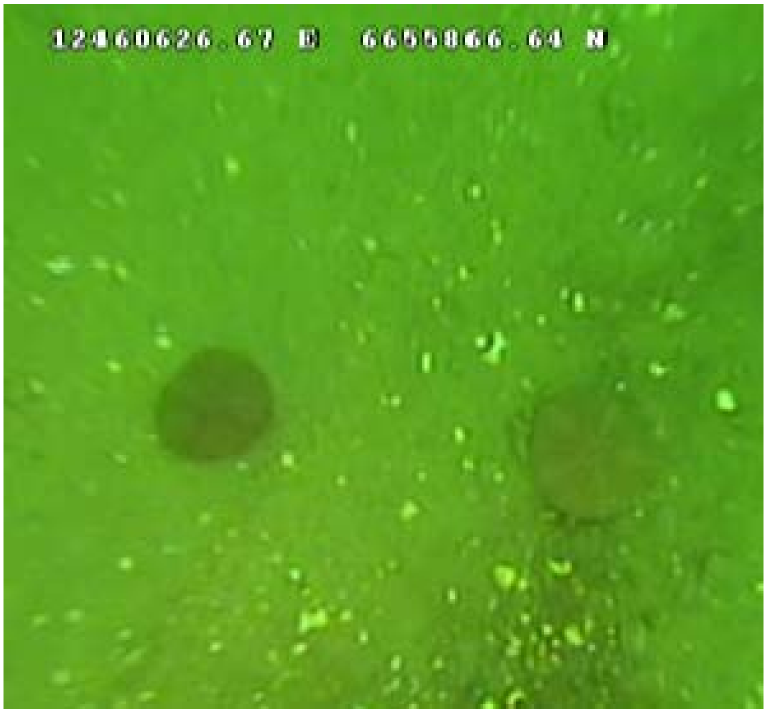

Photo 4: Sand dollars (*Echinarachinus parma*) from Station #14 Unnamed Shoal B at a depth of 48 ft.

Photo 5: Station #10 Unnamed Shoal B at a depth of 55 ft. Portly spider crab (*Libinia emarginata*) in lower right quadrant.

Photo 6: Station #10 Unnamed Shoal B at a depth of 55 ft. Moon snail (*Polinices* spp.) sand collars in upper right quadrant and moon snail in upper left quadrant.

Photo 7: Sea robin (*Prionotus* spp.) in lower right quadrant from Station #39 Unnamed Shoal B at a depth of 56 ft.

SECTION SIX: IDENTIFICATION OF MANAGED SPECIES

The National Marine Fisheries Guide to Essential Fish Habitat Designations in the Northeastern United States (http://www.nero.noaa.gov/hcd/) was used to determine potential species that have designated EFH in the project area. The species and life stages of EFH in the project area were determined by using the quick reference 10-minute x 10-minute (10' x 10') squares that are representative of the geographic area where project activities are proposed to occur.

The project area includes three 10' x 10' squares that are described below.

Square I:

Square I Coordinates

Boundary	North	East	South	West
Coordinate	38°00.0'	75°20.0'	37°50.0'	75°30.0'

Waters within Chincoteague Bay and the following areas: on the main coast of Virginia, from Powell Creek southwest of Greenbackville, VA; past Cockle Point, Swans Gut Creek, Sinnickson, VA; Horntown Ledge, Mosquito Creek, Cockle Creek, Shelley Bay, Shoaling Point, Willis Point, Gunboat Point, Kendell Narrows, Walker Marshes, Walker Point, Old Root Narrows, Gunboat Island, Balfast Narrows, all the way south to Wallops Island, Taylors Narrows, and Island Hole Narrows. Also, within the waters east of the above, within Simoneaston Bay, Watts Bay, Powells Bay, and Bogues Bay, the following features are included: almost all of Chincoteague Island, except for the northeast portion, the western part of Morris Island, Queen Sound Channel, Wire Narrows, Black Narrows, Chincoteague Channel Point, Chincoteague, Virginia, Piney Island, Assateague Channel, and southern Assateague Island, including around Assateague Point, Fishing Point, Assateague Beach, Tom’s Cove, and Little Tom’s Cove, as well as waters over southwestern Chincoteague Shoals, Turner’s Lump, and Chincoteague Inlet.

Square II:

Square II Coordinates

Boundary	North	East	South	West
Coordinate	38°00.0'	75°10.0'	37°50.0'	75°20.0'

Atlantic Ocean waters, waters within Chincoteague Bay affecting the following: east of southern Assateague Island in Virginia, from Ragged Point Marshes on the north, south and west within Assateague Bay, around the Coardes Marshes, around Wild Cat Point on the northeast tip of Chincoteague Island, and Morris Island. Also affected are Blackfish Bank, and northern Chincoteague Shoals.

Square III:

Square III Coordinates

Boundary	North	East	South	West
Coordinate	37°50.0'	75°20.0'	37°40.0'	75°30.0'

Waters within the Atlantic Ocean, south one square of the square affecting Chincoteague Inlet in Virginia (Square I). The waters touch the coast near Hog Creek just north of Assawoman Inlet. They also affect Porpoise Banks and southwestern Wallops Island.

Managed Species Within The SRIPP Project Area

Species and their life stages within Squares I, II, and III are listed below.

Compiled Species List: Squares I, II and III

Species Common Name (*Scientific Name*)	Eggs	Larvae	Juveniles	Adults
Atlantic angel shark *(Squatina dumerili)*	---	X	X	X
Atlantic butterfish (*Peprilus triacanthus*)	---	---	X	X
Atlantic sea herring *(Clupea harengus)*	---	---	---	X
Atlantic sharpnose shark (*Rhizopriondon terraenovae)*	---	---	---	X
black sea bass (*Centropristus striata*)	n/a	X	X	X
bluefish (*Pomatomus saltatrix*)	---	X	X	X
clearnose skate *(Raja eglanteria)*			X	X
cobia (*Rachycentron canadum*)	X	X	X	X
dusky shark (*Charcharinus obscurus*)	---	X	X	---
king mackerel (*Scomberomorus cavalla*)	X	X	X	X
little skate *(Leucoraja erinacea)*			X	
monkfish *(Lophius americanus)*	X	X	---	---
red drum (*Sciaenops occelatus*)	X	X	X	X
red hake (*Urophycis chuss*)	X	X	X	---
sand tiger shark (*Odontaspis taurus*)	---	X	---	X
sandbar shark (*Charcharinus plumbeus*)	---	X	X	X
scalloped hammerhead shark *(Sphyrna lewini)*	---	---	X	X
scup (*Stenotomus chrysops*)	n/a	n/a	X	X
Spanish mackerel (*Scomberomorus maculatus)*	X	X	X	X
spiny dogfish *(Squalus acanthias)*	n/a	n/a	---	X

Species Common Name (*Scientific Name*)	Eggs	Larvae	Juveniles	Adults
summer flounder (*Paralicthys dentatus*)	---	---	X	X
surf clam (*Spisula solidissima*)	n/a	n/a	X	X
tiger shark (*Galeocerdo cuvieri*)		X		
windowpane flounder (*Scopthalmus aquosus*)	X	X	X	X
winter flounder (*Pleuronectes americanus*)	X	X	X	X
winter skate *(Leucoraja ocellata)*			X	X
witch flounder (*Glyptocephalus cynoglossus*)	X	---	---	---

Source: NMFS, No date, http://www.nero.noaa.gov/hcd/webintro.html. The notation "X" in the above table indicates that EFH has been designated within the project area for a given species and life stage. The notation "n/a" in the table indicates that the species either has no data available for the designated stage, or the particular stage is not present in the species' reproductive cycle. These species are: spiny dogfish, surf clam, which are referred to as pre-recruits and recruits (this corresponds with juveniles and adults in the table); scup and black sea bass, for which there is insufficient data for the life stages listed, and no EFH designation has been made as of yet for certain life stages, although data is available to describe the applicable life stages for these species.

Description of SRIPP Project Area

The SRIPP project area is found within the Mid-Atlantic Bight (MAB), one of the four subregions of The Northeast Continental Shelf ecosystem. Each subregions reflects different underlying oceanographic conditions and fishery management boundaries. There is also variation in marine water temperature, salinity, chlorophyll, and zooplankton biomass within each of these subregions.

The temperature and salinity within the MAB are two important factors influencing which managed fish species are present, and the time of year at which they are present in the SRIPP project area. In the MAB, temperature stratification varies greatly between summer and winter in. The water column is vertically well-mixed, with surface water temperatures of 14°C (57°F) at the surface and 11°C (52°F) at depth in the winter. During the summer, the water is generally 25°C (77°F) near the surface and 10°C (50°F) at depths greater than 656 feet (Paquette *et al*., 1995). The pH of the marine seawater is relatively stable due to the presence of the CO2-carbonate equilibrium system which maintains a pH between 7.5 and 8.5. The major chemical parameters of marine water quality include pH, dissolved oxygen, and nutrient concentrations. Salinity in the MAB generally ranges from 28 to 36 parts per thousand (ppt) over the continental shelf. Lower salinities are found near the coast and the highest salinities found near the continental shelf break. Marine seawater salinity is generally highest during the winter and lowest in the spring. The intrusion of saltier water (greater than 35 ppt) from the continental slope waters and freshwater input from coastal sources causes the variability in this area. A fairly uniform salinity range (32 to 36 ppt) is maintained throughout the year in continental slope waters of the MAB, with pockets of high-salinity water (38 ppt) near the Gulf Stream in the fall (DoN, 2008).

SECTION SEVEN: EVALUATION OF IMPACTS ON EFH SPECIES

7.1 ATLANTIC ANGEL SHARK (*Squatina dumerili*)

7.1.1 EFH for Atlantic Angel Shark

EFH for larvae (known as neonates), juveniles, and adults is off the coast of southern New Jersey, Delaware, and Maryland in shallow coastal waters out to the 25-meter (82-foot) isobath, including the mouth of Delaware Bay.

7.1.2 Background

The Atlantic angel shark is a bottom-dwelling species found in coastal waters of the Atlantic, generally at depths between 40 and 250 meters (131 and 820 feet). The flattened body and sandy-brown or gray color cause the shark to be frequently mistaken for a ray. The angel shark preys on demersal fish like flounder and skate, mollusks, crustaceans, and stingrays, such as the southern stingray (*Dasyatis americana)*. The shark is ovoviviparous, meaning that the female produces eggs, but they remain inside her body until they hatch, so that “live” birth occurs. The litter generally consists of 16 pups, which are born in the spring and summer. The angel shark is highly migratory, moving north during the summer and wintering in warmer southern waters (Florida Museum of Natural History, 2009).

7.1.3 Project Impacts

EFH may be adversely affected, as Atlantic angel sharks are known to frequent coastal areas. Although they may be present when dredging begins at the offshore shoals and during sand placement on the Wallops Island shoreline, they would have the ability to vacate the area once the disturbance begins. The disturbance of bottom sediments associated with dredging could interfere with feeding, predation, and avoidance patterns of this shark species. However, adverse impacts are expected to be temporary and highly localized.

7.2 ATLANTIC BUTTERFISH (*Peprilus triacanthus*)

7.2.1 EFH for Atlantic Butterfish

For juveniles and adults, offshore EFH is the pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina. Inshore, EFH is the "mixing" and/or "seawater" portions of all the estuaries where juvenile butterfish are "common," "abundant," or "highly abundant" on the Atlantic coast, from Passamaquoddy Bay, Maine to James River, Virginia. Generally, juvenile butterfish are present in depths between 10 meters (33 feet) and 366 meters (1,200 feet) and temperatures between approximately 3°C (37°F) and 28°C (82°F).

