

FINDING OF NO NEW SIGNIFICANT IMPACT

Modification of the Negotiated Agreement Authorizing Use of Outer Continental Shelf Sand in the Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Program

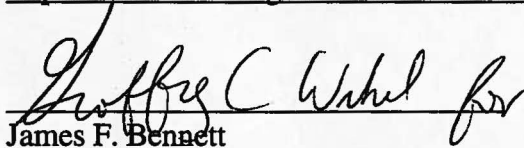
Pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500-1508), and Department of the Interior regulations implementing NEPA (43 CFR 46), the Bureau of Ocean Energy Management (BOEM) prepared an environmental assessment (EA) to determine whether authorizing the use of additional Outer Continental Shelf (OCS) sand from Shoal A in the Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Program (SRIPP) would have a significant effect on the human environment and whether an environmental impact statement (EIS) should be prepared. The EA tiers from the Final Programmatic Environmental Impact Statement (PEIS) prepared by the National Aeronautics and Space Administration (NASA). In March 2011, BOEM, as a cooperating agency, adopted the Final PEIS and issued a Record of Decision authorizing use of OCS sand in initial construction of the Wallops Flight Facility SRIPP.

Initial construction of the Wallops Flight Facility SRIPP began in April 2012. Construction is scheduled to be completed in late July or August 2012. NASA has determined that erosion during a series of recent storms changed the nearshore profile of the project site, requiring additional beach fill to construct the project as originally designed. To address this problem, NASA has requested that BOEM authorize the use of an additional 300,000 cubic yards of OCS sand resources for the initial construction of the Wallops Flight Facility SRIPP.

BOEM has considered the consequences of authorizing the use of additional OCS sand from Shoal A by reviewing new information to determine if any resources should be reevaluated or if new information altered conclusions of the Final PEIS. No new significant impacts were identified that were not already assessed in the Final PEIS, nor is it necessary to change the conclusions of the kinds, levels, or locations of impacts described in that document. Based on the evaluation in the attached EA, BOEM finds that allowing of the use of additional OCS sand, with the implementation of the same mitigating measures identified in the Final PEIS, does not constitute a major Federal action significantly affecting the quality of the human environment, in the sense of NEPA Section 102(2)(C), and will not require preparation of an EIS.

Supporting Document

Final Programmatic EIS for the Wallops Flight Facility SRIPP (NASA 2010). Available at http://sites.wff.nasa.gov/code250/shoreline_eis.html.


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06/29/2012
Date

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Environmental Assessment



**U.S. Department of the Interior
Bureau of Ocean Energy Management**

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1 Introduction

In December 2010 the National Aeronautics and Space Administration (NASA) issued a Record of Decision (ROD) deciding to extend an existing rock seawall and construct a protective beach along approximately 4 miles of Wallops Island shoreline as part of its Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Program (SRIPP). In October 2010 NASA published its Final Programmatic Environmental Impact Statement (PEIS) for the Wallops Flight Facility SRIPP analyzing a suite of project alternatives and the potential environmental impacts associated with each alternative. The PEIS encompassed a 50-year planning horizon, addressing initial construction and potential future maintenance cycles. The PEIS identified a suite of mitigation and monitoring protocols necessary to reduce potential environmental impacts and outlined an adaptive management framework that NASA would use to track project impacts and performance in support of future decision making.

The Bureau of Ocean Energy Management (BOEM) and U.S. Army Corps of Engineers (USACE) served as cooperating agencies during preparation of the PEIS because both possessed regulatory authority and specialized expertise pertaining to NASA's proposed action. Under Section 8(k) of the Outer Continental Shelf Lands Act (OCSLA), BOEM has sole jurisdiction over the preferred borrow areas identified in the proposed action. In March 2011 BOEM issued an independent ROD deciding to authorize use of Outer Continental Shelf (OCS) sand resources in the initial construction of the Wallops Flight Facility SRIPP. The selected alternative authorized the dredging and placement of approximately 3.2 million cubic yards (yd³) of sand from an offshore shoal, referred to as Shoal A, located approximately 8 kilometers (5 miles) east of Assateague Island, VA (Figure 1).

Initial construction of the Wallops Flight Facility SRIPP began in April 2012. Construction is currently scheduled to be completed in late July or August. NASA, working with the USACE as its technical agent, has determined that erosion during a series of recent storms deepened the nearshore area of the project site. The area of most notable change was east of the existing rock revetment on central Wallops Island. The original project design and sand volume needs were based on beach and nearshore conditions in 2007. After resurveying nearshore conditions in advance of project construction, the USACE re-calculated the volume of sand needed to construct the project as originally designed. The USACE determined the project could not be constructed as originally designed without additional beach fill material. To address this problem, NASA has requested that BOEM authorize the use of additional OCS sand resources from Shoal A in the initial construction of the Wallops Flight Facility SRIPP.

This Environmental Assessment (EA) is being prepared to determine if the proposed modification in project scope, requiring a modification to the existing negotiated agreement, would be a substantial change relevant to environmental concerns, or if there are significant new circumstances or information relevant to environmental impacts, such that preparation of a supplemental EIS would be required. Although the PEIS included a programmatic analysis of the potential impacts of the ongoing program (initial construction and potential maintenance cycles) at the Wallops Flight Facility, this EA is necessary because the ROD prepared by BOEM only considered and authorized a specific volume, which NASA is proposing to exceed. This EA tiers from the Final PEIS and incorporates the effects analysis in the Final PEIS by reference.



Figure 1: Project Area

2 Purpose and Need

Loss of sand from the Nation's beaches, dunes, and barrier islands is a serious problem that affects both the coastal environment and important coastal infrastructure. Beach nourishment and other coastal restoration projects are addressing this problem, and sand from the Outer Continental Shelf (OCS) is often used to stem this erosion. NASA originally proposed the SRIPP to reduce the potential for damage to, or loss of, NASA, U.S. Navy, Commonwealth of Virginia, and commercial launch and/or military assets on Wallops Island from storm-induced wave impacts and coastal erosion. As previously described, NASA seeks to modify the scope of initial construction at the Wallops Flight Facility to be able to construct the project according to its original design and thereby maximize fill performance.

The purpose of the BOEM's connected action is to respond to a request for use of OCS sand under the authority granted to the Department of the Interior by the Outer Continental Shelf Lands Act (OCSLA). BOEM's proposed action is necessary because the Secretary of the Interior delegated the authority granted in the OCSLA to BOEM to authorize the use of OCS sand resources for the purpose of shore protection and beach restoration.

3 Proposed Action

NASA's Final EIS considered a wide range of structural and non-structural alternatives. This EA does not reconsider those alternatives because NASA already selected its preferred alternative to construct the Wallops Flight Facility SRIPP, including using OCS sand from Shoal A for the initial beach fill. Under their preferred alternative, NASA is also repairing and extending an existing seawall. In April 2011 BOEM granted authorization for the use of Shoal A for the initial beach fill consistent with the NASA preferred alternative. BOEM negotiated an agreement with NASA that allowed the agency to use 3,199,000 cubic yards (yd³) of OCS sand for sand placement at the Wallops Island shoreline. The proposed action considered herein is a modification of the existing agreement authorizing use of additional OCS sand from Shoal A. The project's design team has recommended that up to an additional 300,000 yd³ of OCS sand from Shoal A would be needed to construct the beach fill according to the original design parameters. All material would be removed using hopper dredges from the same location (areas A-1 or A-2) and placed within the same design template considered in all existing project environmental documents. It is anticipated that the additional dredging would be accomplished in 10-20 additional days given the three hopper dredges working on the project. The same pump-out locations and corridors would be used. All existing mitigation measures identified in the NASA and BOEM Records of Decision would be implemented.

4 Affected Environment and Environmental Consequences

Geomorphology and Oceanography

Since issuing the Final PEIS, the most notable physical change at the project site is the deepening of the subaqueous profile east of the existing rock seawall due to continued erosion. Placement of the proposed additional sediment along the Wallops Island shoreline would benefit the currently sand-starved nearshore transport system because more material would be available for transport either north towards Chincoteague Inlet or south to the adjacent Assawoman Island. Additionally, the increased material would be expected to increase the time between the initial fill cycle and any possible maintenance cycle. Maintenance fill is not considered herein; any future proposal would be subject to further environmental review.

The additional material removed from the Shoal A borrow area would be done so in a uniform manner across the areal extent of area A-1. As such, approximately two thirds of the southern half of the shoal's elevation would be lowered by an additional 0.5-1 ft. As proposed, the elevation of the northern portion of the shoal (area A-2) would remain the same unless an unexpected condition required its use. The analysis performed for the Final PEIS indicated that even when a 5.2 square kilometer (km) (2 square mile) area of the shoal was "planed" to an elevation necessary to obtain 10 million yd³ of material, the induced effects on the Assateague Island shoreline could not be distinguished from those changes occurring as a result of natural variation in sediment transport. Therefore, it is not expected that the lowering of the shoal by the proposed depth would cause any measurable reduction in wave sheltering effects on properties to the west of the borrow area or major changes to flow dynamics in the vicinity of the shoal.

Water Quality

The source and placement site of the additional sand would be the same as those considered in the Final PEIS. Prior to project implementation, NASA obtained a Department of Army permit NAO-1992-1455 from the USACE for work within and discharge of fill material into waters of the U.S. The permit authorized the discharge of approximately 3.2 million yd³ within the proposed fill template. Given the proposed change in the volume of sand discharged, NASA consulted with the USACE to determine if the change would require a permit modification. On March 29, 2012, USACE responded that the proposed change would be permissible within the scope of the existing permit since that the footprint of the project would not change. Assuming a dredge capacity of 3,000 yd³, up to an additional 100 dredge cycles could be needed to provide the necessary material, which would increase the number of turbidity-increasing events (e.g., material removal, discharge, etc.). However, given the sandy nature of the material, impacts on water quality related to turbidity would be short-term and localized. No appreciable changes outside the range of impacts considered in the Final PEIS would be expected.

