National Aeronautics and
Space Administration

Final Environmental Assessment

NASA Wallops Flight Facility
Shoreline Enhancement and Restoration Project

June 2019

In Cooperation with:
Bureau of Ocean Energy Management
U.S. Army Corps of Engineers

Cover image:
Wallops Island in April 2019 – Photo Credit: Patrick J. Hendrickson / Highcamera.com

FINAL NASA WFF SHORELINE ENHANCEMENT AND RESTORATION PROJECT ENVIRONMENTAL ASSESSMENT

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Cooperating Agencies:	U.S. Bureau of Ocean Energy Management U.S. Army Corps of Engineers
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Date:	July 2019

Abstract:

In accordance with the National Environmental Policy Act, NASA has prepared this Environmental Assessment to assess the restoration of the Wallops Island shoreline at the Wallops Flight Facility, located in Accomack County, Virginia. Under the Proposed Action, NASA would fund the placement of up to approximately 1.3 million cubic yards of sand sourced from either the north Wallops Island beach or dredged from offshore Unnamed Shoal A. Additionally, NASA could construct a series of offshore parallel breakwaters approximately 200 feet offshore from the renourished beach. Resources evaluated in detail include coastal geology; water quality; the coastal zone; air quality; noise; benthos; wildlife; fish and Essential Fish Habitat; marine mammals; special status species; cultural resources; and recreation.

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Abbreviations and Acronyms

APE	area of potential effect
APHIS	U.S. Department of Agriculture Animal and Plant Health Inspection Service
ASTM	American Society for Testing and Materials
ATV	all-terrain vehicle
BMP	best management practice
BO	Biological Opinion
BOEM	Bureau of Ocean Energy Management
CAA	Clean Air Act
CEA	cumulative effects analysis
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CNWR	Chincoteague National Wildlife Refuge
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CWA	Clean Water Act
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
dBA	A-weighted decibel
dBpeak	instantaneous peak sound pressure level
dBRMS	root mean square sound pressure level
EA	Environmental Assessment
EPA	Environmental Protection Agency
EFH	Essential Fish Habitat
ESA	Endangered Species Act
°F	degrees Fahrenheit
FCD	Federal Consistency Determination
FONSI	Finding of No Significant Impact
GCM	Global Climate Model
GHG	greenhouse gases
HABS	Historic American Building Survey
HAP	Hazardous Air Pollutants
HAPC	Habitat Areas of Particular Concern
HIF	Horizontal Integration Facility
mm	millimeter
mm/year	millimeters per year
MMPA	Marine Mammal Protection Act
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NPR	NASA Procedural Requirement
NPS	National Park Service
NRHP	National Register of Historic Places
O_3	ozone
OCS	Outer Continental Shelf
Pa	Pascal
Pb	lead
PEIS	Programmatic Environmental Impact Statement
$PM_{2.5}$	Particulate matter less than 2.5 microns in diameter
PM_{10}	Particulate matter less than 10 microns in diameter
ROD	Record of Decision
SERP	Shoreline Enhancement and Restoration Project
SHPO	State Historic Preservation Office
SL	sound level
SO_2	sulfur dioxide
SPL	sound pressure level
SRIPP	Shoreline Restoration and Infrastructure Protection Program
TSS	Traffic Separation Schemes

U.S.	United States
U.S.C.	U.S. Code
VDHR	Virginia Department of Historic Resources
VDEQ	Virginia Department of Environmental Quality
VDOT	Virginia Department of Transportation
VMRC	Virginia Marine Resources Commission
WFF	Wallops Flight Facility

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

The National Aeronautics and Space Administration (NASA) has prepared this Environmental Assessment (EA) to evaluate the potential environmental impacts of both enhancing and restoring the shoreline on Wallops Island. This Shoreline Enhancement and Restoration Project (SERP) EA has been prepared by NASA in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States [U.S.] Code [U.S.C.] 4321-4347); the Council on Environmental Quality (CEQ) regulations implementing NEPA (Title 40 of the Code of Federal Regulations [CFR] Parts 1500-1508); NASA procedures for implementing NEPA (14 CFR 1216.3); and NASA Procedural Requirement (NPR) *Implementing the National Environmental Policy Act and Executive Order 12114* (NPR 8580.1). The U.S. Department of Interior Bureau of Ocean Energy Management (BOEM) and U.S. Army Corps of Engineers (USACE) Norfolk District are Cooperating Agencies with NASA in preparation of this EA, with NASA serving as the lead agency.

NASA has prepared this EA as a document tiered from the *2010 Final Shoreline Restoration and Infrastructure Protection Program (SRIPP) Final Programmatic Environmental Impact Statement (PEIS)*[1] with information and project components as presented in the *2013 Final Post-Hurricane Sandy EA* [2]. The *2010 Final SRIPP PEIS* and *2013 Final Post-Hurricane Sandy EA* are incorporated by reference with new information and analysis provided as appropriate.

1.2 BACKGROUND

On December 13, 2010, NASA issued a Record of Decision (ROD) for the Wallops Flight Facility (WFF) SRIPP PEIS, hereafter referred to as the *2010 Final SRIPP PEIS*. The U.S. Department of the Interior's BOEM and the USACE, Norfolk District were Cooperating Agencies. The primary goal of the SRIPP is to reduce direct damage to Wallops Island's infrastructure; however, its true benefit is the continued use of the island to support the aerospace programs that are at the core of WFF's mission (NASA 2010). The *2010 Final SRIPP PEIS* analyzed three action alternatives including structural and non-structural options, varying beach berm widths, and multiple sources of fill material. In its ROD, NASA selected *Alternative 1: Full Beach Fill, Seawall Extension* and adopted a suite of mitigation and monitoring protocols to both reduce potential environmental impacts and track project performance. Implementing the initial phase of Alternative 1 entailed: 1) the placement along the Wallops Island shoreline of approximately 3.2 million cubic yards of sand dredged from Unnamed Shoal A, located on the Outer Continental Shelf (OCS) in the Atlantic Ocean under BOEM jurisdiction; and 2) an initial 1,430 foot southerly extension of the Wallops Island rock seawall with future extensions completed as funds are available to a maximum length of 4,600 feet. An estimated nine beach renourishment cycles at approximately five year intervals would be implemented. The ROD stated that fill material for future renourishment cycles could be taken from either Unnamed Shoal A, Unnamed Shoal B, or north Wallops Island beach and left the specifics of how and when the fill material would be obtained to be addressed in future action-specific NEPA documentation.