7.2.2 Background

Both juveniles and adults are found over the shelf during the winter months, and spend the spring and fall in the estuaries. Schools of adults and larger juveniles form over sandy, sandy-silt, and muddy substrates. During summer, butterfish move toward the north and inshore to feed and spawn. Spawning occurs from June to August, and peaks progressively later at higher latitudes. During winter, butterfish move southward and offshore to avoid cool waters. Butterfish are primarily pelagic, and form loose schools that feed upon small fish, squid, and crustaceans. Smaller juveniles evade predation by associating with floating objects and organisms such as jellyfish. Inshore and in the surf-zone, butterfish prey on plankton, thaliaceans, squid, and copepods (Overholtz, 2000).

7.2.3 Project Impacts

Juvenile and adult butterfish may be present at the dredging area, but would likely temporarily vacate the shoal areas once dredging begins. No indirect impacts to juveniles or adults are expected due to dredging because butterfish are pelagic and their prey is largely found in the water column. The dredging area would be confined to portions of the two shoals and butterfish prey species are present throughout the surrounding areas. Dredging operations should not cause significant adverse impacts to the EFH for this species. Any adverse impacts, such as increased turbidity and loss of benthic prey would be highly localized and temporary.

7.3 ATLANTIC SEA HERRING (*Clupea harengus*)

7.3.1 EFH for Atlantic Herring

For adults, EFH consists of pelagic waters and bottom habitats in the Gulf of Maine, Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where Atlantic herring adults are found: water temperatures below 10° C (50° F), water depths from 20 to 130 meters (66 to 427 feet), and salinities above 28 ppt.

7.3.2 Background

Adult herring are found in pelagic waters and bottom habitats of the Mid-Atlantic Bight at water depths from 20 to 130 meters (65 to 426 feet). They primarily feed on zooplankton, krill, and fish larvae. Adult herring prefer temperatures below 10° C (50° F), and salinities above 28 ppt. Spawning occurs at depths of 15 to 46 meters (50 to 150 feet), at temperatures below 15°C, and salinities from 32 to 33 ppt. The bottom substrates on which they spawn consist of gravel, sand, and shell fragments, and eggs are occasionally found on aquatic macrophytes. The eggs are spawned in areas of well-mixed water, with tidal currents between 1.5 and 3.0 knots, with the majority of spawning in and adjacent to the project area occurring between July and November.

7.3.3 Project Impacts

Adult Atlantic herring may be present in the water column at the dredging areas. Atlantic herring are highly motile and would be able to vacate the shoal areas during dredging operations. Adult Atlantic herring are not generally associated with bottom habitats and are unlikely to be affected by activities in the proposed project area. No indirect impacts to adults are expected due to dredging because the area to be dredged is confined to portions of the two shoals and typical herring prey species are present throughout the surrounding areas.

7.4 ATLANTIC SHARPNOSE SHARK (*Rhizopriondon terraenovae*)

7.4.1 EFH for Atlantic Sharpnose Shark

EFH for adults is from Cape May, New Jersey, south to the North Carolina-South Carolina border; shallow coastal areas north of Cape Hatteras, North Carolina to the 25–meter (82-foot) isobath (USACE, 2009).

7.4.2 Background

Adult sharpnose sharks are found in estuaries, the surf zone of sandy beaches, and deeper offshore waters. This small shark only attains a maximum length of 85-90 cm (36 inches) when it is approximately 2.5 years old. Primary prey items of the sharpnose shark include small bony fish, worms, shrimp, crabs, and mollusks. Mating occurs in spring and early summer, followed by a 10 to 11 month gestation period. Litters of 4 to 7 pups are born in June in shallow coastal waters or estuaries.

7.4.3 Project Impacts

EFH may be adversely affected, as Atlantic sharpnose sharks are know to frequent coastal areas. Although they may be present when dredging begins at the offshore shoals and during sand placement on Wallops Island shoreline, they would have the ability to vacate the area once the disturbance begins. The disturbance of bottom sediments associated with dredging could interfere with feeding, predation, and avoidance patterns of this shark species. However, these adverse impacts are expected to be temporary and highly localized.

7.5 BLACK SEA BASS *(Centropristus striata)*

7.5.1 EFH for Black Sea Bass

For larvae, EFH consists of: 1) north of Cape Hatteras, the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina; and 2) estuaries where black sea bass were identified as common, abundant, or highly abundant in the Estuarine Living Marine Resources (ELMR) database, NOAA’s program to develop a consistent database of economically important fishes in the Nation’s estuaries, for the "mixing" and "seawater" salinity zones. Generally, the habitats for the transforming (to juveniles) larvae are near the coastal areas and into marine parts of estuaries between Virginia and New York. When larvae become demersal, they are generally found on structured inshore habitat such as sponge beds.

For juveniles, EFH consists of: 1) offshore, the demersal waters over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina; and 2) inshore, the estuaries where black sea bass are identified as being common, abundant, or highly abundant in the ELMR database for the "mixing" and "seawater" salinity zones. Juveniles are found in the estuaries in the summer and spring. Generally, juvenile black sea bass are found in waters warmer than 6 ^{o} C (43^{o} F) with salinities greater than 18 ppt and coastal areas between Virginia and Massachusetts. In winter, they are present offshore from New Jersey and south. Juvenile black sea bass are usually found in association with rough bottom, such as shellfish and eelgrass beds, and man-made structures in sandy-shelly areas; offshore clam beds and shell patches may also be used during the wintering.

For adults, EFH consists of: 1) offshore, the demersal waters over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina; and 2) inshore, the estuaries where adult black sea bass were identified as being common, abundant, or highly abundant in the ELMR database for the "mixing" and "seawater" salinity zones. Black sea bass are generally found in estuaries from May through October. Wintering adults (November through April) are generally offshore, south of New York to North Carolina. Temperatures above 6° C (43^{o} F) seem to be the minimum requirements. Structured habitats (natural and man-made), and sand and shell substrate are preferred.

7.5.2 Background

Black sea bass is a demersal species found in temperate and subtropical waters all along the Atlantic coast, from the Gulf of Maine to the Gulf of Mexico. In the Mid-Atlantic, black sea bass migrate to inshore coastal areas and bays in the springtime and offshore areas in the fall as the temperatures change. The species is strongly associated with structured habitats including jetties, piers, shipwrecks, submerged aquatic vegetation, and shell bottoms.

7.5.3 Project Impacts

Potential impacts to the black sea bass EFH within both the offshore dredging site and the nearshore sand placement area are expected to be minimal and limited to temporary disturbance of bottom sediments. Significant displacement is not expected, as much of the underwater habitat (i.e., structures) that the species is strongly associated with is not prevalent in the proposed project area.

7.6 BLUEFISH *(Pomatomus saltatrix)*

7.6.1 EFH for Bluefish

For larvae, EFH consists of: 1) North of Cape Hatteras, pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ) most commonly above 49 feet (15 meters), from Montauk Point, New York, south to Cape Hatteras; 2) south of Cape Hatteras, 100% of the pelagic waters greater than 45 feet over the continental shelf (from the coast out to the eastern edge of the Gulf Stream) through Key West, Florida; and 3) the "slope sea" and Gulf Stream between latitudes 29^{o} 00' N and 40^{o} 00' N. Bluefish larvae are not generally found inshore so there is no EFH designation inshore for larvae. Generally, bluefish larvae are present April through September in temperatures greater than 18^{o} C (64^{o} F) in shelf salinities greater than 30 ppt.

For juveniles, EFH consists of: 1) north of Cape Hatteras, pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ) from Nantucket Island, Massachusetts south to Cape Hatteras; 2) south of Cape Hatteras, 100% of the pelagic waters over the continental shelf (from the coast out to the eastern edge of the Gulf Stream) through Key West, Florida; 3) the "slope sea" and Gulf Stream; and 4) inshore, EFH is all major estuaries between Penobscot Bay, Maine and St. Johns River, Florida. Generally juvenile bluefish occur in North Atlantic estuaries from June through October, Mid-Atlantic estuaries from May through

October, and South Atlantic estuaries March through December, within the "mixing" and "seawater" zones (Nelson et al., 1991; Jury et al., 1994; Stone et al., 1994). Distribution of juveniles by temperature, salinity, and depth over the continental shelf is undescribed (Fahay, 1998).

For adults, EFH consists of: 1) north of Cape Hatteras, the pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ), from Cape Cod Bay, Massachusetts south to Cape Hatteras; 2) south of Cape Hatteras, 100% of the pelagic waters over the continental shelf (from the coast out to the eastern edge of the Gulf Stream) through Key West, Florida; and 3) inshore, all major estuaries between Penobscot Bay, Maine and St. Johns River, Florida. Adult bluefish are present in Mid-Atlantic estuaries from April through October in the "mixing" and "seawater" zones (Nelson et al., 1991; Jury et al., 1994; Stone et al., 1994). Bluefish adults are highly migratory and distribution varies seasonally and according to the size of the individuals comprising the schools. Bluefish are generally found in shelf salinities greater than 25 ppt.

7.6.2 Background

EFH is defined within the project area for larval, juvenile, and adult bluefish. Eggs of this species are pelagic and highly buoyant; with hatching and early larval development occurring in oceanic waters in the MAB, a coastal region running from Massachusetts to North Carolina. The young move inshore to estuaries, which serve as chief habitat for juveniles. Adults travel northward in spring and summer and to the south in fall and winter. Southerly migration may be closer to shore than northerly movement, although movement in both directions is characterized by inshore-offshore movement. It is believed that estuarine and nearshore waters are important habitats for juveniles and adults from Maine to Florida (NMFS, 2006). Adult bluefish prey on squid and other fish such as silverside.

7.6.3 Project Impacts

Bluefish are a schooling, pelagic species not associated with bottom habitats; therefore dredging operations should not significantly impact preferred habitat. Since bluefish are sight feeders, increased turbidity in the proposed project area may affect their ability to locate prey. Being highly mobile, however, bluefish should be able to avoid and/or quickly exit areas impacted by dredging operations. Wilber et al. (2003) reported in a study of the response of surf zone fish to beach nourishment in northern New Jersey that bluefish avoided areas of active beach fill operations. Any adverse impacts, such as increased turbidity and loss of benthic prey would be highly localized and temporary

7.7 CLEARNOSE SKATE (*Raja eglanteria*)

7.7.1 EFH for Clearnose Skate

For juveniles, EFH consists of bottom habitats with a substrate of soft bottom along the continental shelf and rocky or gravelly bottom, ranging from the Gulf of Maine south along the continental shelf to Cape Hatteras, North Carolina (the southern boundary of the New England Fishery Management Council [NEFMC] management unit). Generally, their full range is from the shore to 500 meters (1,640 feet), but they are most abundant at depths less than 111 meters

(364 feet). The juvenile skate prefers temperatures in the range of 9° to 30° C (48° to 86° F), but are most abundant from 9° to 21° C (48° to 70° F) in the northern part of its range and 19 to 30° C (66° to 86° F) around North Carolina.

For adults, EFH includes bottom habitats with a substrate of soft bottom along the continental shelf and rocky or gravelly bottom, ranging from the Gulf of Maine south along the continental shelf to Cape Hatteras, North Carolina (the southern boundary of the NEFMC management unit). Their full range is from the shore to 400 meters (1,312 feet), but they are most abundant at depths less than 111 meters (364 feet). The adult skate prefers temperature in the range of 9° to 30° C (48 to 86° F), but are most abundant from 9° to 21° C (48° to 70° F) in the northern part of its range and 19° to 30° C (66° to 86° F) around North Carolina.

7.7.2 Background

This skate species occurs along the eastern coast from the Nova Scotian Shelf to northeastern Florida, as well as in the northern Gulf of Mexico from northwestern Florida to Texas. North of Cape Hatteras, skate move inshore and northward along the Outer Continental Shelf during the spring and early summer, and offshore and southward during the autumn and early winter. In winter, the juveniles are most densely concentrated on the continental shelf from the Delmarva Peninsula to Cape Hatteras out to the 20 meter (66 foot) contour. In spring, skates concentrate inshore in the same region. In winter, adults are concentrated inshore out to 200 meters (656 feet) from near the Hudson Canyon to Cape Hatteras. In spring, small numbers of adults are found inshore out to 200 meters (656 feet) from Delaware to south of Cape Hatteras. In summer, small concentrations of adults are found from Cape May to Cape Hatteras, and during the fall, they are located from Long Island to Cape Hatteras. The clearnose skate is found on soft bottoms along the continental shelf but may also occur on rocky or gravelly bottoms. The species is abundant from the sublittoral zone out to about 55 meters (180 feet) (NOAA, 2003c).