Air Quality

A re-evaluation of project-related air emissions (employing actual project conditions and contractor-owned equipment) indicates that the quantities of pollutants presented in the Final PEIS were more conservative (i.e., higher estimates) than what would be expected to actually occur, even in consideration of the proposed additional beach fill material (see Table 1 below). Therefore, the dredging and placement of the additional material would not have any additional air quality impacts above those considered in the Final PEIS.

Table 1: Comparison of Initial Beach Fill Emission Estimates

Borrow Site: Unnamed Shoal A	Tons per year					Metric tonnes per year			
	CO	NO _x	VOC	PM	SO _x	CO ₂	N ₂ O	CH ₄	CO ₂ e
Presented in <i>Final PEIS</i> for 3.2 million yd ³ placed	99.7	723.6	27.1	23.8	18.0	28,255	0.9	0.5	28,552
Refined estimate based upon actual project conditions and 3.5 million yd ³ placed	74.7	467.6	16.2	13.5	10.5	20,249	0.3	0.5	20,345

Noise

The duration of noise-producing events would be extended by up to several weeks with the dredging and placement of additional material; however, the total length of construction including the new material (approximately 4 months) would be within the timeframe considered for the initial fill cycle in the Final PEIS (approximately 8 months). Additionally, both the types of equipment used and the resulting intensity of project-related noise would be similar to that considered in the Final PEIS. Given the distance of the borrow area from the pump-out location,

and that all placement activities would be conducted along the Wallops Island shoreline, the sensitive receptors of concern would be wildlife; the potential noise-induced effects on which are discussed below under *Avian Resources*, *Non-Threatened Marine Mammals*, and *Threatened and Endangered Species*.

Avian Resources

The longer presence of heavy equipment associated with the proposed change would be within the duration of initial fill construction considered in the Final PEIS, and therefore would not result in longer-term noise or visual disturbances to beach nesting and foraging birds. A reduction in available food sources above that considered in the Final PEIS is not expected as the areal extent of the fill would not change; rather the additional material would fill a deepened nearshore area that was within the placement site already considered. Over the long term, the additional sand would be expected to prolong the lifespan of the elevated, sparsely vegetated beach berm, which could create suitable shorebird nesting habitat. Also, the placement of additional material would provide for a greater time interval between initial construction and any potential maintenance cycle, allowing additional time for nearshore avian food sources to repopulate and/or recover from any disturbance.

Dredging the offshore shoal by an additional 0.5-1 ft would not measurably change shoal topography or impact the availability of seabird food sources as considered in the Final PEIS. The change in cut depth would only slightly increase the water depth such that diving species could still forage on the shoal following dredging. All additional sand would be removed within areas already disturbed; therefore, it would not expand the footprint of the area that would be expected to have reduced available forage immediately following the dredge event.

Benthic Resources

The dredging and placement of additional material would not substantially change the geographic or temporal extent of impacts (e.g., entrainment, burial) on bottom dwelling communities already disturbed or considered in the Final PEIS. The post construction faunal recovery process at the borrow area could be delayed due to the additional dredge passes necessary to obtain the material, however recovery would be expected soon thereafter.

NASA obtained permit 10-2003 from the Virginia Marine Resources Commission (VMRC) for work within state-owned nearshore and on Wallops Island. The permit authorized the placement of approximately 3.2 million yd³ within the proposed fill template. Given the proposed change in the volume of sand discharged, NASA consulted with VMRC to determine if the change would require a permit modification. On March 28, 2012 VMRC responded that the proposed change was within the scope of the existing permit given that the footprint of the project would not change.

Essential Fish Habitat and Fish

The impacts that may occur above those considered for the initial fill cycle in the Final PEIS would be a slightly greater depth and duration disturbance of habitat, as well as a slightly greater number of turbidity-producing events, such as dredging, overflow, and nearshore

discharge of material. However, as all dredging and placement would occur within the areas considered in the Final PEIS, the resulting difference in impact is expected to be negligible. NASA, as lead federal agency, informally consulted with the National Marine Fisheries Service (NMFS) Habitat Conservation Division (HCD) regarding the proposed increase in material volume. In a March 30, 2012 email, NMFS HCD reiterated the same measures and comments that it provided during the Essential Fish Habitat (EFH) consultation performed in parallel with the Final PEIS; however, the agency did not express any additional concern or offer any further conservation recommendations. The EFH recommendations adopted by NASA in whole or in part for the initial fill cycle are described in the NASA and BOEM RODs, and would continue to apply to the dredging, placement, and maintenance of the additional fill material.

Non-Threatened Marine Mammals

Potential adverse impacts to marine mammals resulting from the dredging, transport, and placement of additional beach fill material would be associated with slightly more physical disturbance to habitats during dredging and fill, relatively greater exposure to vessel strike, and a relatively greater exposure to noise from vessel activities (e.g., dredging, pump-out, etc.). However, given that all additional dredging and placement would occur within areas already disturbed by the project, the relatively slow speed at which the dredges would operate, avoidance behavior often exhibited by species of concern, and with the implementation of mitigation measures to protect sensitive in-water species (described in the Final PEIS), no different adverse effects are expected.

Threatened and Endangered Species

In-Water Species: Dredging additional material from the offshore borrow site would slightly increase the probability of adverse effects (e.g., entrainment, collision, etc.) on in-water sea turtles and marine mammals could occur, however with the implementation of mitigation measures outlined in PEIS and the NMFS Biological Opinion, the additive effects would be minor. Since the PEIS was published and NASA/BOEM issued RODs, NMFS listed the Atlantic sturgeon as endangered under the Endangered Species Act (ESA) (77 FR 5880). Accordingly, on August 11, 2011, NASA, as lead federal agency, provided a Supplemental Biological Assessment to NMFS regarding potential effects of the SRIPP on Atlantic sturgeon (Attachment). On November 15, 2011, NMFS initiated conference with NASA on Atlantic sturgeon although contract award to NASA's dredging contractor had already occurred. On February 6, 2012, NMFS published two final rules listing five distinct population segments (DPSs) of Atlantic sturgeon, with an effective date of listing on April 6, 2012 (77 FR 5880; 77 FR 5914). Construction on the Wallops Flight Facility SRIPP also started the same month. NMFS has not yet issued a biological opinion to NASA, but anticipates doing so in late August 2012, likely after project completion. NMFS has informally indicated that there will be a no jeopardy determination for the five distinct Atlantic population segments. NASA also informally consulted with NMFS regarding the additional material under consideration. The PEIS previously considered the direct and indirect effects on various fish species, as did the EFH assessment. Potential, but unlikely effects include entrainment and mortality, disturbance and injury from vessel strike or noise exposure, and temporary foraging disturbance. NMFS has indicated that the project, even in consideration of the additional material, would have minor

effects on Atlantic sturgeon given that they generally are not in the open ocean area where dredging will occur. No specific avoidance mitigation is expected from that already disclosed in the Final PEIS and existing Biological Opinions. Given that the areal extent of placement would not change from that considered in the Final PEIS, impacts (e.g., interaction with the sediment plume, noise, etc.) to species in the nearshore site would not be expected to measurably change.

On-Land Species: The potential impacts on listed shorebirds and nesting sea turtles related to the duration, time of year, and geographic extent of activities for the additional fill would be within those considered in the Final PEIS and the July 10, 2010 Biological Opinion issued by the U.S. Fish and Wildlife Service (USFWS). NASA, as lead agency, consulted with USFWS to determine if the modification of the Biological Opinion was necessary. On April 13, 2012, USFWS concluded that no additional consultation pursuant to the ESA would be required due to the fact that the project's footprint would not change and that the duration of the additional construction would be within that considered in the July 2010 Biological Opinion.

Socioeconomics

Dredging of the offshore shoals could result in additional minor adverse effects on commercial and recreational fishing due to entrainment of fish and clams, elevated turbidity levels, and disruption of the benthos which would cause fish to avoid the disturbed areas. However, the geographic extent of impacts would not change and the additional time for site recovery would be slight. Consistent with the conclusions in the Final PEIS, dredging and placement of the additional material would not result in disproportionately high impacts on minority and low income persons.

Cultural and Historic Resources

All additional dredging and placement activities would occur within the areas previously surveyed and coordinated with BOEM and Virginia Department of Historic Resources (VDHR) per Section 106 of the National Historic Preservation Act. No areas of archaeological concern were identified during remote sensing surveys of these areas; therefore no additional impacts would occur during dredging. Since issuing the Final PEIS, NASA conducted additional remote sensing surveys of the contractor's nearshore pump-out areas and, as lead agency, provided the additional information to and coordinated with VDHR. On April 2, 2012, VDHR concurred that no additional survey effort would be needed. Therefore, no adverse effects on cultural and historic resources are expected. The existing chance finds clause would continue to be implemented.

5 No Action Alternative

The BOEM considered the no action alternative as the only practical and technically feasible alternative to the proposed action. It is not economically feasible at this point in the construction window to identify a substitute borrow area or alternative source of sand. Moreover, the Final PEIS had already considered such options and supported the decision to select Shoal A. Under the no action alternative, NASA would not be authorized to use additional OCS sand resources

from Shoal A. This would be the equivalent of the proposed action in the Final PEIS and BOEM ROD. The effects of the no action are disclosed in the same documents.

6 Conclusion

The Final PEIS analyzed the effects of authorizing NASA to use an additional 300,000 cubic yards of OCS sand in the Wallops Flight Facility SRIPP. As detailed above, the proposed removal of additional material from the existing Shoal A borrow site would not be a substantial change to the proposed action such that it would substantially change the environmental analyses or impact determinations presented in the Final PEIS. NASA, as lead agency, has consulted with applicable resource and permitting agencies and has received concurrence that the minor modification to the project would not necessitate additional consultation or modifications to existing permits. This review has not identified any significant new circumstances or information that would have a bearing on the proposed action or its environmental impacts. No new mitigation has been identified as being necessary in this analysis; however, BOEM expects existing mitigation would continue to be implemented.