[1] The *2010 Final SRIPP PEIS* is available online at: https://code200-external.gsfc.nasa.gov/250-wff/programmatic-environmental-impact-statement-shoreline-restoration-and-infrastructure-protection
[2] The *2013 Final Post-Hurricane Sandy EA* is available online at: https://code200-external.gsfc.nasa.gov/250-wff/wallops-island-post-hurricane-sandy-shoreline-repair-final-environmental-assessment-fea-and-finding

In October 2012, Hurricane Sandy made landfall. Monitoring surveys following the storm event identified the need to repair a section of the seawall and the southern two-thirds of the recently nourished beach. Public Law 113-2, *Disaster Relief Appropriations Act, 2013*, was signed into law on January 29, 2013. The bill included a provision for NASA to repair facilities that sustained damage during the hurricane. NASA signed a Finding of No Significant Impact (FONSI) on June 6, 2013, for the *Wallops Island Post-Hurricane Sandy Shoreline Repair Final Environmental Assessment* (NASA 2013), hereafter referred to as the *2013 Final Post-Hurricane Sandy EA*. Repairs to the seawall and beach renourishment were completed in September 2014. Subsequent storms including Hurricane Joaquin in 2015 and Winter Storm Jonas in 2016 reduced the sand volume in the southern portion of the project area by an average of 1,014,337 cubic yards as compared to volumes present after 2014 shoreline repair (USACE 2018a). Additional sand volume reduction occurred most recently in 2018 with Winter Storm Riley.

1.3 Cooperating Agencies

NASA, as the WFF property owner and project proponent, is the lead agency in preparing this EA. As with the *2010 Final SRIPP PEIS*, BOEM and USACE Norfolk District have served as Cooperating Agencies because they each possess both regulatory authority and specialized expertise regarding the Proposed Action. A Cooperating Agency, as defined in 40 CFR §1508.5, is "any federal agency other than a lead agency which has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major federal action significantly affecting the quality of the human environment."

BOEM has jurisdiction over mineral resources on the federal OCS. A Negotiated Noncompetitive Agreement pursuant to Section 30 CFR Part 583, would be negotiated among BOEM, USACE, and NASA to allow the dredging of sand from the OCS. Under Section 404 of the Clean Water Act (CWA), the USACE Regulatory Program has jurisdiction over the disposal of dredged and fill material in waters of the U.S. Similarly, under Section 10 of the Rivers and Harbors of Act of 1899, the USACE has jurisdiction over the placement of structures and work conducted in navigable waters of the U.S. NASA would require authorizations from both the BOEM and the USACE to undertake the proposed project.

In addition to its regulatory role in the project, the USACE Norfolk District is involved in project design, construction, and monitoring of SRIPP on NASA's behalf. Since issuing its 2010 ROD and 2013 FONSI, NASA and USACE oversaw the initial seawall extension between August 2011 and March 2012 and have nourished the beach twice, once during initial construction in 2012 and again in 2014. Beginning prior to the initial beach fill, both agencies have sponsored biannual (spring and fall) topographic and hydrographic monitoring surveys of the Wallops Island shoreline, which have demonstrated a trend in sediment transport from the southern portion of the project area to the north. Additionally, the USACE Norfolk District has evaluated using breakwaters along the Wallops Island shoreline to reduce the intensity of wave action to valuable assets and slow the rate of sediment transport.

1.4 Purpose and Need for the Proposed Action

1.4.1 Purpose

The purpose of the Proposed Action is to restore the Wallops Island shoreline in order to reduce the potential for damage to, or loss of, NASA, U.S. Navy, and Virginia Commercial Spaceflight Authority's Mid-Atlantic Regional Spaceport assets on Wallops Island from wave impacts associated with storm events.

1.4.2 NEED

The Proposed Action is needed because the shoreline's beach berm and dune system established to protect NASA's Wallops Island launch range infrastructure has been eroded through storm wind and wave damage; therefore, the existing beach cannot provide the level of storm damage reduction for which it was originally designed.

The constructed beach system has served its intended purpose of reducing damage to the range assets. However, a notable portion of sub-aerial (i.e., on land surface) sand has been relocated by storm winds and waves with a majority of this sand volume transported to the north end of Wallops Island. The effects of storms are most apparent within the southern half of Wallops Island, where the majority of the most critical launch assets are located. Within this area, the seaward half of the beach berm has been lowered by 3 feet or more. As such, the beach berm and dune system can no longer provide the level of storm damage reduction to which it was originally intended, without being restored to regain full functionality.

1.4.3 COOPERATING AGENCIES PURPOSE AND NEED

BOEM and USACE, as cooperating federal agencies, would each undertake a "connected action" (40 CFR 1508.25) that is related to, but unique from, NASA's Proposed Action, the funding of the project. The purpose of BOEM's Proposed Action is to consider NASA's request for the use of OCS sand resources in renourishing the Wallops Island beach. The purpose of USACE's Proposed Action is to consider NASA's request for authorization to: 1) discharge fill material into waters of the U.S. under Section 404 of the CWA; and 2) conduct work in navigable waters of the U.S. under Section 10 of the Rivers and Harbors Act. The BOEM and USACE Proposed Actions are needed to fulfill each agency's jurisdictional responsibilities under the OCS Lands Act, the CWA, and the Rivers and Harbors Act, respectively.

1.5 PUBLIC INVOLVEMENT

The steps taken to involve the public in the preparation of this SERP EA are outlined below.

- **Scoping** – Federal, state, and local agencies and members of the public were invited to provide input during the scoping period that began February 27, 2018, and ended March 29, 2018. Comments were received from the Accomack County Administrator, the Virginia Department of Environmental Quality (VDEQ), the Environmental Protection Agency (EPA), Virginia Marine Resources Commission, and the Pamunkey Indian Tribe. The comment letters received are provided in **Appendix A**. A project website has been established to keep all interested parties informed and to encourage public input: https://sites.wff.nasa.gov/code250/Tiered_Shoreline_Enhancement_and_Restoration_EA.html.
- **Draft EA** – The draft EA analyzed the environmental consequences of the Proposed Action and a range of reasonable alternatives, including no action alternative. It included the purpose and need for the Proposed Action, the description of the alternatives, the existing environmental conditions where the Proposed Action would take place, and the environmental consequences of implementing the alternatives. The Draft EA is supported by detailed technical studies.
- **Draft EA Notice of Availability (NOA) and Notice of Public Meeting** – Advertisements were placed in the following newspapers: *Chincoteague Beacon*, *Eastern Shore News*, *Eastern Shore Post,* and *The Daily Times*. The advertisements announced the availability of the Draft

EA for review and comment as well as the details of the public meeting held at the Wallops Flight Facility Visitor Center on December 19, 2018, from 5 to 7 p.m. An electronic version of the Draft EA, along with the advertisement of the public meeting, were available to the public on the NASA project website. Print copies of the Draft EA were available for review at the following locations: Chincoteague Island Library, Chincoteague, VA; Eastern Shore Public Library, Accomac, VA; Northampton Free Library, Nassawadox, VA; and the WFF Visitor Center, Rt. 175, Wallops Island, VA. Print copies were also available upon request.