7.7.3 Project Impacts

Disturbance of bottom habitat by dredging operations could negatively impact the clearnose skate, which favors soft bottom habitat which is prevalent throughout the project area. Additionally, turbidity associated with dredging could interfere with skate feeding, predation, and avoidance patterns. It is expected that these adverse impacts, however, would be temporary and highly localized. The benthic species that the skates feed would be expected to repopulate the dredged areas of sand bottom within a few years (Diaz et al., 2004). The skate is a highly mobile species, and would be capable of foraging in other locations near the shoal while the benthic community recovers.

7.8 COBIA *(Rachycentron canadum)*

7.8.1 EFH for Cobia

EFH for all stages of cobia includes sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone. For cobia, EFH also includes high salinity bays, estuaries, and seagrass habitat. In addition the Gulf Stream is an EFH because it provides a mechanism to disperse coastal migratory pelagic larvae. For cobia, EFH occurs in the South Atlantic and Mid-Atlantic Bights.

7.8.2 Background

Cobia is a pelagic species found in small schools near piers, buoys, boats, and platforms, sandy shoals, and offshore sandbars. Cobia are also associated with large marine animals such as sea turtles, rays, and sharks; in fact, they are often mistaken for remora (suckerfish). While usually found in the coastal areas, they occasionally inhabit inshore bays and inlets. Females form large aggregations and spawn during the day in the inshore area just outside coastal bays, inside bays, and in other areas within estuaries from June to mid-August. Spawning occurs once every 9 to 12 days, often up to 15 times per season (Florida Museum of Natural History, 2009). Cobia eggs are planktonic, and float freely in the water column. In the spring, the adults migrate north from the warmer waters of the Florida Keys to the coastal waters of Virginia. Cobia feed on crustaceans, invertebrates, and occasionally other pelagic fish (NOAA, 2009).

7.8.3 Project Impacts

This coastal migratory pelagic species may be impacted by proposed project activities, especially juveniles and adults which tend to feed on crabs and inhabit inshore environments. Disturbance to bottom habitat by dredging may affect prey availability in the project area. However, these adverse impacts are likely to be highly localized and temporary.

7.9 DUSKY SHARK *(Charcharinus obscurus)*

7.9.1 EFH for Dusky Shark

For neonate/early juveniles, EFH consists of shallow coastal waters, inlets and estuaries to the 25-meter (82-foot) isobath from the eastern end of Long Island, New York, to Cape Lookout, North Carolina; from Cape Lookout south to West Palm Beach, Florida, in shallow coastal waters, inlets and estuaries and offshore areas to the 100-meter (328-foot) isobath.

For late juveniles/subadults, EFH includes off the coast of southern New England, coastal and pelagic waters between the 25- and 200-meter (82- and 656-foot) isobaths; shallow coastal waters, inlets and estuaries to the 200-meter (656-foot) isobath from Assateague Island at the Virginia/Maryland border to Jacksonville, Florida (NOAA, 2008).

7.9.2 Background

Dusky shark habitat ranges from shallow inshore waters to beyond the continental shelf. Although the shark feeds near the bottom, it can also be found anywhere in the water column up to 378 meters (1,240 feet) deep. Mating occurs in the spring, followed by a gestational period of either 8 or 16 months, depending on the number of birth seasons in a given year. While juveniles inhabit estuaries and shallow coastal waters, adults are not found in estuaries or waters with lower salinities. The dusky shark preys on a variety of fish and invertebrates, such as herring, grouper, sharks, skates, rays, crabs, squid, and starfish. The species is highly migratory, moving north during the summer and wintering in warmer southern waters. Males and females make the seasonal migrations separately (Florida Museum of Natural History, 2009).

7.9.3 Project Impacts

EFH for neonates and juveniles may be adversely affected by dredging operations associated with the proposed project, as the species is known to frequent the bottom habitats of coastal areas. The disturbance of bottom sediments associated with dredging could interfere with feeding, predation, avoidance, and migratory movements of this shark species. The dusky shark would experience a deficit of prey items in the immediate dredging area; however, this adverse impact is expected to be temporary and highly localized.

7.10 KING MACKEREL *(Scomberomorus cavalla)*

7.10.1 EFH for King Mackerel

EFH for all stages of king mackerel includes sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, from the Gulf Stream shoreward, including *Sargassum.* For king mackerel, EFH also includes high salinity bays, estuaries, and seagrass habitat. In addition, the Gulf Stream is considered EFH because it provides a mechanism to disperse coastal migratory pelagic larvae. For king mackerel, EFH occurs in the South Atlantic and Mid-Atlantic Bights (USACE, 2009).

7.10.2 Background

King mackerel live in large schools in pelagic waters at depths from about 23 to 34 meters (75 to 112 feet). Spawning takes place over the Outer Continental Shelf from May through October, with peaks between late May and early July, and between late July and early August. The larval stage of this species is very brief, with growth rates of 0.51 mm to 1.27 mm (0.02 to 0.05 inches) per day (Florida Museum of Natural History, 2009). Larvae are found in estuaries with water temperatures from 26° to 31° C (79° to 88° F). Juveniles prey on fish larvae, small fish such as anchovies, and squid. In addition to pelagic fish and squid, adults prey on mollusks, shrimp, and other crustaceans. The adult king mackerel is present in waters with temperatures above 20° C (68° F), so their migration along the Atlantic coast migration depends heavily on the temperature of the coastal waters.

7.10.3 Project Impacts

King mackerel is a coastal, pelagic species not associated with bottom habitats. Therefore dredging operations should not significantly impact king mackerel EFH. Being highly mobile, king mackerel should be able to avoid and/or quickly exit areas impacted by dredging operations. Adverse impacts to king mackerel EFH, such as increased turbidity and decreased prey populations, would be highly localized and temporary.

7.11 LITTLE SKATE *(Leucoraja erinacea)*

7.11.1 EFH for Little Skate

For juveniles, EFH includes bottom habitats with a sandy or gravelly substrate or mud, ranging from Georges Bank through the Mid-Atlantic Bight to Cape Hatteras, North Carolina. Generally, juvenile little skates are found from the shore to depths of 137 meters (449 feet), with the highest abundance from 73 to 91 meters (240 to 299 feet). Most juvenile skates are found in waters between 4° to 15° C (39° to 59° F).

For adults, EFH consists of bottom habitats with a sandy or gravelly substrate or mud, ranging from Georges Bank through the Mid-Atlantic Bight to Cape Hatteras, North Carolina. Generally, little skate adults are found from the shore to depths of 137 meters (449 feet), with the highest abundance from 73 to 91 meters (240 to 299 feet). Most juveniles prefer temperatures in the range of 2° to 15° C (36° to 59° F).

7.11.2 Background

Little skate make no extensive migrations, although where it occurs inshore the species moves onshore and offshore with seasonal temperature changes. This species is found on sandy or gravelly bottoms but may also occur on mud bottoms. They are known to remain buried in depressions during the day and become more active at night (NOAA, 2003b). Common prey items include crabs, shrimp, worms, amphipods, ascidians (sea squirts), bivalve mollusks, squid, small fishes, and some copepods.

7.11.3 Project Impacts

The disturbance of bottom habitat by dredging could negatively impact the little skate EFH. Little skate are known to bury themselves in sea floor depressions during daylight hours. Additionally, turbidity could interfere with little skate feeding, predation, and avoidance patterns. It is expected that these adverse impacts, however, would be temporary and highly localized.

7.12 MONKFISH *(Lophius americanus)*

7.12.1 EFH for Monkfish

For eggs, EFH consists of surface waters of the Gulf of Maine, Georges Bank, southern New England, and the Middle Atlantic south to Cape Hatteras, North Carolina. Generally, the monkfish egg veils are found at sea surface temperatures below 18° C (64° F), and water depths from 15 to 1000 meters (49 to 3,281 feet). Monkfish egg veils are most often observed from March to September.

For larvae, EFH is the pelagic waters of the Gulf of Maine, Georges Bank, southern New England and the Middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where monkfish larvae are found: water temperatures 15° C (59°F) and water depths from 25 - 1000 meters (82 to 3,281 feet). Monkfish larvae are most often observed from March to September.

7.12.2 Background

Monkfish are demersal, and prefer sand, mud, and shell habitats. They can be found from inshore up to 899 meters (2,950 feet) deep, at a wide range of temperatures. Fish, crustaceans, mollusks, shrimp, squid and even seabirds are prey for juvenile and adult monkfish. Larval monkfish prey on zooplankton in the water column. Spawning occurs from February to October, from the southern part of the range to the north. Monkfish are believed to spawn over inshore shoals and in deeper offshore waters.

7.12.3 Project Impacts

Monkfish eggs and larvae may be present in the water column within the project area from March to September. If they are present at the offshore shoals during dredging, some eggs and larvae may be entrained during dredging operations; however, this will be temporary and localized to the area being dredged. In addition, eggs and larvae may be disturbed by the turbidity created in the water column. The sediment is expected to settle from the water column shortly after dredging activities cease. In addition, eggs and larvae may be when sand is pumped along the shoreline. It is expected that these adverse impacts to monkfish EFH, however, would be temporary and highly localized.

7.13 RED DRUM *(Sciaenops occelatus)*

7.13.1 EFH for Red Drum

For all stages of red drum, EFH includes all the following habitats to a depth of 50 meters (164 feet) offshore: tidal freshwater; estuarine emergent vegetated wetlands (flooded salt marshes, brackish marsh, and tidal creeks); estuarine scrub/shrub (mangrove fringe); submerged rooted vascular plants (sea grasses); oyster reefs and shell banks; unconsolidated bottom (soft sediments); ocean high salinity surf zones; and artificial reefs. The area covered extends from Virginia through the Florida Keys.

7.13.2 Background

Red drum are distributed along the Atlantic coast in temperatures ranging from 2° to 33°C (36° F to 91° F). Larval and juvenile red drum use the shallow backwaters of estuaries as nursery areas and remain there until they move to deeper water portions of the estuary associated with river mouths, oyster bars, and front beaches. The types of estuarine systems vary along the Atlantic and subsequently, the preferred juvenile habitat also varies with distribution. Young red drum are found in quiet, shallow, protected waters with grassy or slightly muddy bottoms. Shallow bay bottoms or oyster reef substrates are preferred by subadult and adult red drum. Nearshore artificial reefs along the Atlantic are also known to attract red drum as they make their spring and fall migrations. In the fall and spring red drum concentrate around inlets, shoals, capes, and from the surfzone to several miles offshore. Spawning occurs in or near passes of inlets, with larvae being transported into the upper estuarine areas of low salinity. As larvae develop into juveniles and subadults, they use progressively higher salinity estuarine and beachfront surf zones. Red drum move out of estuarine areas as adults and occupy the high salinity surf zone nearshore and offshore coastal waters. In North Carolina and Virginia, large adults move into estuaries during summer months (SAFMC, 1998). Red drum feed on the bottom on small bony fish, crabs, and shrimp (Davis, 1990).

7.13.3 Project Impacts

EFH for this coastal migratory pelagic species may be impacted by proposed project activities, especially EFH for juveniles and adults which feed on crabs, shrimp, and fish that inhabit littoral and nearshore environments. Disturbance to bottom habitat by dredging may affect prey availability in the project area. However, these adverse impacts are likely to be highly localized and temporary.

7.14 RED HAKE *(Urophycis chuss)*

7.14.1 EFH for Red Hake

EFH for eggs includes the surface waters of the Gulf of Maine, Georges Bank, the continental shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, hake eggs are found in areas where sea surface temperatures are below 10° C (50° F) along the inner continental shelf with salinity less than 25 ppt. Eggs are most often present during the months from May through November, with peaks in June and July.