7 Consultation and Coordination

List of agencies and persons consulted:

National Marine Fisheries Service, Habitat Conservation Division, Northeast Regional Office
National Marine Fisheries Service, Protection Resources Division, Northeast Regional Office
U.S. Fish and Wildlife Service, Ecological Services, Virginia Field Office
U.S. Army Corps of Engineers, Norfolk District
Virginia Marine Resources Commission
Virginia Department of Historical Resources

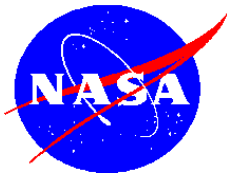
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8 Attachment – Biological Assessment

Supplemental Biological Assessment

Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Program



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

August 2011

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1. Introduction

1.1.Purpose of Document

Section 7(c) of the Endangered Species Act (ESA) of 1973 requires that a Biological Assessment (BA) be prepared for all Federal actions that may affect Federally-listed threatened or endangered species. The National Aeronautics and Space Administration (NASA) has prepared this Supplemental BA to consider the potential impacts of its Shoreline Restoration and Infrastructure Protection Program (SRIPP) on Atlantic sturgeon (ATS) (*Acipenser oxyrinchus oxyrinchus*) under the jurisdiction of the National Marine Fisheries Service (NMFS).

Also considered in this BA are connected Federal actions undertaken by two independent regulatory agencies - the Department of the Army Corps of Engineers (USACE) and the Department of the Interior's Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE). Each agency has issued an authorization for the initial fill cycle of the project; USACE's permit (NAO-1992-1455) was granted under Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors of Act of 1899 (RHA). Through its authorities provided under section 8(k)(D) of the OCS Lands Act, BOEMRE conveyed the rights to dredge Outer Continental Shelf sand at NASA's preferred borrow site by way of a negotiated 3-way agreement (OCS-A 0480) among NASA, USACE, and itself.

This BA has been prepared to facilitate the reinitiation of a previous ESA consultation for the SRIPP. As practicable, detailed project information that is available in related environmental documents has been summarized or incorporated by reference such that this document can focus on the status of ATS in the project area and any expected effects on the species.

1.2.Previous ESA Consultations

In May 2007, NASA requested formal consultation on the effects of its proposed SRIPP on listed species and submitted a final BA to NMFS. NMFS delivered its Biological Opinion (BO) on September 25, 2007, concluding that the proposed action was likely to adversely affect but was not likely to jeopardize the continued existence of loggerhead and Kemp's ridley sea turtles and was not likely to adversely affect leatherback or green sea turtles or right, humpback, and fin whales. NMFS also concluded that the action would not affect hawksbill turtles as this species is unlikely to occur in the action area. The BO included an Incidental Take Statement (ITS) exempting the incidental taking of no more than 1 sea turtle for approximately every 1,529,110 cubic meters (m³) (2,000,000 cubic yards [yd³]) of material removed from the borrow areas, which over the life of the project exempted the take of 28 sea turtles, with no more than 3 being Kemp's ridleys and the remainder being loggerheads. The action considered in the September 2007 BO was never initiated by NASA, and NASA subsequently redesigned the SRIPP.

In February 2010, NASA requested reinitiation of its consultation with NMFS due to the actions previously considered in the September 2007 BO being modified in manner that would cause effects to listed species that were not previously assessed. On July 22, 2010 NMFS issued its BO, concluding that the proposed project may adversely affect but is not likely to jeopardize the continued existence of loggerhead and Kemp's ridley sea turtles and is not likely to adversely affect leatherback or green sea turtles or right, humpback, or fin whales. NMFS also concluded that the action will not affect hawksbill turtles as these species are unlikely to occur in the action

area. The BO included an ITS exempting the incidental taking of no more than 1 sea turtle for approximately every 1,146,832 m³ (1,500,000 yd³) of material removed from the borrow areas. NMFS estimated that at least 90% of these turtles will be loggerheads. As such, over the course of the project life, NMFS estimated that a total of 9 sea turtles will be taken, with no more than 1 being Kemp's ridleys and the remainder being loggerheads. NMFS assessed the project's impacts on listed species over the project's proposed 50-year lifetime.

During each SRIPP ESA consultation, effects of the project on ATS were not considered given that the species was not listed as threatened or endangered. However, on October 6, 2010, NMFS published two proposed rules to list five distinct population segments (DPS) of ATS under the ESA. NMFS is proposing to list four DPSs as endangered (New York Bight, Chesapeake Bay, Carolina, and South Atlantic) and one DPS of ATS as threatened (Gulf of Maine DPS) (75 FR 61872; 75 FR 61904).

As provided in 50 CFR 402.16, reinitiation of formal consultation is required when any of four general conditions apply, one of which is when a new species is listed or critical habitat designated that may be affected by the action. Given the anticipated listing of ATS in the fall of 2011, NASA and NMFS have agreed that it is in the agencies' best interest to reinitiate consultation such that it could be efficiently completed should the species be listed and appropriate coverage for take, if needed, is in place. At this time, the reinitiated consultation will take the form of a conference, with a BO issued if the species is listed.

2. Description of the Action

NASA prepared a Programmatic Environmental Impact Statement (PEIS) for its SRIPP; the October 2010 Final PEIS considered three action alternatives (NASA, 2010a). On December 13, 2010, NASA signed its Record of Decision (ROD) for the program, selecting Final PEIS Alternative One, beach fill only with seawall extension, as its course of action (NASA, 2010b). Subsequent to the ROD, NASA prepared detailed design documents and submitted requests to both USACE and BOEMRE for authorizations of its initial fill cycle; both agencies authorized the project as proposed by NASA. Accordingly, the SRIPP initial fill cycle can be considered well-defined.

Beach renourishment cycles are less-defined and could vary throughout the 50-year life of the SRIPP. Storm frequency and severity will dictate the magnitude and rate of recurrence of beach renourishment. The timing and volume of material placed during renourishment events will be based upon an analysis of beach monitoring data.

The below section presents a summary of the project as proposed; more detailed information regarding the project can be found in Sections 2.5.1, 2.5.2, and 2.5.7 of the Final PEIS (NASA, 2010a).

2.1. Project Components

Seawall Extension

Wallops Island's existing rock seawall will be extended a maximum of 1,400 meters (m) (4,600 feet [ft]) south of its southernmost point. The seawall extension will be implemented in the first year of the SRIPP prior to the placement of the initial beach fill. At first, the seawall will be extended approximately 435 m (1,430 ft) south with additional extension (up to the maximum length) undertaken in the future as funding becomes available. The initial phase of seawall extension is expected to begin in August 2011 and will last approximately 7 months.

Beach Fill

Offshore

NASA is considering two offshore sand shoals (Unnamed Shoals A and B) as sources for beach fill material over the project lifecycle. Depths at Unnamed Shoal A range from approximately 8 to 22 m (25 to 72 ft); Unnamed Shoal B depths range from 10 to 25 m (32 to 82 ft). The sediment on Unnamed Shoals A and B is generally well-sorted, medium sand with a median composite grain size of 0.29 millimeters (mm) (USACE, 2010).

For the initial nourishment, NASA will dredge an estimated 3,057,500 m³ (3,998,750 yd³) of fill from Unnamed Shoal A sub-areas 1 and 2 (Figure 1). Trailer suction hopper dredges will most likely be used for the SRIPP. A 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 hopper dredges likely to be used typically remove material from the bottom of the sea floor in layers up to 0.3 m (1 ft) in depth (Williams, personal comm.).

Once the hopper is filled, the dredge will transport the material to a pump-out buoy or station that will be placed at a water depth of approximately 9 m (30 ft), which is approximately 3 km (2 mi) offshore of the placement area. The pathway from Unnamed Shoals A and B to the pump-out buoy is not a straight line, but a dogleg shape with a turning point, for the purpose of avoiding Chincoteague Shoal and Blackfish Bank. The distance from the turning point to the pump-out buoy is approximately 5 km (8 mi). The one-way distance from Unnamed Shoal A to the theoretical pump-out buoy is approximately 22 km (14 mi), and the corresponding transit distance from Unnamed Shoal B to the theoretical pump-out buoy is approximately 31 km (19 mi). Booster pumps may be needed to aid the offloading of sand from the pump-out buoy to the shoreline.

Based on previous offshore dredging operations along the east coast, it is assumed that dredges with a hopper capacity of approximately 3,000 m³ (4,000 yd³) will be used; however, because this volume is a slurry and not all sand, the actual volume of sand that each dredge will transport during each trip will be approximately 2,300 m³ (3,000 yd³). The dredges will operate for 12- to 24-hour stretches.

Using the estimated beach fill volumes, there will be approximately 1,000 to 1,100 dredge trips from the offshore borrow site to the Wallops Island shoreline for the initial beach fill. Two dredges will likely be in use at the same time and will accomplish about 3 round trips per day. Assuming 10 percent downtime for the dredges due to weather, equipment maintenance, etc., the initial fill portion will take 216 days, or about 7 months. Work on the initial beach fill is expected to begin in November 2011.

Approximately nine renourishment events are proposed throughout the 50-year life of the SRIPP. Renourishment activities (assuming all fill is taken from one of the proposed offshore shoals) will take approximately 50 days, or about 2 months for each cycle. Each renourishment cycle is anticipated require the dredging of approximately 770,000 m³ (1,007,500 yd³) of sand every 5 years. This would equate to approximately 240 to 270 dredge trips per cycle. Up to one-half of the fill volume could be excavated from the north Wallops Island borrow site (requiring no in-water work), and the remaining half, or the entire renourishment volume, would be dredged from either Unnamed Shoal A or Unnamed Shoal B. It should be assumed that renourishment dredging could occur at any time of year.

In total, over the 50-year design life of the SRIPP, up to approximately 9,990,000 m³ (13,066,250 yd³) of sand are expected to be dredged from Unnamed Shoals A and B.