- **Public Comment Period** – Federal, state, and local agencies and members of the public were invited to provide written comments on the Draft EA over a 30-day period. Electronic versions of all public meeting materials were available to the public on the project website. Written comments were accepted throughout the 30-day public comment period.
- **Final EA** – The Final EA incorporates changes, as appropriate, resulting from substantive comments. Changes include supplementing, improving, or modifying the analyses; and factual corrections.
- **Final EA NOA and FONSI** – Advertisements were placed in the following newspapers: *Chincoteague Beacon*, *Eastern Shore News*, *Eastern Shore Post*, and *The Daily Times*. The advertisements announce the availability of the Final EA and the FONSI. Electronic versions of the Final EA and FONSI are available to the public on the NASA public website and at the following locations: Chincoteague Island Library, Chincoteague, VA; Eastern Shore Public Library, Accomac, VA; Northampton Free Library, Nassawadox, VA; and the WFF Visitor Center, Rt. 175, Wallops Island, VA. .

1.5.1 Scoping Comment Summary

Table 1.5-1 provides a brief summary of the issues raised during the scoping period. Refer to **Appendix A** for the comment letters received during the scoping period.

Table 1.5-1. Summary of Scoping Issues

Comment	Addressed in EA?	If yes, location in PEIS; if no, rationale
EPA requests the list of federal and state permits required to implement the Proposed Action.	Yes	Section 3.1
How has shoal A diminished in volume since the 2013 Shoreline Repair EA; can it sustain additional dredging as a source of material for beach nourishment?	Yes	Section 2.3.3.2
What impacts would dredging Shoal A have on the habitat it provides for birds and invertebrates such as annelids, mollusks and crustaceans?	Yes	Sections 3.7 and 3.8
Please evaluate and discuss any impacts the Proposed Action may have on herpetofauna and any proposed avoidance and minimization measures.	Yes	Sections 3.8 and 3.11

Table 1.5-1. Summary of Scoping Issues		
Comment	**Addressed in EA?**	**If yes, location in PEIS; if no, rationale**
Please include discussion of any anticipated habitat creation for species such as the Piping Plover or Diamondback Terrapin and any monitoring of these species that will be conducted.	Yes	Sections 3.8 and 3.11
It would be helpful if the EA documented if offshore sandbars have formed since the additional sand was incorporated into the nearshore system. Please describe how any offshore sandbars formed since the Shoreline Repair EA may influence the construction of offshore breakwaters proposed in the SERP.	Yes	Section 3.2
Virginia Marine Resources Commission is concerned that a southern end jetty would affect longshore transport of sand to Assawoman Island.	No	No jetty is proposed.
Pamunkey Indian Tribe has requested notification of an inadvertent discovery of a cultural or religious site of significance	Yes	Section 3.12.3

1.5.2 Draft Comments Summary

Table 1.5-2 provides a brief summary of the substantive issues raised during the Draft EA review period that required changes to the Final EA. Refer to **Appendix B** for the comment letters received during the scoping period.

Table 1.5-2. Summary of Substantive Public Comments		
Comment	**Addressed in EA?**	**If yes, location in PEIS; if no, rationale**
Concerns that history of dredging Chincoteague Channel was not complete.	Yes	Table 3.2.1 was updated with dredging history for Chincoteague Inlet 1993-present
Questions about required mitigations and monitoring of natural resources during and after proposed activities.	Yes	The following sections were updated based on required permitting and consultations: • 3.4 – Coastal Zone Management Act Consultation • 3.9 – Essential Fish Habitat Consultation • 3.11 – Endangered Species Act Consultation

Based upon consultations with resource agencies, and its own internal review, NASA made the following substantive changes to the document which are reflected in this Final EA:

- A summary of the Coastal Zone Management Act consultation has been added to Section 3.4;
- A summary of the Essential Fish Habitat consultation has been added to Section 3.9;
- A summary of Endangered Species Act consultation has been added to Section 3.11;
- Comments received on the Draft EA have been included as Appendix B;
- The Biological Opinion issued by the U.S. Fish and Wildlife Service has been added to Appendix G
- The USACE Individual Permit for the project has been added as Appendix I

2.0 DESCRIPTION OF PROPOSED ACTION AND NO ACTION ALTERNATIVE

2.1 INTRODUCTION

This section provides a discussion of the alternatives under consideration for the restoration of the Wallops Island shoreline. The *2010 Final SRIPP PEIS* considered in detail a range of potential storm damage reduction alternatives, including structural and non-structural options, varying beach berm widths, and multiple sources of fill material. Based upon a combination of economic, engineering, and environmental factors in its ROD, NASA selected for implementation *Alternative 1: Full Beach Fill, Seawall Extension*. The initial phase of the 50 year SRIPP project was completed in August 2012. However, within two months of completion, the effects of Hurricane Sandy damaged the southern two-thirds of the recently renourished beach including a portion of the rock seawall; post-Hurricane Sandy repairs were completed in 2014. The effects of subsequent storms have greatly reduced the shoreline most notably within the southern half of the Wallops Island beach where many of the most critical launch assets are located. Therefore, the focus of this EA is to regain function of the Wallops Island beach berm and dune system to reduce storm damage as described and analyzed in the *2010 Final SRIPP PEIS*.

2.2 PROPOSED ACTION

Consistent with the renourishment component of Alternative 1 described in detail in the *2010 Final SRIPP PEIS* and reexamined in the *2013 Final Post-Hurricane Sandy EA*, NASA's Proposed Action is to renourish the beach along the Wallops Island shoreline infrastructure protection area. Before the renourishment, NASA may construct a series of parallel nearshore breakwater structures that would reduce the intensity of wave action and slow sediment transport.

2.2.1 ELEMENTS COMMON TO ALL ALTERNATIVES

2.2.1.1 Beach Renourishment

Approximately 1.3 million cubic yards of sand material would be placed on the shoreline areas that have sustained berm and dune system reductions (**Figure 2.2-1)**. Material for renourishment could come from the north Wallops Island beach, an area that has been accreting due to transport of material from the south, or from Unnamed Shoal A, which was used as a sand source for previous renourishment projects. Detailed descriptions of these two alternatives are provided in **Section 2.3, Alternatives Carried Forward for Detailed Analysis**.

If work were conducted between April and September, NASA would ensure that the work site and adjacent areas would be surveyed for nesting birds and sea turtles by a biological monitor on a daily basis. Survey protocols would be the same as those developed for the initial beach fill and seawall extension (NASA 2011a). The biological monitor would coordinate directly with onsite project employees to ensure that all parties are made aware of nesting status and any need to suspend or relocate work activities until chicks have fledged and/or sea turtles have hatched.

Figure 2.2-1. Approximate Beach Renourishment Area

2.2.1.2 Post-Renourishment Activities

Once renourishment and grading are complete, dune grasses would be planted along the renourished dune (**Figure 2.2-2**). As described in detail in the *2010 Final SRIPP PEIS*, NASA and USACE would also resume the regular beach profile monitoring of the project site once beach renourishment activities have been completed.