EFH for larvae includes surface waters of Gulf of Maine, Georges Bank, the continental shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, red hake larvae are found where sea surface temperatures are below 19° C (66° F), water depths are less than 200 meters, and salinity is greater than 0.5 ppt. Red hake larvae are most often observed from May through December, with peaks in September and October.

EFH for juveniles consists of bottom habitats with a substrate of shell fragments, including areas with an abundance of live scallops, in the Gulf of Maine, on Georges Bank, the continental shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, red hake juveniles are found where water temperatures are below 16° C (61° F), depths are less than 100 meters (328 feet), and salinity ranges from 31 to 33 ppt.

7.14.2 Background

Red hake migrate seasonally, coming from as far north as Maine to the warmer southern waters of Virginia and North Carolina. Spawning for red hake populations throughout the eastern Atlantic occurs in the Mid-Atlantic Bight. Not much is known about the eggs, other than that they float near the surface and hatching occurs about a week after spawning. Larvae can be found in the upper water column from May through December. Juveniles are pelagic and stay close to floating debris and patches of *Sargassum* until they are approximately 2 months old, at which time they become demersal. Juveniles prefer silty, fine sand sediments while adults favor muddy substrates (NOAA, 1999b).

7.14.3 Project Impacts

Potential impacts to red hake EFH would be limited to temporary disruption of juvenile habitats due to dredging operations. Because significant population centers for this species tend to occur from New Jersey northward of the project area, project impacts would negligible.

7.15 SAND TIGER SHARK *(Odontaspis taurus)*

7.15.1 EFH for Sand Tiger Shark

EFH is defined within the project area for larvae and adult sand tiger sharks. The sand tiger shark may be found in the western Atlantic from the Gulf of Maine to Argentina, the Atlantic coast of Europe and North Africa, and the Mediterranean Sea. Sand tiger sharks may occur singly or in small schools and are active primarily at night. They are generally coastal and usually found from the surf zone to depths of around 25 meters (82 feet). However, they may also be found in shallow bays and to depths of 200 meters (656 feet).

7.15.2 Background

The sand tiger shark is found inshore in areas including the surf zone, shallow bays, reefs, and wrecks. It can also be found in deeper areas like the Outer Continental Shelf. The sand tiger shark usually gives birth to only one or two pups at a time. Although the shark can be found throughout the water column, it prefers to drift along the bottom. To become buoyant in the water column, the shark comes to the surface to gulp air, as it lacks the swim bladder that bony fish possess. The species is seasonally migratory, moving north during the summer and wintering in warmer southern waters. Common prey includes herring, bluefishes, flatfishes, eels, mullets, snappers, rays, squid, crabs, and other sharks (Florida Museum of Natural History, 2009).

7.15.3 Project Impacts

Because sand tiger sharks favor littoral and inshore areas, EFH may be adversely affected by dredging operations associated with the proposed project. These sharks also feed on crabs that may be impacted by bottom habitat disturbance. However, adverse impacts are expected to be temporary and highly localized.

7.16 SANDBAR SHARK *(Charcharinus plumbeus)*

7.16.1 EFH for Sandbar Shark

For neonates/early juveniles, EFH consists of shallow coastal areas to the 25-meter (82-foot) isobath from Montauk, Long Island, New York, south to Cape Canaveral, Florida (all year); nursery areas in shallow coastal waters from Great Bay, New Jersey, to Cape Canaveral, Florida, especially Delaware and Chesapeake Bays (seasonal-summer); shallow coastal waters to up to a depth of 50 meters (164 feet) on the west coast of Florida and the Florida Keys from Key Largo to south of Cape San Blas, Florida. Typical parameters include salinity greater than 22 ppt and temperatures greater than 21° C (70° F).

For late juveniles/subadults, EFH includes offshore southern New England and Long Island, both coastal and pelagic waters; also, south of Barnegat Inlet, New Jersey, to Cape Canaveral, Florida, shallow coastal areas to the 25–meter (82-foot) isobath; also, in the winter, in the Mid-Atlantic Bight, at the shelf break, benthic areas between the 100- and 200-meter (328- and 656-foot) isobaths; also, on the west coast of Florida, from shallow coastal waters to the 50–meter (164-foot) isobath, from Florida Bay and the Keys at Key Largo north to Cape San Blas, Florida.

For adults, EFH is on the east coast of the United States, shallow coastal areas from the coast to the 50-meter (164-foot) isobath from Nantucket, Massachusetts, south to Miami, Florida; also, shallow coastal areas from the coast to the 100-meter (328-foot) isobath around peninsular Florida to the Florida panhandle near Cape San Blas, Florida, including the Keys and saline portions of Florida Bay.

7.16.2 Background

The sandbar shark is the most common gray shark along the Mid-Atlantic Coast (Chesapeake Bay Program, 2009). From late May to early June, females head to the inlets and coastal bays of Virginia to give birth to litters of between 6 and 13 pups. The pups remain in the area until

September or October, when they school and migrate south, along with the adults, to the warmer waters of North Carolina and Florida. The sharks begin to return to the coastal waters of Virginia around April. Pups and juveniles feed primarily on crustaceans, graduating to a more diverse diet of fish from higher in the water column, as well as rays skates, mollusks, and crustaceans near or in the benthic layer. The sharks are bottom-dwellers found in relatively shallow coastal waters 18 to 61 meters (60 to 200 feet) deep on oceanic banks and sand bars with smooth, sandy substrates. The adults can also occasionally be found in estuaries in turbid waters with higher salinity (Florida Museum of Natural History, 2009).

7.16.3 Project Impacts

Because sandbar sharks favor habitats such as sand shoals, EFH may be adversely affected by dredging operations associated with the proposed project. No impacts to neonates/early juveniles are expected, as they tend to congregate in estuaries. Juveniles and adults are opportunistic bottom feeders whose prey items might be negatively impacted by dredging operations. The disturbance of bottom sediments associated with dredging could interfere with feeding, predation, avoidance, and migratory movements of this shark species. However, these adverse impacts are expected to be temporary and highly localized.

7.17 SCALLOPED HAMMERHEAD SHARK (*Sphyrna lewini*)

7.17.1 EFH for Scalloped Hammerhead Shark

EFH for juvenile sharks includes all shallow coastal waters of the U.S. Atlantic seaboard from the shoreline to the 200-meter (656-foot) isobath south to the vicinity of the Dry Tortugas and the Florida Keys.

7.17.2 Background

Litters of between 12 and 38 pups are born inshore in shallow waters during the summer months. The pups remain in shallow coastal areas, where they live until males reach 1.8 meters (6 feet) long and females reach 2.5 meters (8.2 feet). Although adult scalloped hammerheads are generally coastal-pelagic species found in shallow inshore waters, they can also be found in estuaries and deeper offshore habitats of up to 275 meters (902 feet) in depth. The sharks tend to school as juveniles, preferring to swim in pairs or alone as they mature. Typically the adults are found inshore during the day and move offshore at night to feed on prey including fish, cephalopods, crustaceans, rays, and smaller sharks (Florida Museum of Natural History, 2009).

7.17.3 Project Impacts

EFH for juvenile hammerhead sharks may be adversely affected by dredging operations associated with the proposed project. This species is known to move between inshore and offshore environments and favored prey fish species might be negatively impacted by turbidity associated with dredging. Any adverse impacts, such as increased turbidity and decrease in availability of prey would be highly localized and temporary.

7.18 SCUP *(Stenotomus chrysops)*

7.18.1 EFH for Scup

For juveniles, EFH includes: 1) offshore, the demersal waters over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina; and 2) inshore, the estuaries where scup are identified as being common, abundant, or highly abundant in the ELMR database for the "mixing" and "seawater" salinity zones. In general during the summer and spring, juvenile scup are found in estuaries and bays between Virginia and Massachusetts, in association with various sands, mud, mussel and eelgrass bed type substrates and in water temperatures greater than 7.2°C (45^{o} F) and salinities greater than 15 ppt.

For adults, EFH consists of: 1) offshore, the demersal waters over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina; and 2) inshore, the estuaries where scup were identified as being common, abundant, or highly abundant in the ELMR database for the "mixing" and "seawater" salinity zones. Generally, wintering adults (November through April) are usually offshore, south of New York to North Carolina, in waters above 7.2° C (45^{o} F).

7.18.2 Background

Although EFH is not designated for eggs and larvae within the project areas, they can be found inshore from May through September in Virginia in waters between 13 and 23° C (55^{o} and 73^{o} F) and in salinities greater than 15 ppt. Both juveniles and adults are demersal. Juveniles are found in a variety of benthic habitats in offshore waters, as well as inshore estuaries and bays in temperatures greater than 7° C (45^{o} F) and salinities greater than 15 ppt. Adults are found both inshore and offshore of Virginia during warmer months. From November through April, they are found offshore in waters above 7° C (45^{o} F). Scup form schools based on their body size, utilizing a wide range of areas, such as smooth and rocky bottoms, and around piers, rocks, underwater infrastructure, wrecks, and mussel beds, at depths of 2 to 37 meters (6 to 120 feet) (MDFG, 2009). Migration occurs from the coastal waters in the summer to offshore waters in the wintertime (USACE, 2009d).

7.18.3 Project Impacts

The disturbance of bottom sediments associated with dredging could adversely impact scup EFH and interfere with the feeding, predation, avoidance, and migratory movements of scup juvenile and adult pelagic life stages. As a demersal species, there is a possibility that scup may become entrained in the dredge. However, no permanent effects to the species or the shallow water habitat are anticipated. Any adverse impacts, such as increased turbidity and loss of benthic prey would be highly localized and temporary.

7.19 SPANISH MACKEREL *(Scomberomorus maculatus)*

7.19.1 EFH for Spanish Mackerel

EFH for all stages of Spanish mackerel includes sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf Stream shoreward, including *Sargassum*. All coastal inlets and all state-designated nursery habitats are of particular importance to Spanish mackerel. EFH also includes high salinity bays, estuaries, and seagrass habitat. In addition, the Gulf Stream is considered EFH because it provides a mechanism to disperse coastal migratory pelagic larvae. For Spanish mackerel, EFH occurs in the South Atlantic and Mid-Atlantic Bights.

7.19.2 Background

Spanish mackerel eggs are found in open water off the coast of Virginia from April through September. The Spanish mackerel is most commonly found in waters with a temperature above 20° C (68° F) and salinity greater than 30 ppt. The species prefers the waters from the surf zone to shelf break from the Gulf Stream shoreward, especially sandy shoal and reef areas, and can occasionally be found in shallow estuaries and in grass beds. In the open ocean, Spanish mackerel feed on pelagic fish including herring, sardines, mullet, and anchovy; shrimp; crabs; and squid (NOAA, 2009). Spanish mackerel are a fast-swimming, highly migratory species which is found in large schools. They winter in the warm pelagic waters of Florida, moving north along the coast to Virginia waters in April or May.

7.19.3 Project Impacts

Spanish mackerel are a fast moving coastal, pelagic species not associated with bottom habitats. Therefore, dredging operations should not significantly impact Spanish mackerel EFH. Being highly mobile, Spanish mackerel should be able to avoid and/or quickly exit areas impacted by dredging operations. Adverse impacts, such as increased turbidity and absence of prey would be highly localized and temporary.

7.20 SPINY DOGFISH *(Squalus acanthias)*

7.20.1 EFH for Spiny Dogfish

For Adults, EFH includes the following: North of Cape Hatteras, the waters of the Continental shelf from the Gulf of Maine through Cape Hatteras, North Carolina in areas that encompass the highest 90% of all ranked ten-minute squares for the area where adult dogfish were collected in the NEFSC trawl surveys. 2) South of Cape Hatteras, EFH is the waters over the Continental Shelf from Cape Hatteras, North Carolina through Cape Canaveral, Florida, to depths of 450 meters (1476 feet) 3) Inshore, EFH is the "seawater" portions of the estuaries where dogfish are common or abundant on the Atlantic coast, from Passamaquoddy Bay, Maine to Cape Cod Bay, Massachusetts. Generally, adult dogfish are found at depths of 10 to 450 meters (33 to 1476 feet) in water temperatures ranging between 3^{o}F (37°F) and 28^{o}C (82 ^{o}F).