Onshore

The beach fill will start approximately 460 m (1,500 ft) north of the Wallops Island-Assawoman Island property boundary and extend north for 6.0 km (3.7 mi). The initial fill will be placed so that there will be a 1.8-m (6-ft) (referencing North American Vertical Datum [NAVD] 1988) berm extending a minimum of 21 m (70 ft) seaward of the existing seawall. The remainder of the fill will be placed at a 20:1 slope underwater for an additional distance seaward; the amount of that distance would vary along the length of the beach fill, but will extend for about an additional 137 m (450 ft), so that the total distance of the fill profile from the seawall will be up to approximately 158 m (520 ft).¹ The beach fill profile will also include a 4.3-m (14-ft) NAVD dune built up over the shoreward face of the seawall.

2.2.Action Area

The action area is defined in 50 CFR 402.02 as “All areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.” Figure 2 depicts the action area for the SRIPP. The action area for this BA includes the following:

- The northern portion of Wallops Island;
- The portion of Wallops Island shoreline that will be affected by the extended seawall and the beach fill;
- The area affected by the nearshore pump-out or booster station;
- Offshore borrow sites;
- The waters between and immediately adjacent to the above, where project vessels will travel and dredged material will be transported; and
- 1,220 meters (4,000 feet) in all directions from the area to be dredged to account for the sediment plume generated during dredging activities.

¹ It should be noted that although the seaward distances of fill shown in this BA differ from those presented in the 2010 SRIPP PEIS and the 2010 NMFS BO, dredge and placement volumes have not changed. The larger seaward distances reflect the project’s “construction template,” which is the target cross-sectional profile the contractor is expected to build to ensure that the proper volume is placed. This volume includes advance nourishment and accounts for loss of material as the beach profile adjusts. The distances presented in previous documents reflect the “design template,” which represents the width and height required to meet the targeted level of storm damage reduction.

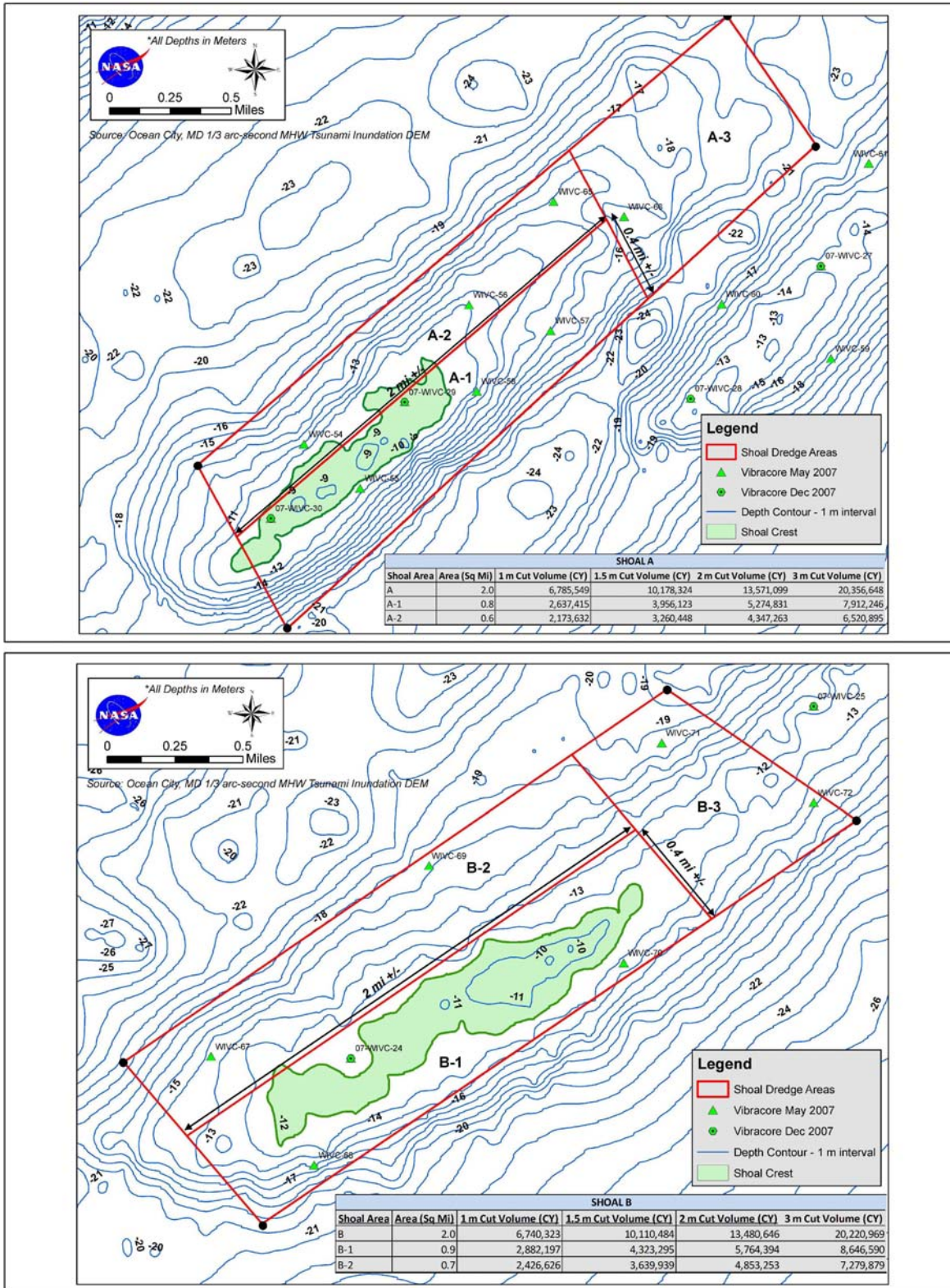


Figure 1 – Unnamed Shoals A and B Borrow Areas

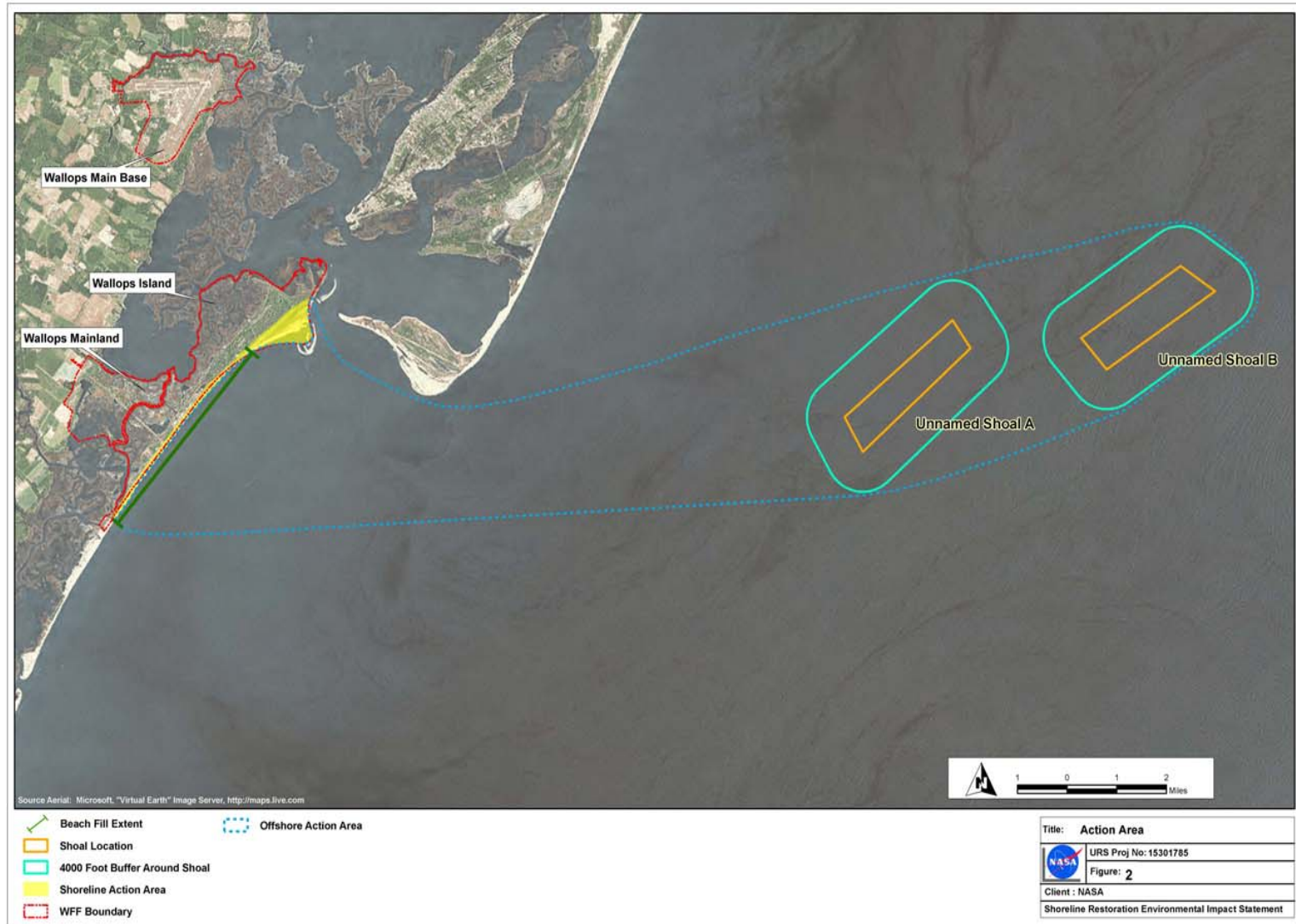


Figure 2 – SRIPP Action Area

3. Atlantic Sturgeon

3.1 Description and Distribution

The ATS is a long-lived, estuarine dependent, anadromous fish (Figure 3). ATS can grow to approximately 14 feet (4.3 m) long and can weigh up to 800 lbs (370 kg). They are bluish-black or olive brown dorsally (on their back) with paler sides and a white belly. They have five major rows of dermal scutes (NMFS, 2011).