Figure 2.2-2. Beach Post-Renourishment Activity, Planting Dune Grasses

2.3 ALTERNATIVES CARRIED FORWARD FOR DETAILED ANALYSIS

2.3.1 NO ACTION ALTERNATIVE

CEQ regulations require that an agency "include the alternative of no action" as one of the alternatives it considers (40 CFR 1502.14[d]). The No Action Alternative serves as a baseline against which the impacts of the Proposed Action are compared. Under the No Action Alternative for this SERP EA, NASA would not restore the Wallops Island shoreline infrastructure protection area beach and dune system to their full functionality or construct nearshore breakwater structures.

2.3.2 ALTERNATIVE 1: RENOURISHMENT ONLY WITH SAND FROM NORTH WALLOPS ISLAND BEACH

Alternative 1 would use sand from an existing beach at the northern end of Wallops Island to renourish the beach along the shoreline infrastructure protection area. USACE modeling showed that prior to the initial shoreline restoration, on average, approximately 40,000 cubic yards of sediment per year was accumulating at the northern end of Wallops Island by longshore transport from the south (NASA 2010). A requirement of the *2010 Final SRIPP PEIS* was the establishment of semiannual (fall and spring) beach monitoring. The Fall 2017 Monitoring Report (USACE 2018a), which described high erosion rates and substantial losses of sediment in the southern portion of the project area and significant accretion resulting from longshore transport in the northern portion of the project area.

USACE calculated that 1.7 million cubic yards of sand is available at the north Wallops Island borrow area, more than enough to provide the 1.3 million cubic yards required for the proposed renourishment. Based on vegetation and wildlife habitat constraints (such as avoiding areas of most dense vegetation and bird and sea turtle nesting season), the total potential area for sand removal is approximately 200 acres. Excavation depth would be to an average of -2.35 feet above mean sea level (**Figure 2.3-1**).

Figure 2.3-1. Approximate Backpassing Borrow Area

Using sand from the northern end of Wallops Island would offer a material without the mobilization and operational costs associated with offshore dredging. Sediment transported alongshore to the north from a previous fill cycle would be of the proper grain size and could be effectively recycled, or “backpassed” by excavating it and placing it in eroding areas in the southern project area.

A pan excavator would likely be used to remove sand from north Wallops Island beach. Because it 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 sand would be stockpiled and then loaded onto dump trucks for transport down the beach. Based on an average 12 cubic yard capacity of a 10 wheel dump truck, is estimated that 108,000 loads would be required to move the sand. Bulldozers would be used to spread the fill material once it is placed on the beach. Other onshore equipment may include all-terrain vehicles (ATVs), an office trailer, mobile generators, construction site lighting, and mobile fuel tanks. 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.

Prior to excavation, a pre-project topographic and hydrographic survey would be conducted. Multiple survey crews would employ ATVs and light trucks to conduct pre-project surveys of the project site.

2.3.3 Alternative 2: Renourishment Only With Sand from Unnamed Shoal A

Alternative 2 would renourish the beach along the Wallops Island shoreline infrastructure protection area using material from OCS Unnamed Shoal A, an offshore sand ridge located at the southern end of the Assateague ridge field. In 2010, the surface area was measured at approximately 1,800 acres. Up to 515 acres of the shoal (sub-area A-1) were dredged to produce approximately 3.2 million cubic yards of material for the initial beach fill cycle. An additional 800,000 cubic yards were dredged from the same area (sub-area A-1) for the post-Hurricane Sandy repairs.

2.3.3.1 Beach Fill Mobilization

The first phase of the beach fill portion of the project would involve the dredge contractor transporting equipment and materials to the project site. Offshore equipment would include at least several miles of discharge pipe, pumpout buoys, multiple barges, tugboats, derricks, and smaller crew transportation vessels (**Figure 2.3-2**).

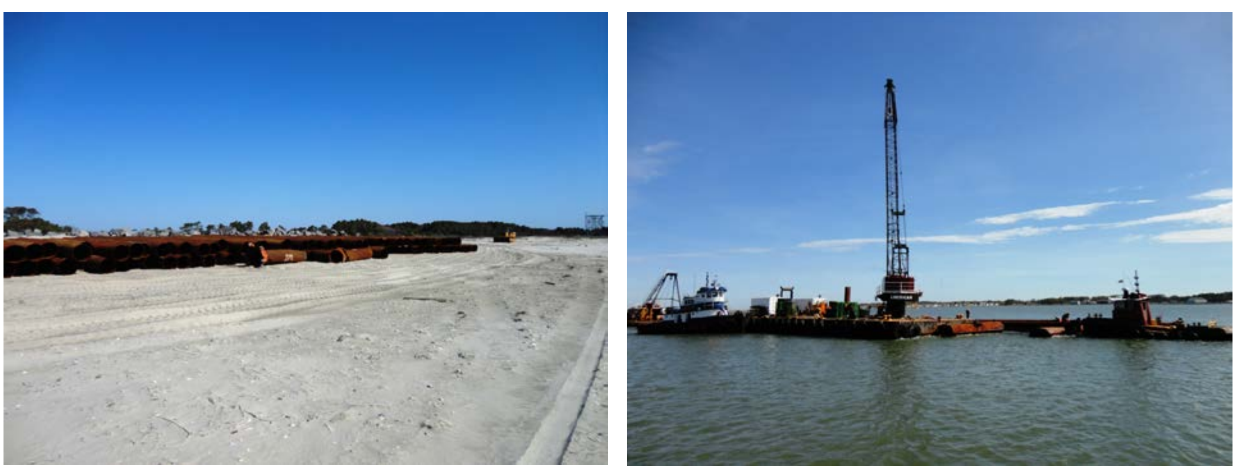

Figure 2.3-2. Beach Fill Mobilization, Onshore Staging (left) and Offshore Equipment (right)

Based on experience gained during the initial beach fill cycle in 2012 and implemented during the post-Hurricane Sandy restoration in 2014, it is expected that the discharge lines would be assembled inside the protected waters of Chincoteague Inlet, then "rafted" together, and floated to their ultimate placement site as weather conditions allow. Onshore, it is expected that sections of the discharge lines would be trucked in, staged, and placed using a front-end loader or crane. Other onshore support equipment would likely be trucked in and include multiple bulldozers, several ATVs, an office trailer, mobile generators, construction site lighting, and mobile fuel tanks. The mobilization is expected to take 30 to 45 days.

2.3.3.2 Dredging and Sand Placement Process

Upon receipt of all necessary authorizations, the USACE (on NASA's behalf) would contract the placement of approximately 1.3 million cubic yards of sand. The dredging process would employ one or more munitions and explosives of concern (MEC) screened trailing suction hopper dredges to obtain material. The dredging process would be cyclic in nature, with the vessel transiting to the borrow area, lowering its dragarms, filling its hopper, and returning to a discharge site. Approximately 2 miles east of Wallops Island in 25 to 30 feet of water, the dredge would connect to the floating end of the submerged pipeline temporarily placed on the seafloor. The sand/water slurry would be pumped through this pipeline to the beach. All dredging and equipment placement would take place in areas previously surveyed as part of the analyses associated with the *2010 Final SRIPP PEIS* and the *2013 Post-Hurricane Sandy EA.*

Once the hopper has discharged its entire load, the dredge would return to the borrow area to remove more material.