7.20.2 Background

Dogfish are located both inshore and offshore at the Continental Shelf. Although dogfish can be found at the surface and in the water column, they spend most of their time on the bottom. They can also be found inshore and in estuaries. Spiny dogfish primarily prey on a variety of species including herring, mackerel, squid, silver hake, and comb jellies. Flatfishes, polychaetes, marine worms, shrimp, crab, snails, and squid also comprise their diet. Dogfish are seasonally migratory and would most often be found in the project area during the spring and fall. During the summer they are found in waters to the north, and during the winter they migrate south to warmer waters.

7.20.3 Project Impacts

Because dogfish may be present near the offshore shoals, EFH may be adversely affected by dredging operations. Adults are typically found on the sand bottom, so they may temporarily vacate the area during dredging. The disturbance of bottom sediments associated with dredging could interfere with feeding, predation, avoidance, and migratory movements of this species. However, these adverse impacts are expected to be temporary and highly localized, and would be minimized if the dredging occurs in the summer or winter.

7.21 SUMMER FLOUNDER *(Paralicthys dentatus)*

7.21.1 EFH for Summer Flounder

EFH for juveniles consists of: 1) north of Cape Hatteras, the demersal waters over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina; 2) south of Cape Hatteras, the waters over the continental shelf (from the coast out to the limits of the EEZ) to depths of 150 meters (500 feet) from Cape Hatteras, North Carolina, to Cape Canaveral, Florida; and 3) inshore, all of the estuaries where summer flounder were identified as being present (rare, common, abundant, or highly abundant) in the ELMR database for the "mixing" and "seawater" salinity zones. In general, juveniles use several estuarine habitats as nursery areas, including salt marsh creeks, seagrass beds, mudflats, and open bay areas in water temperatures greater than 3° C (37^{o} F) and salinities from 10 to 30 ppt.

For adults, EFH consists of: 1) north of Cape Hatteras, the demersal waters over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina; 2) south of Cape Hatteras, the waters over the continental shelf (from the coast out to the limits of the EEZ) to depths of 150 meters (500 feet) from Cape Hatteras, North Carolina, to Cape Canaveral, Florida; and 3) inshore, the estuaries where summer flounder were identified as being common, abundant, or highly abundant in the ELMR database for the "mixing" and "seawater" salinity zones. Generally summer flounder inhabit shallow coastal and estuarine waters during warmer months and move offshore on the outer continental shelf at depths of 150 meters (500 feet) in colder months.

7.21.2 Background

EFH is defined within the project area for juvenile and adult summer flounder. The geographical range of the summer flounder encompasses the shallow estuarine waters and outer continental shelf from Nova Scotia to Florida. The center of the species abundance lies within the MAB from Cape Cod to Cape Hatteras, North Carolina. Adult and juvenile summer flounder normally inhabit shallow coastal and estuarine water during the warmer months of the year. In Virginia, adult flounder use the Eastern Shore seaside lagoons and lower Chesapeake Bay as summer feeding areas. The fish concentrate in shallow warm water at the upper reaches of the channels and larger tidal creeks on the Eastern shore in April and then move toward the inlets as spring and summer progress. Juveniles apparently utilize a range of substrate types ranging including mud, silt, and submerged aquatic vegetation. Adults seem to prefer sandy habitat in order to avoid predation and conceal themselves from prey. Seasonal temperature shifts appear to drive juveniles and adults in and out of estuary habitats (NOAA, 1999c). Juveniles prey on crustaceans, small pelagic fish and shrimp, and adults feed opportunistically on a variety of fish, crustaceans, squid, and polychaetes.

7.21.3 Project Impacts

Juvenile and adult summer flounder may face minimal impacts from proposed project activities. The project area itself does not appear to offer favorable habitat to this species which seems to prefer estuarine environments. Minor temporary impacts, including disturbance of bottom habitat by dredging operations, may occur as the flounder enter into and exit the favored estuarine environments provided on the eastern shore of Virginia. Also, flounder that remain on the bottom during dredging could be entrained and destroyed.

7.22 SURF CLAM *(Spisula solidissima)*

7.22.1 EFH for Surf Clams

Juveniles and adults are found throughout the substrate, to a depth of 1 meter (3 feet) below the water/sediment interface, within Federal waters throughout the Atlantic Exclusive Economic Zone (EEZ), which is the area that extends 200 nautical miles from the United States coastline. Surf clams were found in areas that encompass the top 90% of all the ranked 10-minute squares in the Northeast Fisheries Science Center (NEFSC) surf clam and ocean quahog dredge surveys. The species generally occurs from the beach zone to a depth of about 61 meters (200 feet), but beyond about 38 meters (125 feet) abundance is low.

7.22.2 Background

The surf clam is a bivalve mollusk which prefers substrates of fine to medium grained sand, in waters with salinities above 14 parts per thousand (ppt) (NJMSC, 2009). The clam rarely moves locations unless it becomes uncovered, it filter-feeds on plankton in its immediate area. Surf clams reproduce by releasing eggs and sperm directly into the water column; in Virginia waters this occurs from May to July (Cargnelli et al., 1999). Larvae are planktonic for approximately three weeks, at which time they grow a hard shell and settle to the bottom (NEFSC, 2006).

7.22.3 Project Impacts

Unnamed Shoals A and B fall within the area designated as EFH for the juvenile and adult surf clam. The dredging of these offshore sand shoals is expected to cause temporary adverse effects to this non-motile organism. Entrainment in the dredger would destroy surf clams in the areas of the shoals where sand is dredged, but the population would have the ability to rebound from undisturbed adjacent areas. Studies conducted from 2002 to 2005 by the Virginia Institute of Marine Science (VIMS) examined the effects of dredging to the benthic community in offshore sand shoals. The study suggests that benthic invertebrate communities destroyed by the dredger are able to rebound within a few years (Diaz et al., 2004). Dredging would also cause an increase in turbidity, which may temporarily impair the ability of the clams to feed by filtering plankton from the water. Surf clam predators would have a shortage of prey in the dredged shoal area until the population recovered.

7.23 TIGER SHARK *(Galeocerdo cuvieri)*

7.23.1 EFH for Tiger Shark

For tiger shark larvae (referred to as “neonates”), EFH extends from shallow coastal areas to the 200 m isobath in Cape Canaveral, Florida, north to offshore Montauk, Long Island, NY (south of Rhode Island); and from offshore southwest of Cedar Key, FL north to the Florida/Alabama border from shallow coastal areas to the 50 m isobath.

7.23.2 Background

The tiger shark is found in turbid coastal and pelagic waters of the Continental shelf, at depths of up to 350 meters (1,148 feet), although the shark has a tolerance for a wide variety of marine habitats (MBS, 2009). Tiger sharks have been found in estuaries and inshore as well. Prey items for the tiger shark include fish, crustaceans, mollusks, and plankton. Little is known about the nursery areas for tiger sharks, though they are believed to occur in offshore areas (NMFS, 2006b). Females are thought to produce a litter of pups every other year.

7.23.3 Project Impacts

Although it is possible that there may be tiger sharks in the project area, it is unlikely that they would experience significant adverse effects. A highly mobile species, the shark would be able to temporarily leave disturbed areas while dredging and placement of sand on the shoreline is occurring. Because of the shark’s highly varied diet, the activities of the proposed action are not expected to cause difficulties in finding prey. Only short-term localized impacts on the tiger shark are anticipated.

7.24 WINDOWPANE FLOUNDER (*Scopthalmus aquosus*)

7.24.1 EFH for Windowpane Flounder

For eggs and larvae, EFH consists of pelagic waters around the perimeter of the Gulf of Maine, on Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. Generally, windowpane flounder larvae are found at sea surface temperatures less than 20° C (68° F) and water depths less than 70 meters (230 feet). Larvae are often present from February to November with peaks in May and October in the middle Atlantic and July through August on Georges Bank.

EFH for juveniles is bottom habitat with a substrate of mud or fine-grained sand, around the perimeter of the Gulf of Maine, on Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. Generally, windowpane flounder juveniles are found at water temperatures below 25° C (77° F), at depths from 1 to 100 meters (3 to 328 feet), and salinities between 5.5 to 36 ppt.

EFH for adults is comprised of bottom habitats with a substrate of mud or fine-grained sand around the perimeter of the Gulf of Maine, on Georges Bank, southern New England and the middle Atlantic south to the Virginia-North Carolina border. Generally, windowpane flounder adults are found in water temperatures below 26.8° C (80° F), depths from 1 to 75 meters (3 to 246 feet), and salinities between 5.5 to 36 ppt.

EFH for spawning adults is bottom habitats comprised of mud or fine-grained sand in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to the Virginia-North Carolina border. Spawning windowpane flounder are found in water temperatures below 21° C (70° F), depths from 1 to 75 meters (3 to 246 feet), and salinities between 5.5 to 36 ppt. Windowpane flounder are most often observed spawning during the months February to December with a peak in May in the middle Atlantic.

7.24.2 Background

Windowpane flounder inhabit estuaries, nearshore waters, and the continental shelf of the middle Atlantic. The species is demersal and prefers substrates of sand or mud. Juveniles that settle in shallow inshore waters move to deeper waters as they grow, migrating to nearshore or estuarine habitats in the southern MAB in the autumn. Juvenile and adult windowpane feed on small crustaceans and various fish larvae.

7.24.3 Project Impacts

There may be some limited adverse impacts to windowpane flounder, particularly juveniles and adults due to their presence year-round (slightly less in the warmest summer months) in bottom habitats like the type present at the dredging sites. The disturbance of benthic sediments organisms caused by dredging operations would likely cause a temporary, localized reduction in prey species.

7.25 WINTER FLOUNDER *(Pleuronectes americanus)*

7.25.1 EFH for Winter Flounder

For eggs, EFH consists of bottom habitats with a substrate of sand, muddy sand, mud, and gravel on Georges Bank, the inshore areas of the Gulf of Maine, southern New England, and the middle Atlantic south to the Delaware Bay. Generally, winter flounder eggs are found in water temperatures less than 10° C (50° F), salinities from 10 to 30 ppt, and water depths of less than 5 meters (16 feet). On Georges Bank, winter flounder eggs are generally found in water less than 8° C (46° F) and less than 90 meters (295 feet) deep. Winter flounder eggs are often observed from February to June with a peak in April on Georges Bank.

For larvae, EFH consists of pelagic and bottom waters of Georges Bank, the inshore areas of the Gulf of Maine, southern New England, and the middle Atlantic south to the Delaware Bay. Generally, winter flounder larvae are found in sea surface temperatures less than 15° C (59° F), salinities from 4 to 30 ppt, and water depths of less than 6 meters (20 feet). On Georges Bank, winter flounder larvae are generally found in water less than 8° C (46° F) and less than 90 meters (295 feet) deep. Winter flounder larvae are often observed from March to July with peaks in April and May on Georges Bank.

For juveniles, EFH is bottom habitats with a substrate of mud or fine grained sand on Georges Bank, the inshore areas of the Gulf of Maine, southern New England and the middle Atlantic south to the Delaware Bay. Generally, winter flounder juveniles are found in water temperatures below 28°C (82° F), depths from 0.1 to 10 meters, and salinities from 5 to 33 ppt. Juveniles over one year old prefer water temperatures below 25°C (77° F), depths from 1 to 50 meters (3 to 164 feet), and salinities between 10 and 30 ppt.