ATS are similar in appearance to shortnose sturgeon (*Acipenser brevirostrum*), but can be distinguished by their larger size, smaller mouth, different snout shape, and scutes (NMFS, 2011).



Figure 3 - Atlantic Sturgeon

The species' historic range included major estuarine and riverine systems that spanned from Hamilton Inlet on the coast of Labrador to the Saint Johns River in Florida (Smith and Clugston, 1997).

To date, five distinct population segments (DPSs) of ATS (Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic) have been identified (ASSRT, 2007). These DPSs were configured to account for the discreteness and significance of the population segments, stemming from the marked difference in physical, genetic, and physiological factors within the species, as well as the unique ecological settings and unique genetic characteristics that would leave a significant gap in the range of the taxon if one of them were to become extinct (ASSRT, 2007). On October 6, 2010, these five DPSs were proposed for ESA listing by NMFS (75 FR 61872; 75 FR 61904)

3.1.1. Life History and Habitat Preferences

ATS spawn in freshwater, but spend most of their adult life in the marine environment. Spawning migrations are cued by temperature, which causes fish in U.S. South Atlantic estuaries to migrate earlier than those in mid-Atlantic and New England portions of their range (Smith, 1985). Spawning adults in the mid-Atlantic systems generally migrate back upriver in April-May to spawn in their natal river (ASSRT, 2007). Upon reaching maturity, which can occur from ages 5 to 24 years (depending on the location of the ATS natal river system), spawning adults spawn at irregular intervals ranging from 1 to 5 years for males and 2 to 5 years for females (NMFS, 2011). The two most active ATS spawning rivers nearest the action area are the Delaware River, a tributary to Delaware Bay, to the northwest, and the James River, a tributary to Chesapeake Bay, to the southwest. Spawning may also be occurring in the York River, another Chesapeake Bay tributary to the southwest of the project site.

Following spawning migrations by adults, benthic eggs are deposited on hard surfaces (e.g., cobble) in regions between the salt front and fall-line of large rivers. After spawning, males may remain in the river or lower estuary until the fall; females typically exit the rivers within several months (Dovel and Berggren, 1983). Young-of-the-year juveniles initiate seasonal migrations within estuaries (Dovel and Berggren, 1983). Emigration from natal estuaries to primarily marine habitats occurs at ages 1 to 5 years, after which subadults wander among coastal and estuarine habitats until maturation, undergoing rapid growth rates (Dovel and Berggren, 1983).

Tagging and genetic data indicate that subadult and adult ATS may travel widely once they emigrate from rivers. These migratory fish are normally captured in shallow (10 to 50 m [33 to 164 ft]) near shore areas dominated by gravel and sand substrate (Stein et al., 2004a). In an evaluation of data from monitored fishing trips between 1989 and 2000, Stein et al. (2004a) found that fish were most frequently caught in depths of less than 25 m (80 ft) along the Mid-Atlantic Bight (MAB), and in deeper waters in the Gulf of Maine. Erickson et al. (2011) found that tagged fish within the MAB generally inhabited deepest waters (i.e., greater than 20 m [65 ft]) during winter and early spring (i.e., December to March) and shallowest waters (i.e., less than 20 m [65 ft]) during spring and early fall (i.e., May to September). Additionally, Dunton et al. (2010) suggest that Atlantic coastal waters of depths less than 20 m (65 ft) represent an important habitat corridor and potential migratory pathway.

The reasoning for ATS long range migrations is unknown, although it is thought that part of this behavior is driven by the search and selection of optimal foraging grounds (Bain, 1997). Once in marine waters, ATS typically forage on benthic invertebrates, including amphipods, isopods, shrimps, polychaete worms, mollusks and small fishes, especially sand lances (*Ammodytes* spp.) (Scott and Crossman, 1973). Johnson et al. (1997) reported similar dietary preferences for ATS caught off the coast of New Jersey, finding that polychaetes were the largest prey group consumed.

3.1.2. Status of Species in the Action Area

Habitats and migratory patterns of ATS during their oceanic phase are largely unknown. However, given that subadults and adults are well known to travel widely along the Atlantic coast during migrations (Bain, 1997), it is reasonable to expect that multiple DPSs of ATS may be present in the action area.

A study by Erickson et al. (2011) employed pop-up satellite archival tags to track the movements of 23 ATS originating in the Hudson River, New York (NY). Of those tagged, 15 entered the Atlantic Ocean, generally remaining in shallow depths (5 to 40 m [15 to 130 ft]) in the MAB between Long Island, NY and the Chesapeake Bay. The authors of the study suggested that all sturgeons tracked as a part of the study were of the New York Bight DPS. Through statistical analysis, the authors identified areas of sturgeon concentration, most notably at the mouths of the Delaware and Chesapeake Bays. These findings correlate well with studies of five fishery-independent surveys performed by Dunton et al. (2010), which also identified mouths of major bays and estuaries as congregation areas. Dunton et al. (2010) also identified the coastal waters between the New York Bight to Virginia as a region of overwintering habitat for ATS, particularly juvenile ATS. These findings correspond with those of Laney et al. (2007), which identified the coastal waters off North Carolina, Virginia (near the mouth of the Chesapeake Bay), and the mouth of the Hudson River as overwintering sites for ATS.

Related tagging efforts undertaken by the Connecticut Department of Environmental Protection (Long Island Sound) and Cornell University (Hudson River) between 1993 and 2008 produced recaptured ATS as far south as Cape Charles, Virginia, and Cape Hatteras, North Carolina, respectively (USFWS, 2009).

In a study of sturgeon in the Delaware River, approximately 1,700 sub-adult ATS were tagged by the Delaware Division of Fish and Wildlife from 1991 through 1997 (Shirey et al., 1997). Within this sample of ATS were individuals that had been previously tagged in the Hudson River), coastal New Jersey, and coastal North Carolina. Sturgeon tagged in the Delaware River were subsequently recaptured from the near-shore ocean and some estuaries from Maine through North Carolina.

The USFWS Maryland Fisheries Resources Office tagged over 1,400 ATS between the years 1993-2008 (tagging ongoing) in the Maryland portion of the Chesapeake Bay and its tributaries. Recaptured fish ranged from Long Island Sound, Connecticut to the Atlantic Coast of North Carolina. Commercial fishermen reported 49 recapture events, most in the Chesapeake Bay and along the Atlantic coast of Virginia. The greatest concentration of Virginia coast-caught fish were east of the mouth of the Chesapeake Bay; however some were caught north of the project action area. Other commercial reports ranged from Fire Island, New York to the Albemarle, Pamlico and Roanoke Sounds in North Carolina (USFWS, 2009).

A majority of ATS tagged in the James, York, and Rappahannock Rivers in 1997-1998 and 2005-2007 by the USFWS Virginia Fisheries Office were recaptured in Chesapeake Bay and the Virginia Coast (with most Virginia coastal fish found in the vicinity of the mouth of Chesapeake Bay), but ranged from Hancock's Bridge in the Delaware River to Pamlico Sound and Cape Hatteras in North Carolina (USFWS, 2009).

Data on movement of ATS from rivers farther south suggest that juvenile ATS from southeastern rivers do not move as extensively as those from the north. Smith (1985) reported that a juvenile

ATS tagged in the Edisto River, South Carolina was recaptured in Pamlico Sound, North Carolina. Another juvenile tagged in Winyah Bay was recaptured in Chesapeake Bay. Juvenile ATS tagged in the Altamaha River, Georgia between 1986 and 1992 were recovered as far north as North Carolina (Collins et al., 1996). There are few records of more extensive movements. Tagging efforts by the North Carolina Cooperative SEAMAP Tagging Cruise (Atlantic Coast of North Carolina) and the South Carolina Department of Natural Resources (Edisto River) have resulted in recaptured fish as far north as Fire Island, New Jersey and the Atlantic Coast of New York, respectively (USFWS, 2009).

Due to the relative scarcity of data regarding sturgeon movements in the open ocean, only general conclusions may be drawn regarding potential presence of ATS within the action area. Given the location (i.e., outside of identified congregation and overwintering areas, but within the offshore and coastal waters of Virginia) and habitat characteristics (e.g., sandy substrate, depths less than 20 m [65 ft]) of the project area, ATS may be present in the project area. If present, ATS are likely to use the project area as a migratory pathway/corridor to and from overwintering, foraging, and spawning grounds. Accordingly, ATS will most likely be encountered in the fall and early spring – times of peak migration. Also, based upon the most recent tagging data summarized above, it is most likely that “middle latitude” DPSs (New York Bight, Chesapeake Bay, and Carolina) will be encountered; encountering those from the extreme north and south (Gulf of Maine, South Atlantic), while possible, will be less likely.

4. Effects of the Action

4.1. Direct and Indirect Effects

4.1.1. Vessel Strike

There is limited information on the risk that dredge vessels pose to ATS. Available information indicates that ship strikes have occurred in nearby spawning rivers (James River, Delaware River) with some regularity. For example, ten adult ATS were found in the Delaware River in 2004, six in 2005, and six to date in 2006 that were evidently struck by a passing ship or boat (Kahnle et al., 2005; Murphy, 2006 as cited in ASSRT, 2007). Based on the external injuries observed, it is suspected that these strikes are from ocean going vessels and not smaller boats, although at least one fisher reported hitting a large sturgeon with a small craft (C. Shirey, DNREC, Pers. Comm. 2005, as cited in ASSRT, 2007). Five ATS were reported to have been struck by commercial vessels within the James River, Virginia in 2005 (ASSRT, 2007).