Because of overflow from the hopper dredge at the borrow area during dredging and losses during discharge and placement, a larger volume of material would need to be dredged to meet the targeted fill volume. As with the *2013 Post-Hurricane Sandy EA*, sediment losses during dredging and placement operations are assumed to be up to 25 percent. Using this estimate, the dredged volume for the proposed renourishment would be approximately 1.625 million cubic yards.

Dredging would be conducted in a manner generally consistent with the recommendations of two publications examining the effects of dredging of offshore shoals in the mid-Atlantic as presented in the *2010 Final SRIPP PEIS*. More specifically, NASA would:

- Dredge offshore sand from Unnamed Shoal A sub-area A-1 (an accretional area);
- Dredge over a large area and not create deep pits;
- Require that cut depth not be excessive (approximately 7 to 10 feet);
- Require that dredging not occur over the entire length of the shoal;
- Require MEC screening at the drag head; and
- Ensure that if dredging occurs during migration season, certified whale and/or sea turtle watchers would be required on the dredging vessel.

The ROD for the *2010 Final SRIPP PEIS* states that dredged depth be limited to not more than 9.8 feet. To date, an average cut of 4 feet occurred in 2012 and 1.1 foot in 2014 (Bonsteel 2015).

Nearshore, it is expected that the contractor would employ one or more anchored pumpout stations approximately 2 miles east of Wallops Island in 25 to 30 feet of water. Up to several miles of submerged steel pipeline would be temporarily placed on the seafloor in areas previously cleared for cultural resources and/or on hard bottom. The sand/water slurry would be pumped from the dredge through the pipeline to the beach.

As the sand slurry is discharged onto the shoreline, bulldozers would grade the material (**Figure 2.3-3**) to the desired design template, which is proposed to include an additional foot of berm elevation (raised from +6 feet to +7 feet referencing North American Vertical Datum of 1988) as compared to the initial beach fill. The purpose of this design change would be to provide an additional buffer during storm conditions.

Figure 2.3-3. Dredging and Sand Placement Process, Trailing Suction Hopper (left) and Bulldozers Grading Discharge Sand (right)

The time in the tidal cycle would factor into the location on the beach within which the equipment would work for a given dredge load. During low tide, the equipment would likely concentrate on the intertidal and subtidal zones, whereas during high tide, work would be focused on the upper beach berm and dune. After each section of beach is confirmed to meet design criteria, the process would continue in the longshore direction, with sections of discharge pipe added as it progresses.

The dredging and beach fill portion of the project is expected to take 3 months. At the conclusion of dredging and beach fill, the construction contractor would begin the demobilization phase of the project, the largest task of which would be the disassembly, staging, and loading of discharge piping for transport offsite.

2.3.3.3 Pre- and Post-Dredging Surveys

Another important component of the mobilization phase is the performance of pre-project topographic and hydrographic surveys. Offshore, the dredge contractor would employ vessels to conduct pre- and post-dredging surveys at the borrow site to assess morphological changes of the shoals. Surveys would also be conducted of the nearshore zone within which dredge pumpout equipment would be placed, and the shallower areas of proposed transit routes. Onshore, multiple survey crews would employ ATVs and light trucks to conduct pre- and post-renourishment surveys of the project site.

2.3.4 ALTERNATIVE 3: RENOURISHMENT AND CONSTRUCTION OF NEARSHORE DETACHED PARALLEL BREAKWATERS

Nearshore breakwaters reduce the amount of storm related wave energy reaching protected upland areas as well as slow the rate of longshore sediment transport thereby increasing the longevity of a beach fill project. Because previous renourishments provided only temporary protection, NASA requested the USACE Norfolk District Hydraulics and Hydrology Section to evaluate the effectiveness of constructing a breakwater or series of breakwaters along the Wallops Island shoreline to reduce the rate of sediment transport. Their analysis employed numerical modeling to determine the size and placement of breakwater(s) that would address the erosion issues. The model evaluated seven alternative configurations with varying placement, size, and number of breakwaters and calculated how each alternative affected shoreline stabilization and sediment transport (USACE 2018b). Based on this analysis, a series of rubble mound breakwaters would be constructed under Alternative 3, prior to the renourishment actions described in either Alternative 1 or Alternative 2. The breakwaters would be placed in areas offshore from critical launch assets, approximately 200 feet offshore from the mean high water line of the Wallops Island shoreline infrastructure protection renourishment area. Each breakwater would be constructed of Virginia Department of Transportation (VDOT) Type I armor stone for the outer layer, which ranges from 0.75 to 2 tons, and VDOT Class II Stone for the core layer, which ranges from 150 to 499 pounds. All stone would be placed parallel to the shore on top of approximately 130 feet long of prefabricated geotextile marine mattresses. The breakwaters would measure approximately 10 feet wide at top crest elevation and would be placed approximately 100 feet apart from each other. Water depths in these areas is approximately 4 to 8 feet. The breakwaters would be positioned offshore of Launch Pad 0-B and continue north to the Horizontal Integration Facility (HIF; Building X-079). Depending upon economic, engineering, and environmental factors, the initial series may be broken into smaller series of three breakwaters offshore of Launch Pad 0-B and another three offshore of the HIF. The USACE modeling showed that this configuration could reduce wave energy, resulting in slower shoreline erosion, while still allowing shoreline growth to the north (**Figure 2.4-1**) (USACE 2018b).

The rocks for constructing each breakwater would be transported to the breakwater construction area by barge or to the WFF area by rail, offloaded, and then barged to the handling or placement site offshore of Wallops Island. Construction, estimated to last approximately 6 to 9 months, would take place in the water using a barge and heavy lifting equipment. These breakwaters would be permanent structures as removal would be impractical and cost prohibitive (NASA 2010).

Once offshore breakwaters are constructed, beach renourishment would occur using material sourced from either the north Wallops Island beach or Unnamed Shoal A, as described above in Alternatives 1 and 2, respectively.

2.4 Alternatives Considered But Not Carried Forward

2.4.1 Excavation from North Wallops Island Beach and Dredging from Unnamed Shoal A

One alternative considered was to source sand from both the north Wallops Island beach and from Unnamed Shoal A; however, it was determined that utilizing sand from both sources would be inefficient and too costly. Vessel mobilization and demobilization costs associated with dredging Unnamed Shoal A would be the same whether sourcing sand for either a partial or a full beach renourishment from the borrow site.