For adults, EFH includes bottom habitats including estuaries with a substrate of mud, sand, and gravel on Georges Bank, the inshore areas of the Gulf of Maine, southern New England and the middle Atlantic south to the Delaware Bay. Generally, winter flounder adults are found in water temperatures below 25° C (77° F), at depths from 1 to 100 meters (3 to 328 feet), and salinities between 15 and 33 ppt.

EFH for spawning adults consists of bottom habitats, including estuaries with a substrate of sand, muddy sand, mud, and gravel on Georges Bank, the inshore areas of the Gulf of Maine, southern New England and the middle Atlantic south to the Delaware Bay. Spawning adults are found at water temperatures below 15° C (59° F), depths of less than 6 meters (20 feet), except on Georges Bank where they spawn as deep as 80 meters (262 feet), and salinities between 5.5 and 36 ppt. Winter flounder spawn from February through June.

7.25.2 Background

Winter flounder eggs are found inshore on sandy bottoms and algal mats. Approximately six weeks after hatching, larvae become demersal and their left eye migrates to the right side of their body. The coloring of the winter flounder includes shades of light sandy brown, enabling the fish to blend in with the substrate. Juveniles inhabit these inshore areas with sand or sand-silt substrates until they reach one year of age. Adults are found in offshore waters during the warm summer months, where they feed on shrimp, clams, worms, and other invertebrates. Winter flounder feed during the day due to its dependence on eyesight to locate prey. During the winter, adults migrate to inshore coastal areas with sandy, clay, and gravel bottoms. The flounder buries itself so that only the eyes are above the substrate. Winter flounder spawn from winter through springtime in shallow inshore waters, usually at the same location each year.

7.25.3 Project Impacts

Winter flounder are demersal and can be found on sandy bottoms similar to those found in the project area, and as a result EFH is likely to be adversely affected by the proposed project. The juveniles and adults are found at lower salinities, which are mostly found in the MAB in the spring. However, because the majority of winter flounder populations at all stages are found north of the Delaware Bay, impacts should be negligible. If any adult or juvenile flounder are present at the dredging sites, they would likely vacate the area when dredging begins, however, juveniles may be more vulnerable because of slower swimming speeds.

7.26 WINTER SKATE *(Leucoraja ocellata)*

7.26.1 EFH for Winter Skate

For juveniles, EFH consists of bottom substrates of sand and gravel or mud in Cape Cod Bay, on Georges Bank, the southern New England shelf, and through the Mid-Atlantic Bight to North Carolina. Winter skate juveniles are generally found at a depth range from shoreline to about 400 meters (1,312 feet) and are most abundant at depths less than 111 meters (364 feet). Preferred temperatures are from -1.2° to 21° C (30° to 70° F), with most found in water with temperatures ranging from 4° to 16 °C (39° to 61° F), depending on the season.

For adults, EFH includes bottom substrates of sand and gravel or mud in Cape Cod Bay, on Georges Bank, the southern New England shelf, and through the Mid-Atlantic Bight to North

Carolina. Winter skate adults are generally found at a depth range from shoreline to 371 meters and are most abundant at depths of 111 meters. Preferred temperatures are from –1.2° to 20° C (30° to 70° F), with most found in water with temperatures ranging from 5° to 15° C (41° to 59° F), depending on the season.

7.26.2 Background

The winter skate is found all along the western Atlantic, from Newfoundland to North Carolina. In the cooler winter months, the winter skate comes closer to shore. Winter skates prefer sandy and gravelly bottoms but may also be found in mud substrates. The skate lies on the ocean floor covered by a layer of sand during the day, and at night preys upon crabs, worms, squid, shrimp, clams, and occasionally small fish. Winter skates are oviparous. Although there is no defined reproductive season, skate reproduction peaks during the summer months. Each female produces approximately 40 egg cases per year, each containing one embryo. The egg cases are released by the female in offshore waters on rock bottom habitats.

7.26.3 Project Impacts

The disturbance of bottom habitat by dredging could negatively impact skate EFH. Skates are known bury themselves in sea floor depressions during daylight hours. Additionally, turbidity could interfere with feeding, predation, and avoidance patterns (NOAA, 2003a). It is expected that these adverse impacts, however, would be temporary and highly localized.

7.27 WITCH FLOUNDER *(Glyptocephalus cynoglossus)*

7.27.1 EFH for Witch Flounder

EFH for eggs consists of surface waters of the Gulf of Maine, Georges Bank, the continental shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Witch flounder eggs are generally found at sea surface temperatures below 13° C (55° F) over deep water with high salinities. Eggs are most often observed during March through October.

7.27.2 Background

Witch flounder eggs are spawned from March through October, with May and June as the peak months. Eggs are spawned close to the bottom of deep pelagic waters, but they rise to the top of the water column where they develop and hatch. Eggs and larvae are found in waters with a temperature between 4° to 13° C (40° to 55° F). After metamorphosis, juveniles become demersal and generally remain in waters from 30 to 150 meters (98 to 492 feet), including the continental slope off Virginia (NOAA, 1999a).

7.27.3 Project Impacts

Within the project areas, EFH is not designated for larvae, juveniles, or adult witch flounder. No adverse effects to witch flounder eggs are anticipated because eggs are primarily found in areas to the north of the project area in waters of greater depths than those in the project area.

SECTION EIGHT: CUMULATIVE IMPACTS

The SRIPP Project Area includes sand shoals, sand bottom, and water column that may be utilized by managed fish and their prey. The Proposed Action would impact both offshore sand shoals and the nearshore waters adjacent to the Wallops Island shoreline.

Summary of Project Impacts

The dredging of sand from the offshore sand shoals would have a significant and immediate adverse impact on the local benthic community of the shoal. The primary direct effect would be the removal of sand and entrainment of the infauna and epifauna that reside within and on the sediment, including the managed surf clam. The anchors and anchor sweeps from the nearshore pump-out station would also have an adverse impact on the local benthic community. However, it is expected that there would be a negligible impact on the regional benthic ecosystem from these activities because: (1) the benthic assemblages on the sand shoals and the flat bottom nearshore area are not unique and are similar to assemblages in adjacent areas and (2) the spatial extent of the dredging and pump-out area is small compared to the broad area of the nearshore continental shelf. Studies conducted from 2002 to 2005 by the Virginia Institute of Marine Science (VIMS) examined the effects of dredging to the benthic community in offshore sand shoals. The study suggests that benthic invertebrate communities destroyed by the dredge are able to rebound within a period of a few years (Diaz et al., 2004).

The hopper dredge would cause an increase in turbidity which could temporarily disturb the ability of surf clams and other mollusks to feed by filtering plankton from the water; however, this effect would be temporary. In the nearshore area of Wallops Island, the placement of sand for beach nourishment can cause a smothering effect, likely to result in the loss of some immobile benthic species. The amount of individuals lost would depend on factors such as the size of the area to be dredged, the amount of sand removed, and the time of year that the beach nourishment takes place. The loss of these benthic invertebrates would create a loss of prey for local wildlife, including some managed fish species, but the effect will be localized and temporary.

Finfish inhabiting the sand bottom and shoals, such as black sea bass, summer flounder, windowpane flounder, winter flounder, and witch flounder would temporarily exit the disturbed area upon commencement of dredging, and would return shortly after dredging operations cease. It is likely that a small number of these fish will become entrained in the dredging equipment. The juvenile and adult bony finfish found in the water column are highly motile and will also likely exit the area during dredging, although a number of these fish may still become entrained in the dredger or ship propellers. Eggs and larvae are the life stages that are most likely to be affected by the temporary increase in turbidity and decrease in dissolved oxygen caused by dredging. These stages are more delicate and are unable to flee the area like juveniles and adults, and therefore will be more greatly impacted.

Cartilaginous finfish found within the project area, like the clearnose skate, spiny dogfish, sand tiger shark, sandbar shark, dusky shark, and the Atlantic angel shark are seasonally migratory, moving southward along the Atlantic Coast in search of warmer waters during the winter. They are usually found alone or in pairs when not migrating, so it is unlikely that there would be any concentrations of these species in the project area, especially in the wintertime. While pups and small juveniles are primarily found inshore in estuaries and in shallow coastal waters, adults can more readily be found offshore on the sand bottom, shoals, and occasionally in the water column. If the managed species were in the disturbed area upon commencement of dredging, they would migrate to another area and would likely return shortly after dredging operations cease. It is possible, though highly unlikely, that one of the managed skates or sharks would become entrained in the dredging equipment. This is due to their sparse numbers in any one area at a given time, and their ability to avoid the dredge.

Indirect impacts to managed fish species include diminished availability of bottom-dwelling food sources such as crustaceans and other invertebrates. A number of benthic prey species found on the shoals and sand bottom, such as crustaceans and worms, would be destroyed during dredging. Sedimentation at the shoals and burial during the beach nourishment on Wallops Island shoreline would likely smother a number of benthic species. This is expected to cause only a temporary reduction in prey, as the area is expected to become repopulated by benthic organisms from neighboring areas within approximately two years (Diaz et al., 2004). Increased turbidity and decreased dissolved oxygen are expected in the water column in both the dredging area and directly offshore of Wallops Island when sand is placed on the shoreline (MMS, 2006). The increased turbidity may temporarily clog the gills of fish, preventing them from extracting oxygen from the water and interfering with feeding ability. It can also slow egg growth and impair the survival of larvae (Gordon et al., 1972). However, any adverse effects due to increased turbidity and decreased dissolved oxygen in the water column would be minor and short-term.

This turbidity may temporarily cause difficulty in locating prey, but this would not cause adverse effects to any species in the area, as they can easily migrate to another area to feed. The dredging for the initial beach nourishment would be limited to an area of Unnamed Shoal A which is approximately 520 hectares (1,280 acres), so prey would still be accessible at the nearby Unnamed Shoal B (would not be considered for dredging until the first renourishment cycle approximately 5 years after initial beach fill), Blackfish Bank Shoal, and Chincoteague Shoals. These nearby shoals may experience increases impacts such as increases in turbidity and sedimentation, but it is anticipated to be temporary and minor.

While it is likely that there may be a number of individuals of managed species destroyed during both the dredging of the offshore shoals and the beach nourishment activities, the overall populations are not expected to be adversely affected in the long-term. Several environmental studies of beach nourishment indicate that there are no detrimental long-term changes in the beach fauna as a result of beach nourishment (USACE, 1992; Burlas *et al.*, 2001). The greatest influencing factor on beach fauna populations appears to be the composition of the placed material not the introduction of additional material onto the beach. The deposited sediments, when similar in composition (grain size and other physical characteristics) to existing beach material (whether indigenous or introduced by an earlier nourishment or construction event), do not appear to have the potential to result in long term impacts on the numbers of species or community composition of beach infauna (USACE, 1994, Burlas *et al.*, 2001).

Summary of Impacts on Offshore Shoals

Dredging activities would result in changes to the bathymetry of the selected offshore borrow site. The crest of Unnamed Shoal A is approximately 8 meters (25 ft) below msl with the adjacent troughs approximately 20 meters (70 ft) below msl. The crest of Unnamed Shoal B is approximately 9 meters (30 feet) deep. Dredging would be conducted in a manner to remove a uniform thickness of material from the chosen borrow area, and would deepen the shoal area by approximately 0.3 to 1.5 meters (1 to 5 feet) for both the initial nourishment and for each renourishment cycle. The shoal's general profile would be maintained, though at a lower elevation than pre-project conditions.

Within the borrow area, dredging may create a series of parallel furrows in the shoal surface up to several feet deep along the length of the dredged area. Based on the final dredging design, dredging may occur once in a given area of a shoal or multiple times.

The area impacted within the borrow site during a typical renourishment event would depend on the volume of sand needed and the thickness of material dredged, but is anticipated to be a significant change in bathymetry for each borrow cycle.

Dredging would remove a significant amount of sand from the shoal and shoal complex; approximately 30 percent of the total volume of Unnamed Shoal A and approximately 15 percent of the total volume of Unnamed Shoal B.