Locations that support large ports and have relatively narrow waterways seem to be more prone to ship strikes (ASSRT, 2007). Neither of these conditions apply within the action area. Additionally, given that ATS spend the majority of their time near the bottom of the water column (i.e., in the bottom meter) and the expected underkeel clearance (distance between the ship and the bottom considering variables such as pitch, roll, and heave) of project vessels would not likely be less a meter (3 ft) in even the shallowest of depths, it is extremely unlikely that any interactions between project vessels and ATS will occur.

4.1.2. Dredge Entrainment

Limited information exists regarding interactions of ATS with dredging in the open-ocean environment, however it may be reasonably concluded that the potential for entrainment exists based upon experiences with riverine projects. USACE records from dredging between the years 1990 and 2010 (USACE, unpublished data) indicate that of the approximately 27 reported sturgeon takes, at least 14 were ATS, and of those 14, approximately 12 were taken with hopper dredges. The beach nourishment projects most similar in nature to the SRIPP and nearest the action area are the Atlantic Coast of Maryland, Assateague Island, Sandbridge, and Virginia Beach projects, all of which are overseen by USACE. No encounters with ATS were reported for either project; however there were two incidental takes of ATS during April 2011 maintenance dredging of Thimble Shoals and York Spit Channels, just inside the mouth of the Chesapeake Bay (Lockwood, pers. comm.; Spaur, pers. comm.).

The highest reported dredging-related sturgeon take event was in the Kennebec River, Maine in October 2005 (NMFS, 2009). Five Shortnose sturgeon were entrained in the hopper dredge McFarland over three days of dredging in the Kennebec River Federal navigation channel at Doubling Point (NMFS, 2009). Additionally, other species of sturgeon have been entrained in hopper dredging events in the United States, including Gulf sturgeon (NMFS, 2009). Based on this information, it is apparent that sturgeon species are vulnerable to dredge entrainment, particularly in dredging operations involving a hopper dredge. As the proposed SRIPP will involve the use of a hopper dredge, the risk of entrainment for ATS exists; however, as dredging operations will occur in the open ocean, in an area where ATS are not believed to congregate, the risk of entrainment is expected to be low in comparison to the reported takes in riverine systems where ATS densities are expected to be higher, and thus, the chances of an interaction higher.

4.1.3. Dredge Noise

Hopper dredging produces regular intervals of continuous sound that originates from a number of related sources, which are summarized below (MALSF, 2009):

- Collection: sound is produced from the operation of the drag head and its contact with the ocean bottom; this is highly influenced by the dredge site substrate, with coarser materials generating greater sound levels;
- Pumps: sound is generated by the on-board pumps driving the suction through the pipe;
- Transport: sound is produced as the sediment/water slurry moves through the suction pipe from the seafloor to the dredge;
- Deposition: sound is produced as the sediment is placed within the dredge's hopper; and
- Ship/Machinery: sound is produced by the dredging vessel itself, including engines, propellers and thrusters.

The dredging process is interspersed with quieter periods when the dragheads are raised to allow the dredge to turn. Filling and emptying the hopper is a cyclical process on a longer timescale, as the full dredge must transport the dredged material to the disposal site before returning for another filling process (Clarke et al., 2003).

A study conducted by Clarke et al. (2003) evaluated the sound levels produced by a hopper dredge during its "fill" cycle working in a sandy substrate. The authors found that most of the

produced sound energy fell within the 70 to 1,000 hertz (Hz) range, with peak pressure levels in the 120 to 140 decibel (dB) range at 40 m (130 ft) from the dredge. These data correspond well with another study conducted in United Kingdom waters, which found trailing suction hopper dredge sounds to be predominantly of low frequency (below 500 Hz), with peak spectral levels at approximately 122 dB at a range of 56 m (184 ft) (DEFRA, 2003).

Effects of Noise on ATS

Characterizing the effects of noise on ATS involves assessing the species' sensitivity to the particular frequency range of the sound; the intensity, duration, and frequency of the exposure; the potential physiological effects caused by the increase in underwater noise; and the potential behavioral responses that could lead to impairment of biologically important functions (e.g., feeding, sheltering, and migration).

The lack of an acoustic coupling between the swim bladder and inner ear supports the conclusion that sturgeon are not hearing “specialists” (NMFS, 2008). Rather, sturgeon are considered hearing “generalists,” meaning that they are unlikely to detect sound at frequencies above 1 to 1.5 kilohertz (kHz), and compared to “specialists,” they have a higher sound detection threshold (i.e., require higher intensity before detection) for the same frequencies of sound (Popper, 2008).

There are few studies or published data available on either hearing in sturgeon or their responses to audible stimuli. Initial studies by Meyer and Popper (unpublished) measuring responses of the ear using physiological methods suggest that a species of *Acipenser* may be able to detect sounds from below 100 Hz to possibly higher than 1,000 Hz. However, thresholds were not determined. The results do suggest, however, that sturgeon should be able to localize sound (determine the direction from which it comes) (Popper, 2005). Accordingly, it can be concluded that hopper dredge operations produce sounds that are within the audible range of ATS.

Physiological Effects

The effects of exposure to sound on hearing can be divided into two classes. Exposure to low levels of sound for a relatively long period of time or exposure to higher levels of sound for shorter periods of time may result in temporary hearing loss, referred to as temporary threshold shift or TTS (Yost, 1994 as cited in Kastak et al., 1999). The level and duration of exposure that causes TTS varies widely and can be affected by factors such as repetition rate of the sound, sound pressure level (SPL), frequency, duration, health of the organisms and many other factors. Hearing recovers after TTS; effects may continue from minutes to days after the end of exposure. The second possible effect is referred to as permanent threshold shift or PTS. PTS is a permanent loss of hearing (Clark, 1991).

Published studies on the physiological effects of continuous, longer duration sounds (i.e., comparable to dredge noise) on sturgeon are not available, however studies performed for other “generalist” fish can be used as a proxy for estimating potential effects. Both Scholik & Yan (2002) and Smith et al. (2004) reported no hearing loss in two species of hearing “generalists” (bluegill sunfish [*Lepomis macrochirus*] and Nile tilapia [*Oreochromis niloticus*], respectively). The Scholik & Yan (2002) study exposed sunfish to white noise (0.3–2.0 kHz, 142 dB) for up to 24 hours, whereas the Smith et al. (2004) study exposed tilapia to white noise (0.1–10 kHz, 170 dB) for up to 28 days. The longest duration study was performed by Wysocki et al. (2007) and did not find TTS in rainbow trout (*Oncorhynchus mykiss*) after 9 months of exposure to 2 Hz to 2 kHz broadband noise with an overall SPL of 150 dB in an aquaculture facility.

However, in a review of all three studies, Popper and Hastings (2009) note several study limitations, including that the sound stimulus was primarily pressure, whereas the major stimulus for hearing “generalists” is believed to be acoustic particle motion, and that only the SPL was controlled during electrophysiological measurements to determine the audiograms before and after sound exposure. They further state that the results were as expected because hearing sensitivity and TTS in hearing “generalists” are likely to be most meaningful in terms of acoustic particle motion or possibly acoustic intensity.

Although not appropriate for direct comparison, the results of these available studies provide insights into potential ATS physiological effects. Based upon the measured sound levels reported in Clarke et al. (2003), hopper dredge source levels are estimated to be 164 dB. At even modest distances (40 m [130 ft]) from the dredge, sound levels will attenuate to a level (140 dB) below those found to have insignificant effects on “generalists” in the studies discussed above. At closer distances to the dredge vessel, it is highly likely that a behavioral response (discussed in the section below) will cause individuals to move to greater distances from the disturbance, thus reducing the risk of physiological damage. Moreover, the temporal factor – how long ATS may be exposed to the sounds of dredging – will be substantially less for this project than in the referenced studies as it is believed that when in the action area, ATS will be migrating, rather than spawning or congregating. Thus, it is highly unlikely that individuals will remain in the area for a period of time that could lead to extensive exposure to elevated levels of underwater noise. Accordingly, any resulting effects will be negligible.

Behavioral Effects

Available published studies on the effects of noise on fish behavior have not focused on longer duration activities such as dredging; rather their focus has been on short duration, high intensity activities, such as the use of seismic airguns. Although not appropriate as a direct comparison, insights into potential ATS responses may be gained. A study performed by Wardle et al. (2001) exposed fish to instantaneous sound levels between 195 and 218 dB (at ranges of 109 to 5.3 m [358-17 ft], respectively) and identified responses ranging from no obvious change in behavior to the fish exhibiting a mild “awareness” of the sound or a startle response, but otherwise no change in behavior. Slotte et al. (2004) observed fish undertaking small temporary movements for the duration of the sound to larger movements that might displace fish from their normal locations.

Sufficient species-specific data does not exist to quantitatively assess or predict the significance of minor alterations in ATS behavior; however, the studies above provide insight into the potential behavior response of ATS to dredge noise. Based on the information presented above, it is likely that the behavioral response of ATS to dredge noise, which is lower than the peak sound levels evaluated in the studies of Slotte et al. (2004) and Wardle et al. (2001), will be small, temporary movements away from the area being dredged. As the action area is not a known spawning ground, and is not believed to be a significant offshore foraging or resting ground, these minor movements away from the area being dredged will not cause substantial changes to essential ATS behaviors (e.g., reproduction, foraging, resting, and migration). As the extent of underwater noise will not present a barrier to ATS movements, if individuals are present within the vicinity of the action area, they are likely to veer/swim away from the dredge site and continue normal behaviors (e.g., feeding, resting, and migrating) in other portions of the action area and/or in other locations within Virginia coastal waters.

4.1.4. Interactions with Sediment Plume

Offshore Dredging and Transit

Dredging operations cause sediment to be suspended in the water column. Re-suspension of fine-grained dredged material during hopper dredging operations is caused by the dragheads as they are pulled through the sediment, turbulence generated by the vessel and its prop wash, and overflow of turbid water during hopper filling operations.