2.4.2 Excavation from North Wallops Island Beach Via Sand Slurry Pipeline

Using a system of pipes to move sand from the north Wallops Island beach in slurry form was also considered. This alternative was also eliminated from detailed consideration because water would have to be added to dry sand and a number of pumping stations would be required to transfer the resulting slurry over the distance of more than four miles. Additionally, if launches were scheduled during the renourishment, piping would have to be removed prior to launch and remobilized afterward, thereby, requiring additional cost and delays in the project schedule.

Figure 2.4-1. Proposed Locations of Offshore Parallel Breakwaters

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3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 ANALYSIS APPROACH

NEPA requires focused analysis of the areas and resources potentially affected by an action or alternative. It also provides that an EA should consider, but not analyze in detail, those areas or resources not potentially affected by the proposal. NEPA also requires a comparative analysis that allows decision makers and the public to differentiate among the alternatives. CEQ regulations (40 CFR §§ 1500-1508) for NEPA require an EA to discuss impacts in proportion to their significance and present only enough discussion of other than significant issues to show why more study is not warranted.

The analysis in this EA considers the existing conditions of the affected environment and compares those to conditions that might occur should WFF implement the alternatives under the Proposed Action or the No Action alternative.

The *2010 Final SRIPP PEIS* presented a complete description of all project related resource areas with relevant, updated descriptions and information presented in the *2013 Post-Hurricane Sandy EA.* As such, only those resources that have measurably changed or would be notably affected are discussed in this SERP EA; all other resources are incorporated by reference.

3.1.1 AFFECTED RESOURCES

Resources that have the potential to be affected by implementing the Proposed Action are carried forward for detailed analysis in this SERP EA. **Table 3.1-1** provides the list of resources carried forward for detailed analysis, the section the analysis is located, and regulatory permits that would be required prior to implementing the Proposed Action.

Table 3.1-1. Resources Carried Forward for Detailed Analysis in this SERP EA

Resource	Analysis Section	Regulatory Consultation or Permit
Coastal Geology and Processes	Section 3.2	none
Water Quality	Section 3.3	Individual Permit from USACE Dune and Subaqueous Permits from VMRC
Coastal Zone Management	Section 3.4	Federal Consistency Determination with DEQ
Air Quality	Section 3.5	none
Noise	Section 3.6	none
Benthos	Section 3.7	none
Wildlife	Section 3.8	none
Fisheries and Essential Fish Habitat	Section 3.9	Essential Fish Habitat Assessment with NMFS
Marine Mammals	Section 3.10	none
Special Status Species	Section 3.11	ESA Consultation with NMFS and USFWS
Cultural Resources	Section 3.12	NHPA Consultation with SHPO
Recreation Resources	Section 3.13	none

Legend: USACE – US Army Corps of Engineers; VMRC – Virginia Marine Resources Commission; DEQ – Virginia Department of Environmental Quality; NMFS – National Marine Fisheries Service; ESA – Endangered Species Act; USFWS – U.S. Fish and Wildlife Service;
NHPA – National Historic Preservation Act; SHPO – State Historic Preservation Office.

Numerous other resources were considered; however, the potential impacts would be negligible as documented in the *2010 Final SRIPP PEIS.* As such, the list of resources not carried forward for detailed analysis warrant no further evaluation. **Table 3.1-2** provides the list of resources not carried forward for detailed analysis.

Table 3.1-2. Resources Considered But Not Carried Forward for Detailed Analysis in this SERP EA

Floodplains	*2010 Final SRIPP PEIS* concluded there would be a negligible impact to each of these resources.
Hazardous Materials and Waste	
Vegetation	
Plankton	
Invertebrate Nekton	
Land Use	
Infrastructure and Utilities	
Socioeconomics	
Health and Safety	
Environmental Justice	
Recreation – Offshore	

3.2 Coastal Geology and Processes

The interaction of wave, wind, and tidal energies determine how erosional and depositional processes shape coastlines. Sections 3.1.4 and 3.1.5 of the *2010 Final SRIPP PEIS* describe in detail the coastal processes influencing the project area and updated information is presented in Section 3.1.1 of the *2013 Post-Hurricane Sandy EA*. This section provides a summary of information presented in these documents and describes impacts expected to result from the Proposed Action.

3.2.1 Affected Environment

Wallops Island is one of the twelve Virginia barrier islands that front the Atlantic Ocean. Though it is morphologically similar to neighboring islands and is shaped by the interplay of waves and tide, localized processes occurring over both the short and long term have led to Wallops Island being distinct from other barrier islands in Virginia. Generally, net sediment transport along the Virginia barrier islands is from north to south. However, along much of Wallops Island, the direction of net longshore sediment transport is toward the north, due primarily to the growth and resulting wave sheltering effects of Fishing Point at the south end of Assateague Island (King *et al*. 2010). In addition to the northerly sediment transport, the westward drift of Chincoteague Inlet ebb shoals in the cross shore direction contributes to the rapid growth of north Wallops Island beach. This sediment accumulation is changing the existing north-south shoreline orientation to one that is oriented more east-west.

Of the Virginia barrier islands, Wallops Island is the only one that has been developed or nourished. With the exception of federally sponsored recreational beach parking area repairs on south Assateague Island, the other islands are managed for conservation and are driven by natural forces. Sediment samples collected on Wallops Island in 2007 and 2009 indicated native median grain sizes ranging from approximately 0.18 to 0.27 millimeter (mm), corresponding to fine sand per the American Society for Testing and Materials (ASTM) unified classification system. Samples collected during the initial beach fill indicate that the sediment within the nourished portion of the beach is coarser, with median grain sizes between approximately 0.28 and 0.54 mm, corresponding to fine to medium sand per ASTM (NASA 2013).

The *2010 Final SRIPP PEIS* included implementation of semiannual topographic and hydrographic beach profile monitoring to evaluate the performance of beach fill projects and to identify the need for future renourishment. Each spring and fall, data are collected from the southern tip of Assateague Island / Toms Cove through Wallops / Assawoman Islands south to Gargathy Inlet. The data collected to date illustrate a general trend of substantial loss of material in the southern portion of Wallops Island and significant volume gain to the north. The data show no evidence of formation of offshore sandbars or impacts to Chincoteague Inlet to the north (USACE 2018a). This monitoring program will continue.

Unnamed Shoal A is an unvegetated offshore sand ridge located approximately 7 miles east of Assateague Island and approximately 11 miles northeast of Wallops Island.

3.2.1.1 Consideration of Sea Level Rise

Coastal environments are highly dynamic and particularly vulnerable to climate change. The impacts of climate change at WFF includes rising sea levels, more frequent flooding, and increasingly intense, unevenly distributed rain events resulting in detrimental impacts to WFF infrastructure. Most of Wallops Island is less than 10 feet above mean sea level (MSL), with the sandy area approximately 6.9 feet above MSL and the highest elevation approximately 15 feet above MSL. Sea level rise, storm surges from hurricanes and nor’easters are increasingly make natural and built systems vulnerable to disruption or damage.