In addition, the bottom substrate at and near either of the borrow sites may be modified in several ways. A change in the hydrological regime as a consequence of altered bathymetry may result in a change of depositional patterns at the site and therefore a change in sediment grain size. Exposure of underlying sedimentary units may also change the depositional patterns by exposing material that has different textural and compositional properties than the existing bottom substrate.

Bottom substrate at a distance from the borrow site may also be modified by the deposition of fine-grained sediments in benthic and surface plumes generated by dredging activities. Sediments contained within plumes produced from the disturbance and resuspension of bottom sediments (benthic plume), and from discharges of the dredging vessel and equipment (surface plume), would settle out from the water column and be deposited at a distance from the dredge site. The deposition of resuspended sediments may result in a layer of sediment that differs from the existing substrate.

The approximate area that would be impacted throughout the 50-year project lifespan is presented in Table 2 below.

Table 2: Offshore Borrow Site Impacts

Borrow Area	Area Impacted by SRIPP[1]	Estimated Total Shoal Volume	Maximum Volume That Could Be Removed Over SRIPP Lifetime
Unnamed Shoal A	520 hectares (1,280 acres)	30 million m^3 (40 million yd^3)	9,990,000 m^3 (13,066,250)
Unnamed Shoal B	520 hectares (1,280 acres)	57 million m^3 (70 million yd^3)	6,932,500 m^3 (9,067,245)

[1]The total area that is proposed to be dredged. Assuming a trailer suction hopper dredge would remove approximately 0.3 meters (1 foot) of sediment during a single pass, the dredge would make approximately 2.3 passes over the entire 520 hectare (1,280 area) on each shoal to obtain the required volume of sediment.

Other Impacts to EFH

Impacts to EFH come from a wide variety of sources, including dredging, pollution, commercial and recreational fishing, disease, weather events, and climate change.

Chincoteague Inlet, which is immediately to the north of Wallops Island, has been periodically dredged by The USACE Norfolk District since the mid-1990s, placing the material in the offshore disposal site that is approximately 4,000 feet offshore of Wallops Island. The disposal site has an area of 300 meters (1,000 feet) by 900 meters (3,000 feet). This activity likely causes similar temporary impacts to turbidity and EFH species and habitat as the SRIPP Proposed Action. Commercial fishing, including activities like surf clam dredging, trawling, and anchoring, directly impact habitats utilized by EFH species. Impacts from non-point source pollution from nearby agriculture and stormwater runoff can deposit chemicals in the estuaries and out to the ocean, sometimes inhibiting the growth or survival of EFH species. Natural events can also impact EFH species. Hurricanes and nor'easters can increase turbidity and destroy benthic habitat used by EFH species and associated species. This can result in detrimental indirect impacts to fish through changes in the food web. The magnitudes of these impacts range greatly depending on their intensity. Generally the effects of these events are only temporary (USACE, 2009).

The proposed action, when considered along with known or anticipated projects, would result in temporary adverse impacts to EFH within the region.

SECTION NINE: MITIGATION MEASURES

Every possible measure would be considered to avoid and minimize effects on EFH and managed species. Minimization has included extensive consultation with Federal and state agencies and sampling to select borrow sites with sand of appropriate grain size. In correspondence from NMFS to NASA dated June 18, 2009, methods to conserve the geomorphic features of the shoals were suggested (Attachment B). This can be achieved through two methods: 1) minimizing the total amount of sand removed from the shoals over the 50-year life of the project, and 2) controlling the methods used for hopper dredging borrow from the shoals. The mitigation techniques suggested by NMFS (2009) will be evaluated for technical and economic viability and utilized to the fullest extent possible. Per NMFS' suggestion, NASA would consider native dune plantings to attempt to decrease the amount of sand required for beach nourishment in the future.

The main biological impacts from the Proposed Action would occur to the benthos and benthic habitats and potentially to commercial fisheries, marine mammals, and sea turtles. Measures to reduce impacts to sea turtles and marine mammals would be adapted to reduce the adverse effects to EFH species and habitats in the project area. The following mitigation measures have been identified:

1. Implement best engineering and management practices.
2. Complete a hydrographic survey before and after dredging which covers each area of the shoals where dredging would take place.
3. Coordinate with NMFS to develop a long-term strategy and dredging management plan for future re-nourishment cycles which identifies rotation criteria and schedule for specific shoal use.

The shoals are not expected to accrete additional sediment once sediment is dredged. However, care would be taken during dredging to maintain the morphology of the shoals, and the benthic community is expected begin recolonization shortly after dredging ends and would be expected to recover to background or predredge conditions within 1 to 5 years (MMS, 2001). One or more mitigation techniques could be utilized to decrease the impacts to EFH, such as 1) minimizing the amount of sand dredged; 2) maintaining shoal morphology; and 3) leaving undisturbed sections of benthic habitat within the designated dredged area(s) to facilitate benthic recolonization and recovery. Use of these techniques would in turn decrease adverse effects to pelagic fish, prey species, and EFH (NMFS, 2009).

The timing of dredging will also be an important factor in determining the eventual recovery of the dredged area because many benthic species have distinct reproductive and recruitment periods (Diaz et al., 2004). Recolonization of the dredged area would be primarily from larval recruitment from the water column as well as adult immigration from undisturbed adjacent areas.

Another source of adverse impacts to fish and other marine life during dredging operations is entrainment. The centrifugal force of the pump, located behind the intake pipe of the drag head, draws fish and other marine life into the pipe. Fish may be killed by the pump and then pulled into the hopper. It is believed that entrainment primarily takes place when the drag head is operating on bottom sediments. Affected fish are usually feeding or resting near the bottom at the time the drag head moves along the bottom. In some rare instances, suction may be created when currents flow around the drag head as it is placed or moved.

SECTION TEN: CONCLUSION AND AGENCY VIEW

NASA is proposing to engage in a shoreline restoration program at WFF that involves the use of one or more offshore borrow sites for initial beach nourishment, as well as for future renourishment cycles. In addition, the existing seawall would be extended. This project would result in some unavoidable adverse impacts to habitats designated as EFH for several federally managed species and their prey. This includes disturbance to the dredged area which is comprised of unvegetated, unconsolidated sand bottom, temporary degradation of the marine water column due to an increase in suspended sediment concentrations, and placement of beach fill and burial of benthic prey species. However, all adverse impacts on managed species, associated species, and EFH are expected to be temporary and localized. With the careful use of mitigation measures and BMPs during project implementation, these effects are not anticipated to have substantial, long-term adverse impacts on EFH. Accordingly, NASA has determined that the proposed SRIPP would have “site-specific adverse effects on EFH” but the impacts would not be significant within a regional context.

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Personal Communication

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ATTACHMENT A

NMFS EFH CONSERVATION RECOMMENDATION MEMORANDUM

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

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FAX TRANSMITTAL

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LOCATION: NASA, NEPA Program

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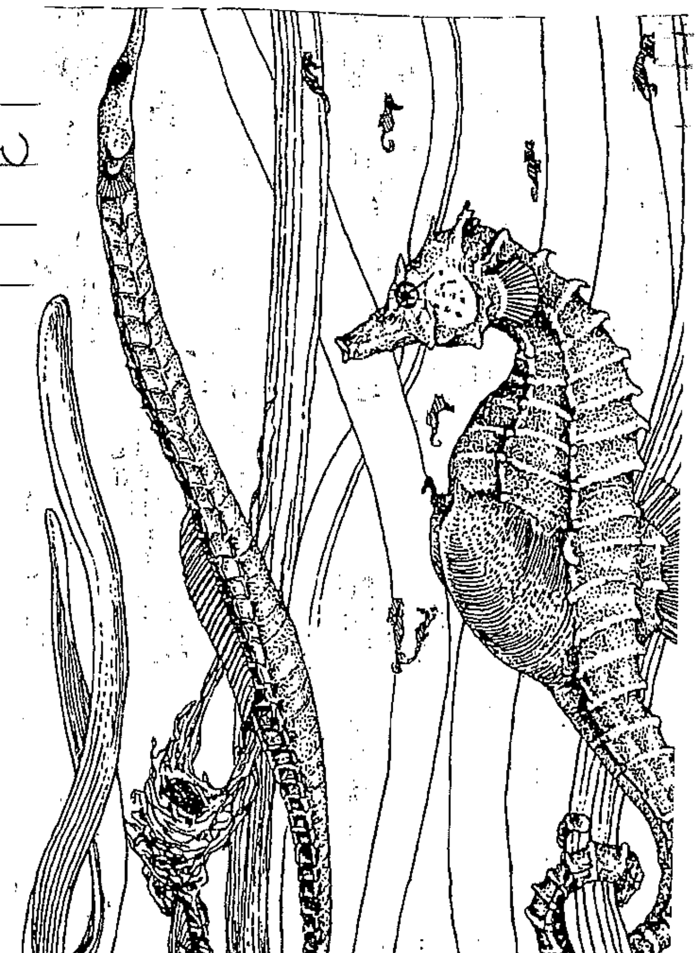
FROM: John Nichols

Number of Pages (3), Including Transmittal



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Habitat Conservation Division
Chesapeake Bay Program Office
410 Severn Ave , Suite 107A
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May 14, 2007

MEMORANDUM TO: Joshua A Bundick
NEPA Program Manager
National Aeronautics and Space Administration
Goddard Space Flight Center, Wallops Flight Facility
Wallops Island, VA 2337-5099

FROM: John S. Nichols
Fishery Biologist

SUBJECT: Shoreline Restoration & Infrastructure Protection Program

This pertains to your request for Essential Fish Habitat (EFH) consultation, dated April 9, 2007, for the proposed Shoreline Restoration and Infrastructure Protection Program at the NASA Wallops Flight Facility on Wallops Island, Virginia. We have reviewed your EFH Assessment for this proposal, and in accordance with Section 305(b)(4)(A) of the Magnuson-Stevens Fishery Conservation & Management Act, we offer the following comments and EFH Conservation Recommendations.

Your Assessment, although detailed and well prepared, should have more thoroughly addressed long-term and cumulative impacts to coastal bottom habitat off Wallops Island from this proposal. Our concerns relate primarily to proposed offshore borrow activities, which would provide a short-term and/or long-term source of sand material for nourishing the facilities' shoreline. Although no estimates were provided on borrow volumes, sand requirements for nourishing 22,309 linear feet of shoreline will likely be significant (i.e., millions of cubic yards of material), particularly if the beach fill only option is selected, and would require borrow from off-shore sites in perpetuity. Such long-term borrow activities have the potential to significantly alter the bottom topography off Wallops Island.

Coastal waters off mid-Atlantic barrier islands possess bottom features, such as sand knolls, which are important to many of the managed species covered in your EFH Assessment. In particular, coastal migratory species, such as cobia, king mackerel, Spanish mackerel, and various sharks make use of coastal topographic bottom features for migratory orientation. The presence of sand knolls has also diversified coastal bottom habitat, forming troughs between the knolls with finer-grained sediments and rich benthic communities, which provide forage for migratory fish. Sand knolls are geologically ancient formations, and once removed (i.e., by borrow actions), will not reform. The proposed borrow activities should, therefore, be designed to conserve ecologically important topographic features that may exist in proposed borrow areas off Wallops Island.

In order for NMFS to fully evaluate the impacts of this proposal on EFH, more detailed information is needed on proposed borrow areas (e.g., Sectors 1-3) We offer the following EFH Conservation Recommendations pertaining to the borrow requirement issue.

1) The forthcoming Programmatic Environmental Assessment (PEA) should provide more detailed information on the physiography of preferred borrow site(s) for this project. Much of this information should focus on the following physical parameters.
   a. Bathymetry, and topographic bottom features
   b. Substrate, including predominant surficial substrates, and sedimentary profiles showing areas of preferred substrate, depths to which preferred substrates extend, and substrates underlying layers of preferred material.

2) Your agency should identify measures that will be used to minimize adverse changes to the topography of borrow site(s) selected for this project. Such measures may include avoidance of areas with unique topographic bottom features (e g., sand knolls), and/or use of borrow methods that conserve such bottom features; and, post-borrow monitoring to determine the effectiveness of conservation-based borrow methods.