As dredged sediment settles on-board, water is released back to the ocean so that transported sediment contains less water. Suspended sediment at the draghead is generally localized and close to the bottom; however, the hopper overflow usually produces a “dynamic” plume (where highly turbid water forms a turbidity plume or current through the water column), a passive phase, and sometimes a near-bottom “pancaking” or laterally spreading turbidity current phase (MMS, 2004). Dredges are often equipped with under-hull release of overflow sediment and anti-turbidity valves, which reduce the extent of suspended sediment plumes generated by the overflow process.

Operations using hopper dredges tend to be discontinuous and associated plumes would be dispersed over a larger area. Hopper dredges trigger a small plume at the seabed from the draghead and a larger surface plume from the discharge of overspill of water with suspended sediment from the hopper (MMS, 1999). The length and shape of the surface plume generated by the overspill depends on the hydrodynamics of the water and the sediment grain size.

Although the volume of discharged material is much higher during construction aggregate dredging, findings from studies of these operations from overseas provide information on the potential behavior of turbidity plumes from dredging for beach restoration material (MMS, 1999). Detailed investigation of these types of operations off the coast of the United Kingdom found that most sediments in the plume settle out within 300 to 500 m (984 to 1,640 ft) from the dredge over a period of roughly 20 to 30 minutes and that suspended sediment concentrations returned to concentrations close to background level within an hour after completion of dredging (Hitchcock et al., 1999). The distance and time increased with decreasing sediment size. Hitchcock et al. (1999) reported that far field (i.e., greater than 500 m [1,640 ft]) visible plumes that extend beyond the boundaries of suspended sediment are comprised of organic compounds such as fats, lipids, and carbohydrates agitated by the dredging process. In a study summarizing measured suspended solids concentrations from five hopper dredging projects, Anchor Environmental (2003) reported nearfield total suspended solids (TSS) values ranging from 80.0 to 475.0 milligrams per liter (mg/L). The authors also indicate that the vast majority of re-suspended sediments resettle close to the dredge within one hour, and only a small fraction takes longer to resettle (Anchor Environmental, 2003). These findings correlate well with the USACE’s Dredging Engineering Manual (1983), which states that turbidity levels in the near-surface plume appear to decrease exponentially with increasing distance from the dredge due to settling and dispersion, quickly reaching concentrations less than 1 part per thousand (1,000 mg/L). USACE (1983) also notes that plume concentrations may exceed background concentrations at up to 1,220 m (4,000 ft) from the dredge.

Since the dominant substrate at the borrow sites is sand, it is expected to settle rapidly and cause less turbidity and oxygen demand than finer-grained sediments. No appreciable effects on dissolved oxygen, pH, or temperature are anticipated because the dredged material (sand) has low levels of organics and low biological oxygen demand. Additionally, dredging activities will

occur within the open ocean where the hydrodynamics of the water column are subject to mixing and exchange with oxygen rich surface waters. Ripple marks seen on the surface of both Unnamed Shoals A and B during the 2009 benthic video survey are evidence that wave energy reaches the seafloor and mixing of the water column occurs there. Any resultant water column turbidity would be short term (i.e., present for approximately an hour) and would not be expected to extend more than several thousand feet from the dredging operation. Accordingly, it is anticipated that the project would have only minor impacts on marine waters at either offshore borrow site.

Placement Site

A second source of potential impacts on sturgeon could be the nearshore zone where the slurry of dredged sediment and water are pumped out onto the beach. This will result in the increase in localized turbidity in the nearshore area. The Atlantic States Marine Fisheries Commission (Greene, 2002) review of the biological and physical impacts of beach nourishment cites several studies that report that the turbidity plume and elevated suspended solids levels drop off rapidly seaward of the sand placement operation. Wilber et al. (2006) evaluated the effects of a beach nourishment project along the coast of northern New Jersey and reported that maximum bottom surf zone and nearshore TSS concentrations related to nourishment activities were 64 mg/L and 34 mg/L, respectively, compared with respective maximum bottom concentrations of 81 mg/L and 425 mg/L after storms. Background maximum bottom TSS concentrations in the surf and nearshore zones on unnourished portions of the beach were less than 20 mg/L. Elevated TSS concentrations associated with the active beach nourishment site were limited to within 400 m (1,310 ft) of the discharge pipe in the swash zone. Other studies found that the turbidity plume and elevated TSS levels are expected to be limited to a narrow area of the swash zone up to 500 m (1,640 ft) downcurrent from the discharge pipe (Schubel et al., 1978; Burlas et al., 2001).

Given that the beach fill material proposed for the Wallops Island shoreline is coarser than the existing beach and has a low amount of fine-grained sediment, it is expected that the turbidity plume generated at the placement site will be comparable to those reported in similar projects—concentrated within the swash zone, dissipating within several hundred meters alongshore; and short term, only lasting several hours.

Sediment Plume Effects on ATS

Studies of the effects of turbid waters on fish suggest that concentrations of suspended solids can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton, 1993). The studies reviewed by Burton demonstrated lethal effects to fish at concentrations of 580 mg/L to 700,000 mg/L depending on species. Studies with striped bass adults showed that pre-spawners did not avoid concentrations of 954 to 1,920 mg/L to reach spawning sites (Summerfelt and Moiser, 1976; Combs, 1979 as cited in Burton, 1993). While there have been no directed studies on the effects of suspended solids on ATS, based on the best available information, ATS are assumed to be at least as tolerant to suspended sediment as other estuarine fish such as striped bass.

The life stages of ATS most vulnerable to increased sediment are eggs and larvae which are subject to burial and suffocation. However, given the geographic location of the proposed project (i.e., open ocean versus natal river where eggs and larvae are found), no eggs and/or larvae will be present in the action area; only sub-adults and adults will be present.

It is expected that juvenile and adult ATS are capable of avoiding a sediment plume by swimming higher in the water column. Laboratory studies (Niklitschek, 2001; Secor and Niklitschek, 2001) have demonstrated that sturgeon are able to actively avoid areas with unfavorable water quality conditions and that they will seek out more favorable conditions when available. While the increase in suspended sediments may cause ATS to alter their normal movements, any change in behavior is likely to be insignificant as it will only involve movement further up in the water column, or movement outside of the immediate vicinity of the dredging operation. Based on this information, any increase in suspended sediment is not likely to affect the movement of ATS between foraging areas and/or concentration areas during any phase of dredging or otherwise negatively affect ATS sturgeon in the action area.

4.1.5. Foraging

Offshore Dredging

Benthic organisms on nearshore shoals serve as a food source to ATS during migrations. Dredging sand from either offshore shoal would have an immediate adverse impact on the local benthic community of the shoal. Dredging operations will result in the alteration of existing biotic assemblages as well as the entrainment of the infauna and epifauna that reside within and on the sediment. Because the majority of the benthos live in the upper 15 cm (6 in) of sediment, a single pass of the dredge would remove approximately 0.3 m (1 ft) of sediment and would result in a substantial decrease in the abundance, biomass, and number of species of benthic organisms in the immediate area of the dredge cut. However, it is expected that there would be a negligible impact on the regional benthic ecosystem because: (1) the benthic assemblages on the sand shoals are not unique but are similar to assemblages in adjacent areas, and (2) the spatial extent of the dredged area is small compared to the broad area of the nearshore continental shelf.

In addition to the direct impacts on the benthos from the dredging operations, there may be indirect impacts as a result of changes to the sedimentary environment. Dredging causes the suspension of sediment, which increases turbidity over the bottom as a benthic plume. The deposition of this suspended sediment in adjacent areas can indirectly affect the benthos by covering the sediment surface and changing the physical characteristics of the sediment. However, benthos living on the nearshore continental shelf are adapted to sediment movements as a result of storm activity. This is evident from the ripple marks and bedforms in the video survey of the proposed SRIPP shoals which showed the frequent movement of surficial sediment around and on the shoals to create these features. Most macrobenthic organisms can burrow and move through a few centimeters of deposited sediment. Changes to the grain size of the sediment surface may affect larval settlement patterns as benthic larvae preferentially settle on particular sized sediment.

Because of the dynamic nature of benthic communities on the nearshore continental shelf and their variability over time, the recolonization and recovery of the dredged area can proceed at various rates. For example, a study conducted in summer months in coastal North Africa found that recolonization of a dredged area can begin in as short as a month, depending on the species (Guerra-Garcia and Garcia-Gomez 2006). However, the authors of this study note that such rapid recolonization could have been attributed to higher water temperature and associated turn-over rate. Moreover, a summary of post-dredge faunal recovery rates from 19 different projects in Europe and the U.S. compiled by Newell and Seiderer (2003) show a range from several weeks to more than ten years. The most rapid recovery rates were observed for muds and sands (i.e.,

several months up to two years); whereas the longest recovery periods (i.e., more than two years) were associated with gravel and reef habitats.

Given that NASA's identified offshore borrow sites, Unnamed Shoals A and B, consist of fine sand, it can be estimated that the required benthic recovery time would be on the order of one year following cessation of dredging. This is supported by a study conducted by Diaz et al. (2006), which evaluated the biological impacts of dredging on Sandbridge Shoal, a shoal located off the southern Virginia coast consisting primarily of medium to fine sands. Grab samples were collected within and outside a dredged area over a four year period, beginning six months prior to a dredge event in 2003. Samples were subsequently collected four months following the dredge cycle; then two months following a second dredge cycle. The final sampling was performed 14 months following the second dredge cycle. The authors reported that the most abundant taxonomic group was polychaetes, representing 73% of all organisms collected. The other 27% of individuals were amphiods (9%), bivalves (7%), lancelets (3%), and other groups. Their results showed no significant differences in macrofaunal abundance or biomass/production between areas that had and had not been dredged (Diaz et al., 2006); suggesting that dredging the area had no long-term impact on the availability of prey groups (e.g., polychaetes, amphipods) identified by Johnson et al. (1997) as important to ATS.