For the purposes of projecting changes affecting Wallops Island, MSL data collected by the National Oceanic and Atmospheric Administration (NOAA) from two stations nearest to WFF (Wachapreague, Virginia (VA) and Ocean City, Maryland) were examined. Data collected from long term tidal gauges in Wachapreague indicate that between 1978 and 2017, the relative sea level trend is 5.35 millimeters per year (mm/year) (+/-0.76 mm/year), the equivalent to a change of 1.76 feet in 100 years (NOAA 2018a). At Ocean City, data indicate the relative sea level trend is 5.59 mm/year (+/- 0.87 mm/year) based on monthly MSL data from 1975 to 2017 which is equivalent to a change of 1.83 feet in 100 years (NOAA 2018b).

3.2.2 Environmental Consequences

Sections 4.2.1 through 4.2.3 of the *2010 Final SRIPP PEIS* as well as Section 3.1.1.2 of the *2013 Post-Hurricane Sandy EA* describe in detail the expected effects of dredging and beach renourishment on coastal processes. This section provides a summary applicable to the No Action Alternative and the alternatives to the Proposed Action.

3.2.2.1 No Action Alternative

Under the No Action Alternative, renourishment of the Wallops Island shoreline infrastructure protection area would not occur. It is expected that the north Wallops Island beach would continue to grow, and the remaining areas to the south including the shoreline infrastructure protection area would continue to erode at historical rates exacerbated by the frequency and intensity of future storm events. Over time, the shoreline infrastructure protection area would continue to narrow until the rock seawall is undermined and eventually fails, jeopardizing the existing infrastructure.

3.2.2.2 Alternative 1

The removal of sand from the north end of Wallops Island would lower topography within the footprint of the excavated areas. This accretion area on the north end of Wallops Island is expected to continue to grow as a result of the littoral transport of sand from the renourished beach as well as from Assateague Island. Thus, the impacts from sediment removal from the north Wallops Island beach would be mitigated by the redeposition of sediment from ongoing littoral processes. While the use of the north Wallops Island beach as a sand source would result in direct, short term adverse impacts on the shoreline in that area for a few months, with full recovery projected 4 to 6 years after excavation activities, in the long term using the sand in this area is not anticipated to result in significant changes to the shoreline.

Renourishment of the beach at the Wallops Island shoreline infrastructure protection area (see **Figure 2.2-1**) would result in a new shoreline extending several hundred feet offshore from the current shoreline. The new beach profile would provide increased wave dissipation and added protection from storm events for the onshore infrastructure. After the initial placement, there would be an equilibration period during which there would be a rapid loss of sand offshore to fill in deeper portions of the beach profile. Analysis of sediment samples from the borrow area indicate only trace amounts of silt and other fine sediments (NASA 2010), which would result in limited increase of water turbidity during longshore sediment transport and equilibration of the borrow sand. The new beach profile would continue to adjust to the minor changes in borrow material sediment size, local wind and wave, climate and tidal action. Adjustments may be episodic as spring tides and/or storms result in transport of the borrow material.

Over time, the new beach would be reshaped until it is in equilibrium with the natural forces and assume a normal profile (Wilson *et al*. 2017). However, this profile would shift with seasonal differences in wave action. Higher wave energy during the winter would likely steepen the beach profile with some of the sand moved offshore into a bar system. During the lower energy summer months, the beach profile would tend to flatten out as sand from the offshore bar system is moved back onto the beach face. The onshore-offshore beach dynamics would also be influenced by the littoral transport of the sand both to the north and to the south depending upon the direction of incident wave action. Transport to the north should be recaptured at the north end as wave action is diminished in the lee of Assateague Island. Transport to the south would eventually provide additional sand resources to the barrier islands south of Wallops Island. The construction of the new dune would provide additional infrastructure protection during major storm events.

This alternative could have short term minor impacts to onshore and nearshore sediments resulting from the accidental release of petroleum products, or other contaminants from construction vehicles and heavy equipment used to remove, transport and deposit the sand. The potential for such construction-related impacts to occur would be minimal as contractors would implement best management practices (BMPs) for vehicle and equipment fueling and maintenance as well as site specific spill prevention and control measures (NASA 2010).

The primary offshore impacts of the beach renourishment would likely be the formation of an offshore bar system and changes in local bathymetry that reduce the slope of the offshore portion of the beach profile. Any offshore bar system that may form would be both dynamic and seasonal. Wave action would constantly form and reform these bars moving them onshore, offshore and along the shore. They may also appear and disappear depending on wind and wave action and storm events. There would also be a seasonal component to their location and configuration with bars being more prominent during the winter and less pronounced during the summer as described above.

The adjacent Chincoteague Channel would not likely be affected by use of the north Wallops Island beach as a sand source. Excavation within the proposed borrow area to -2.35 feet above MSL (**Figure 2.3-1**) would not likely alter the cross-sectional area of the channel or influence current velocities in any meaningful way. The Chincoteague Inlet is dynamic and periodically dredged for depth maintenance (see **Table 3.2-1**). The only likely consequence would be reestablishment of sand accumulation on the north end of Wallops Island.

Table 3.2-1. Historic Dredging of Chincoteague Inlet

Beginning Date	Volume Dredged (cubic yards)
March 1993	112,169
March 1994	123,333
March 1995	120,835
June 1996	120,079
November 1997	122,898
July 1998	72,592
September 2002	91,292
November 2003	12,261
March 2006	71,009
March 2008	63,841
August 2014	11,015
January 2015	13,300
December 2015	3,600
Various dates 2017	26,285
February 2018	8,745
September 2018	4,245
October 2018	8,315

Sources: Wood personal communication, 2019

3.2.2.3 Alternative 2

The onshore and nearshore impacts of Alternative 2 would be very similar to those for the beach renourishment component of Alternative 1. The only difference would be that the sand would be delivered as slurry from the dredge instead of being truck hauled.

As with previous renourishment projects, removal of material from Unnamed Shoal A would be done in a uniform manner across the areal extent of sub-area A-1 in accordance with the mitigation requirements described above in **Section 2.3.3.2, Dredging and Sand Placement Process**. Survey Area Cross-Section Profiles collected before and after the 2012 and 2014 dredge events show the effectiveness of these measures (Bonsteel 2015). For this renourishment, approximately two-thirds of the southern half of the shoal's elevation would be lowered by an additional 1.5 to 3 feet, with some areas approaching an additional 10 feet below the current profile. While cut depths on the order of 5 to 10 feet would not be necessary over the entire borrow area to obtain the targeted fill volume, they could occur in some places due to the inherent limitations in precision associated with operating a dredge in the open ocean. As proposed, the elevation of the northern portion of the shoal (sub-area A-2) would remain the same.