3) The PEA should identify and describe recreational and commercial (trawling, gill-netting) fishing activities that occur in proposed borrow areas. It is preferred that important fishing grounds be avoided for borrow, to conserve existing bottom features that may be responsible for sustaining fisheries in those areas.

4) Chincoteague Bay is a highly important nursery for larval and juvenile summer flounder Following offshore spawning by adults, planktonic larval flounder move inshore and into Chincoteague Bay through the Chincoteague Inlet, from mid-autumn into spring. Many larvae metamorphose, move to the bottom, and over-winter in coastal waters prior to entering Chincoteague Bay as juveniles. Consequently, coastal bottom off Wallops Island, including Borrow Sectors 1-3, may be important to over-wintering and migratory activities of early stage flounder. The PEA should consider alternative borrow sites, and borrow measures for minimizing impacts on larval and juvenile summer flounder. We suggest consulting with Virginia Institute of Marine Science fisheries staff regarding local flounder ecology, and areas off Wallops Island where, and/or seasonal periods when borrow activities should be avoided.

5) The PEA should address the cumulative impacts of the proposed borrow action on fish and fisheries within mid-Atlantic coastal waters

We also have provided the following EFH Conservation Recommendations regarding other project issues.

6) NMFS prefers options that include the use of sand-retention structures to reduce the long-term need for offshore borrow.

7) Stone is the preferred material for constructing sand-retention structures. Geo-textile fabric tubes do not possess the resilience for protecting high-energy shorelines, such as along Wallops Island, for short or long-term duration.

8) NMFS strongly recommends against Alternative 2/Option 4 (i.e , building a levee around the entire island), which would result in significant long-term and cumulative impacts to marine and estuarine fauna, and their essential habitats

9) Cross-sectional profiles should be provided in the PEA reflecting the extent of channelward encroachment of preferred nourishment options, and in relation to MHW and MLW

Protected Resources

Any questions or new information pertaining to the on-going Endangered Species Act Section 7 Consultation for this proposal should be directed to Julie Crocker of our Protected Resources Division, Gloucester, MA; Julie.Crocker@NOAA.GOV, (978) 281-9328, ext. 6530.

ATTACHMENT B

NMFS SUPPLEMENT TO EFH CONSERVATION MEMORANDUM

JAB 6/22/09

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Region
Habitat Conservation Division
410 Severn Avenue, Suite 107A
Annapolis, MD 21403
Commercial Phone: (410) 267-5675
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FAX TRANSMITTAL

TO: Josh Bundick

LOCATION: NEPA Manager

NUMBER: (757) 824-2319

FROM: John Nichols

Number of Pages (5), Including Transmittal

Sorry about the tardiness of this response, but hope it is helpful in preparing the EIS

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Habitat Conservation Division
Chesapeake Bay Program Office
410 Severn Ave., Suite 107A
Annapolis, Maryland 21403

June 18, 2009

MEMORANDUM TO: Joshua A. Bundick
NEPA Program Manager
National Aeronautics and Space Administration
Goddard Space Flight Center, Wallops Flight Facility
Wallops Island, VA 2337-5099

FROM: John S. Nichols JSN

SUBJECT: Shoreline Restoration & Infrastructure Protection Program

National Marine Fisheries Service (NMFS) has reviewed the Description of the Proposed Action and Alternatives, dated March 2009, proceeding release of the Environmental Impacts Statement (EIS; in preparation) for the Shoreline Restoration and Infrastructure Protection Program at the NASA Wallops Island Flight Facility in Virginia.

NMFS provided Essential Fish Habitat (EFH) Conservation Recommendations in a May 14, 2007 memorandum, in response to your EFH Assessment for this proposal, dated April 17, 2007. Subsequent to the earlier consultation, this proposal has changed substantially, with identification of a preferred alternative (Alternative 1), and identification of two offshore sand borrow sites. Furthermore, more than two years have passed since submittal of the earlier EFH Assessment. We are, therefore, recommending that NASA re-initiate EFH Consultation, and provide NMFS with an appended EFH assessment, with revised description of project alternatives, and detailed analyses of potential impacts of each alternative on managed species and their EFH. The supplemental EFH assessment can be incorporated into the forthcoming EIS, provided it is clearly identified in a distinct section of the EIS. NMFS will provide final comments on this project following review of the EIS and supplemental EFH assessment.

We offer the following comments to supplement to our earlier conservation recommendations, and to assist you in preparation of the forthcoming EIS.

CONSERVATION OF OFFHSORE SHOALS

Offshore sand shoals, such as Blackfish Bank and the unnamed shoal proposed as borrow sites for this project, are irreplaceable geologic features of the near shore continental shelf. Shoals are dynamic features, which diversify the sea floor, producing a variety of substrate types and foraging opportunities for finfish and epibenthic fauna. Shoals serve as congregating areas for finfish, and provide guiding features for coastal migratory species. Consequently, the most important issue to NMFS in the review of this proposal is to ensure that proposed borrow actions do not result in direct adverse changes to the geomorphic characters of the shoals from which material will be removed, nor secondary changes to surrounding habitats.

There are two avenues that can be followed for developing measures to conserve geomorphic features of Blackfish Bank and the unnamed shoal; 1) minimizing the total amount of borrow removed from these shoals over the 50-year life of the project; and, 2) controlling the methods used for hopper dredging borrow from these shoals. Various options for conserving the offshore shoals are discussed below, with inclusion of verbal comments NMFS provided during the November 20, 2008 Stakeholder Meeting.

We recommend that your agency consult with the U.S. Army Corps of Engineers, Baltimore District, Planning Division (e.g., Chris Spaur, (410) 962-6134, or Christopher.C.Spaur@usace.army.mil) for information on hopper dredge sand borrow and post-borrow monitoring methods used on Great Gull Bank, an offshore shoal off the Maryland coast, specifically discussed the following document:

U.S. Army Corps of Engineers, Baltimore District. May 2007. Atlantic Coast of Maryland Shoreline Protection Project. Supplemental Environmental Impact Statement, General Reevaluation Study for Borrow Sources for 2010 – 2044.

We also recommend that your agency consult with Minerals Management Service to obtain a copy of the following document, in preparation, regarding physical environment investigations and modeling of the continental shelf off Maryland for dealing with borrow activities.

CSA International, Inc., Applied Coastal Research & Engineering, Inc., Barry A. Vittor & Associates, Inc., C.F. Bean, L.L.C., and Florida Institute of Technology. 2009. Analysis of Potential Biological and Physical Impacts of Dredging on Offshore Ridge and Shoal Features. *Prepared for:* U.S. Department of the Interior, Minerals Management Service, Leasing Division, Marine Minerals Branch, Herndon, VA. OCS Study MMS 2009.

Minimizing Total Borrow From Offshore Shoals

The greater the proportion of material removed from any given offshore shoal, the more likely that the shoal's long-term geomorphic integrity will be threatened. Any approach for removing sand from the subject shoals should be conservative in amount, and apportioned relative to their ability to maintain their existing geomorphic features.

To lessen impacts on the offshore shoals, the amount of material required over the 50-year life of this project can be minimized by constructing sand retention structures along the target shoreline. Alternative 1 would include a terminal groin to partially limit sand movement to the south. However, your agency should also closely investigate Alternative 2, which includes detached offshore breakwaters. Similar to the terminal groin, offshore breakwaters can be designed to permit continued movement of sand to shorelines south of the project area. More importantly, breakwaters assist in retaining material on the beach, and in minimizing seaward movement of beach sand during storms, where it can more easily enter the southerly long shore drift system and be lost to the project shoreline. The sand retention capability of Alternatives 1 & 2 should be modeled and compared to determine which would result in the lowest nourishment requirement of the target shoreline over the life of this project.

NMFS also recommends vegetative planting of nourishment material as a supplemental retention measure. Beach grass (*Ammophila*), and saltmeadow cordgrass (*Spartina patens*) are species frequently used for stabilizing beach nourishment areas. Plantings should be repeated, as necessary, to repair beach damaged by storm action.

Borrow impacts to the offshore shoals can also be lessened by using alternative near shore sand sources for nourishing the target beach. As part of the Long Term Assateague Island Restoration Project near Ocean City, Maryland, near shore shoals are periodically harvested using a small shallow-draft hopper dredge (the "Currituck"), to supplement borrow taken from offshore shoals. Material dredged from maintenance of the Chincoteague Inlet Federal Project, or borrow from near shore shoals such as Fishing Point, should be investigated as supplemental sand sources for this project. Structural and vegetative beach sand retention measures would add stability to finer-grain sand taken from near shore sources to nourish the target shoreline.

Controlling Hopper Dredging Sand Harvest Methods On Offshore Shoals

Borrow impacts to the offshore shoals can also be lessened by using constraints on where, and to what depth material is removed from each shoal. Enclosure 1 (*from:* Atlantic Coast of Maryland Shoreline Protection Project SEIS, 2007) provides two tables showing dredging guidelines and constraints proposed for harvesting individual offshore shoals along the Maryland coast to optimize for long-term geomorphic integrity maintenance; and, estimates on the total permissible proportion of material (5%) that could be safely removed from a given shoal to maintain its integrity.

Offshore shoals are dynamic features of the sea floor, tending to migrate in a southwesterly direction along the mid-Atlantic coast. The dynamics of a given shoal affects the character of adjacent seafloor habitats. A sand harvest protocol for Blackfish Banks and the unnamed shoal should be designed to maintain the existing dynamics of each shoal.

Borrow constraints needed to maintain shoal integrity will require a thorough knowledge of the depths and distribution of suitable materials on each of the target borrow sites, obtained through a repetitive core sampling regime. We also recommend periodic pre- and post-borrow monitoring of shoal geomorphic features, to ascertain that borrow methods are not damaging shoal integrity.

I look forward to continued coordination with your agency on this proposal, and the forthcoming EIS and appended EFH assessment. If you have any questions, please contact me at (410) 267-5675; or, John.Nichols@NOAA.GOV.

Table 5-6: Dredging guidelines and constraints for dredging individual offshore shoals to optimize for long-term geomorphic integrity maintenance.

	Dredging Guideline/Constraint	Reasons (1)
1	Avoid the crest	Maintain shallowest water wave-action processes which are likely important for long-term shoal maintenance (2); Maintain coarse-grained lag deposits in-place since these may serve to ensure crest stability (more wave-erosion resistant) (2);
2	Preferentially dredge sand from downdrift accreting (south*) (2) (3) or updrift eroding side (north**) (2)	Minimizing risk of interrupting sand recycling pattern/process
3	Dredge thin uniform thickness of material from a large area	Least disturbance to existing topography/geometry believed to offer least likelihood of substantial disturbance to physical processes that maintain shoal (3)(4)
4	Dredge no deeper than ambient seafloor depth (i.e., not below shoal)	To confine dredging to active portion of seafloor, and avoid creation of pits which could alter physical process patterns (3)(4)

(1) Reasons more specific than maintaining geomorphologic integrity which is assumed to be of long-term importance for biota
(2) Dr. Robert Nairn, Personal communication to Chris Spaur September 2004
(3) Dr. Randy McBride, Personal communication to Chris Spaur for planning dredging of Great Gull Bank for Short-Term Restoration of Assateague Island, March 2001
(4) Dr. Mark Byrnes, Personal communication to Chris Spaur April 2004

*Determined to be southerly based on Swift and Field (1981), McBride (personal communication), limited USACE monitoring conducted of nearby Great Gull Bank, and MGS monitoring work of Borrow Areas 2 and 3 conducted for this study.
**Assumed to be north based on MGS monitoring work of Borrow Areas 2 and 3 conducted for this study.

Table 5-5: Maximum volume of material permissible to dredge from individual offshore shoals meeting 5% environmental constraint.

	Weaver	Isle of Wight	A	B
Maximum volume (yd^3)	4,650,000	6,800,000	5,150,000	2,500,000