Depending on the time of year, benthos can recolonize the dredged area in varying degrees via larval recruitment as well as from immigration of adults from adjacent, undisturbed areas. Benthic abundances and total species numbers may reach pre-dredge amounts relatively quickly (e.g., within a year) dependent upon the time of year dredging occurs (Burlas et al., 2001; Posey and Alphin, 2002; Byrnes et al., 2004). Recovery should be most rapid if dredging is completed before seasonal increases in larval abundance and adult activity in the spring and early summer (Herbich, 2000).

In the early stages of recovery of the benthic community, there may be shifts in the dominant species in the dredged areas. There are several benthic species in this region of the Mid-Atlantic such as oligochaetes, the bivalve *Tellina* spp. and polychaete worm *Asabellides* that would likely recruit into the dredged area in any season (Diaz et al., 2004). There are species with life history characteristics, such as multiple reproductive events per year, which allow them to rapidly recolonize unoccupied space. These opportunistic species are adapted to exploit suitable habitat when it becomes available.

Borrow Areas in Context

Approximately 3.1 million m³ (4 million yd³) of sand would be dredged from Shoal A. To be conservative, it is assumed that the entire 210 hectare (ha) (515 acre [ac]) sub-area A-1 on Shoal A would be dredged for the initial beach fill requirements at a dredging depth of approximately 2 to 3 m (7 to 10 ft). Shoal A covers approximately 700 ha (1,800 ac), and Shoal B covers approximately 1,600 ha (3,900 ac). Therefore, during the dredging for the initial beach placement approximately 30 percent of the surface area of Shoal A would be affected. For renourishment cycles, either Shoal A or Shoal B would be used. Each renourishment cycle would require the dredging of approximately 770,000 m³ (1,007,500 yd³) of sand. Assuming a conservative uniform dredging depth of 2 m (7 ft), approximately 39 ha (95 ac) or approximately 6 percent of the total area of Shoal A or 3 percent of the total area of Shoal B would be dredged under each renourishment cycle. This could present several scenarios, the most conservative of which (from a benthic organism disturbance perspective) would be that "new," previously un-

dredged areas were targeted for each renourishment cycle. If this were the case, up to 555 ha (1,370 ac) of the 2,300 ha (5,700 ac) of the two-shoal study area would be disturbed over the 50-year project lifecycle.

When the shoals targeted for dredging are considered within the context of the entire complex of shoals off the Delmarva coast, it can be concluded that they are not necessarily unique habitats. A recent study by Dibajnia and Nairn (*in press*) identified 181 shoals between Delaware and Chesapeake Bays that were between the 10 m (33 ft) and 40 m (130 ft) depth contours and greater than 2 kilometers (1.2 miles) in length, all of which fit the general characteristics of Unnamed Shoals A and B and may harbor ATS during migration and overwintering. Assuming that these shoals are rectangular in shape, their surface area is estimated to be in excess of 238,765 ha (590,000 ac). It should be noted, however, that this is only a first-order approximation; the referenced study only focuses on shoals deemed to be economically viable for dredging and excludes shoreface attached shoals, shorter shoals, and those in deeper waters. Accordingly, available shoal habitat is larger. However, even under this conservative evaluation, the SRIPP will affect only 0.2 percent of the shoals within Dibajnia and Nairn's study area. Additionally, when compared to the nearly 1,035,995 ha (2,560,000 ac) of seafloor offshore of Maryland and Virginia, SRIPP dredging will affect approximately 0.05 percent of that area (NASA, 2010a), resulting in a negligible effect on available foraging habitat.

Placement Site

A study conducted off the coast of New Jersey by Burlas et al. (2001) identified nearshore infaunal assemblages consisting of polychaetes and amphipods, groups identified by Johnson et al. (1997) as ATS prey items. Although the area along the Wallops Island shoreline is not expected to have an abundance of prey and thus be an area of concentrated foraging, it is possible that ATS could be found within or adjacent to where sand would be placed.

Accordingly, the placement of fill along the Wallops Island shoreline could have adverse effects on available ATS food sources. Discharge of the dredged will bury existing subtidal benthic organisms seaward of the seawall, as well as intertidal organisms living on and within the interstitial areas of the rock seawall. Placement of the initial fill will bury the 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 will be permanently buried. In addition, approximately 91 ha (225 ac) of the subtidal benthic community along the existing seawall will be buried during the initial fill placement. A new beach will be formed in front of the seawall and a beach benthic community will become established. With the placement of fill and restoration of the beach, the composition of the benthic community along the seawall will fundamentally change. The community will change from one characterized by (1) sessile and mobile epifaunal organisms present throughout an intertidal zone on the hard substrate of the seawall, and (2) an adjacent subtidal sand bottom, to an exposed beach with a swash and surf zone. The presence of the seawall, and the hard habitat it currently provides to intertidal organisms, is an artificial condition that has developed from the erosion of the pre-existing beach.

Due to the handling and pumping activities, the dredged sand itself will also be devoid of live benthos. As a result, the recovery of benthos at the placement area will rely on immigration of adult organisms from adjacent undisturbed areas, as well as larval colonization from the water column. Recovery time of the benthos within the seaward surf zone is expected to be relatively rapid, even more rapid than the offshore borrow sites given the dynamic conditions within the

nearshore and surf zones. Burlas et al. (2001) estimated that the recovery time for benthos in their New Jersey study ranged from approximately 2 to 6 months when there is a good match between the fill material and the natural beach sediment.

Placement Site in Context

To put the amounts of similar, available nearby habitat into perspective, there is approximately 8,100 ha (20,000 ac) of relatively shallow, gently sloped sandy bottom between an area bounded by Chincoteague Inlet to the north, former Assawoman Inlet to the south, Wallops Island to the west, and the 3-nautical mile demarcation (at approximately 10 m (33 ft) depth contour) to the east. Within this context, slightly more than one percent of this area would be filled. This analysis area was chosen as a very conservative example of available habitat given that recent studies of coastal ATS depth preferences have identified waters inside of the 25 m (80 ft) depth contour (Dunton et al., 2010; Erickson et al., 2007; Stein et al., 2004a) as harboring the greatest number of individuals.

Effects on ATS Foraging

Based on the above information, while dredging and fill operations are likely to temporarily remove ATS foraging items from Shoal A and B and the nearshore area adjacent to the Wallops shoreline, the project is not likely to remove critical amounts of prey resources. When considered within the larger context of the available foraging habitat in the vicinity of the SRIPP, the project is likely to only temporarily disrupt normal feeding behaviors for ATS by causing them to move to alternate areas. In addition, the dredging activities are not likely to alter the habitat in any way that prevents ATS from using the project area as a migratory pathway to other nearby areas that may be more suitable for foraging.

For the initial fill cycle, dredging and fill placement will occur during spring and summer months, therefore the period required for full faunal recovery following dredging may be toward the longer end of reported times (up to a year or more offshore and 6 months or more nearshore). The timing of renourishment cycle dredging has not yet been decided; therefore it could occur within any season. However, regardless of the season within which dredging and fill placement will occur, it is anticipated that the frequency of each cycle will be approximately five years, which will allow more than adequate time for faunal recovery between dredge events.

4.2.Actions to Reduce Adverse Effects

To reduce the potential for unintended effects of the project on ATS, all previously established mitigation measures for listed species will also be applied to ATS, including NASA's requirement that a NMFS approved observer, trained in the identification of listed species and ATS, be present on the dredge. Any interactions with sturgeon will also be documented and promptly reported to NMFS consistent with requirements for other listed species. Additionally, if a sturgeon is encountered during dredging or vessel transit, NASA will require its contractor to slow the vessel to a safe speed to allow the fish to leave the vicinity before continuing operations. It is also expected that the use of a rigid deflector on each draghead, an already established mitigation measure intended to protect sea turtles at times of year when potentially in the action area, will also reduce the likelihood of entraining ATS when removing sand at the offshore shoals. Additional mitigation measures may be included as additional information on ATS becomes available. NASA will continue to work with NMFS to ensure that appropriate mitigation measures are in place.

4.3. Conclusion

The effects from the SRIPP on ATS should be minimal given the fact that the project will only disturb a limited amount of available ATS habitat and that all work will take place outside of spawning areas and locations where ATS are believed to congregate. However, NASA cannot entirely discount the possibility that the SRIPP will have adverse effects on ATS. Therefore, NASA concludes that the SRIPP “may affect, likely to adversely affect” ATS. With implementation of the above monitoring and mitigation measures, it is NASA’s belief that the effects will be minimized to the greatest extent possible.

5. Cumulative Effects

The ESA defines cumulative effects on listed species at 50 CFR 402.02 as “those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation.” NASA is aware of such cumulative impact-producing activities within the action area, most of which are related to commercial and recreational fishing and boating.

Although harvesting ATS has been outlawed in Virginia and Federal waters, some bycatch during legal fishing will continue to occur. Summaries of NOAA observer-monitored fishing trips between 1989-2000 prepared by Stein et al. (2004a) indicate that ATS have been caught within the general action area. NOAA observer data spanning years 2000-2004 reviewed by the ASSRT (2007) indicated that striped bass and flounder fisheries caused greatest amount of ATS bycatch; both of which are known to occur within the action area. Accordingly, both recreational and commercial fishing may result in incidental takes of ATS within the action area, with commercial sink gill nets, drift gill nets, and otter trawls likely to cause the majority of interactions. Overall, bottom set gill nets incur the greatest mortality of Atlantic sturgeon, compared to other gill nets or types of gear (Stein et al., 2004b). However, it is not clear to what extent these future activities would occur.

Additionally, poaching has been documented by the Virginia Marine Police (ASSRT, 2007). Despite the fact that the fishery has been closed coastwide since 1995, poaching of ATS continues and is a potentially significant threat to the species, but the present extent and magnitude of such activity is largely unknown (ASSRT, 2007).

Private vessel activities in the action area may adversely affect listed species in a number of ways, including boat strike, or harassment. It is not possible to predict whether additional impacts from these private activities will occur in the future.

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