The conservative model-based analysis performed for the *2010 Final SRIPP PEIS* indicated that even if a 2 square mile area of the shoal was "planed" to an elevation necessary to obtain up to 10 million cubic yards 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 additional lowering of the shoal would cause any measurable reduction in wave sheltering effects on properties to the west of the borrow area. Dredging the borrow area would again create steeply sloped areas of micro-topography, which would be smoothed by tidal and wave energy in the years following the dredge event. The lowering of the shoal's topography would be a longer-term effect, with the shoal maintaining the same general morphology but at a lower elevation and different profile. Changes of this type and order would be expected based on past analyses of Unnamed Shoal A bathymetric surveys conducted before and after each prior dredging effort (Bonsteel 2015). Overall consequences to the offshore shoal would be further reduced because of NASA's commitment to implement the minimization measures detailed above in **Section 2.3.3.2, Dredging and Sand Placement Process**.

3.2.2.4 Alternative 3

Impacts resulting from the beach renourishment portion of Alternative 3 would be the same as those described for Alternatives 1 or 2, depending on the source of sand utilized. Additionally, construction of nearshore breakwater structures would result in a build-up of sediment along the shoreline perpendicular to the breakwaters. Temporary and minor adverse effects on sediments are anticipated in the immediate vicinity of the breakwater during the construction period. Use of offshore parallel breakwaters in conjunction with beach renourishment would allow an accumulation of the sand landward of the breakwaters without substantially interrupting the normal littoral transport. This would help provide an increased level of shoreline protection behind the breakwaters with the minimum possible impact on littoral processes. The greatest amount of erosion and accretion would occur immediately adjacent to each breakwater and would exponentially decrease with distance from the breakwater series. The fact that the breakwaters are designed to "leak" sand would help prevent the structures from impeding the normal transport of the sand south to Assawoman Island or to the north end of Wallops Island.

The offshore impacts of the breakwaters would be temporary alterations to littoral transport that diminish as the system approaches equilibration after beach renourishment. Relatively minor permanent changes in bathymetry adjacent to the breakwaters would be measurable as slight depressions immediately seaward of the breakwaters as the nearest sand bars would tend to be displaced toward the up-coast and down-coast ends of the structures.

Potential impacts to Chincoteague Inlet were discounted from the breakwater analysis, design, and modeling based upon biannual monitoring conducted by USACE, Norfolk District (USACE 2018b).

3.3 WATER QUALITY

This section briefly describes the surface and marine waters in and around Wallops Island. Refer to Section 3.1.6 of the *2010 Final SRIPP PEIS* for the detailed description of the water resources within and adjacent to the project area.

3.3.1 REGULATORY CONTEXT AND PERMITTING

The CWA of 1972 is the primary federal law that protects the nation's waters, including coastal areas. The primary objective of the CWA is to restore and maintain the integrity of the nation's waters. Section 404 of the CWA established a permit program to regulate the discharge of fill material into waters of the U.S. Managed jointly by the USACE and the EPA, the primary intent of the program is to minimize adverse effects to the aquatic environment. USACE is responsible for day-to-day administration and permit review while EPA provides program oversight.

On February 22, 2016, USACE extended the permit NAO-1992-1455 issued on March 10, 2011 for post-Hurricane Sandy renourishment. The permit expires on February 22, 2021. This permit authorizes the seawall extension and beach renourishment. A Joint Permit Application was submitted to USACE, VDEQ, VMRC, and Accomack County on October 1, 2018 (**Appendix C**). After receiving the JPA,USACE indicated that a new Individual Permit for the Proposed Action, including breakwater construction and dredging of sand at the north end of the island or Shoal A, whichever is selected as the preferred alternative would be required. VMRC has previously a issued an extension to Permit #10-2003, which was reissued on February 2, 2016, for rehabilitation of the seawall and beach renourishment. The permit expires in 2021 (VMRC 2016). Following receipt of the JPA, VMRC conducted a public hearing in Accomack County on January 2, 2019, then presented the project to the full Commission in a hearing on January 22, 2019, where it was approved with a unanimous vote. On April 29, 2017, VMRC issued a final permit that includes the current design for beach renourishment and dredging at the north end of the island and a dune/beach permit for required dune impacts (**Appendix C**). VDEQ has waived the requirement for a permit for the proposed action in lieu of USACE and VMRC permits (VDEQ 2018). The USACE issued an Individual Permit for the project on July 2, 2019 (**Appendix I**).

3.3.2 AFFECTED ENVIRONMENT

Inshore surface waters in the vicinity of Wallops Island are saline to brackish and are influenced by the tides. Marine waters in the affected environment, away from inlets, maintain a fairly uniform salinity range (32 to 36 parts per thousand) throughout the year (NASA 2003). Winter surface water temperatures average 57° Fahrenheit (°F) and average summer temperature is 77° F (Paquette *et al*. 1995).As reported in the *2013 Post-Hurricane Sandy EA*, Unnamed Shoal A shows bedforms (i.e., ripples) on its surface, indicating that wave energy reaches the seafloor and mixing occurs throughout the water column.

3.3.3 ENVIRONMENTAL CONSEQUENCES

3.3.3.1 No Action Alternative

Under the No Action Alternative, the proposed breakwater construction and beach renourishment would not occur. Therefore, there would be no project related impacts to water quality.

3.3.3.2 Alternative 1

The *2010 Final SRIPP PEIS* provides a detailed analysis of potential water quality impacts associated with moving sand from the north Wallops Island beach and placement in the shoreline infrastructure protection area. This alternative could have short term minor impacts on nearshore water quality resulting from the accidental release of petroleum products, or other contaminants from construction vehicles and heavy equipment used to remove, transport and deposit the sand. The potential for such construction-related impacts to occur would be minimal as contractors would implement BMPs for vehicle and equipment fueling and maintenance as well as site specific spill prevention and control measures (NASA 2010).

The beach fill material from the north Wallops Island beach has a grain size appropriate for use for renourishment. It is expected that the turbidity plume generated at the placement site would be comparable to those reported in similar projects: concentrated within the swash zone (the part of the beach extending from the edge of the surfzone landward to the limit of maximum inundation), dissipating between 1,000 to 2,000 feet alongshore; and short term, only lasting several hours.

Under this alternative there would be no dredging of sand from the offshore environment and no offshore impact to water quality.

3.3.3.3 Alternative 2

The impact to water quality nearshore would be the same as described for Alternative 1.The *2010 Final SRIPP PEIS* and the *2013 Final Post-Hurricane Sandy EA* provided an analysis of the potential offshore water quality impacts that could result from proposed dredging and pumpout buoy operations, which would cause sediment to be suspended in the water column. Studies of past similar projects specify that the extent of the sediment plume is normally limited to between 1,640 to 4,000 feet from the dredge operation and that elevated turbidity levels are usually short term, approximately an hour or less (NASA 2013).

The length and shape of the plume depends on the hydrodynamics of the water column and the sediment grain size. Given that the dominant substrate material at the borrow site is fine to medium sand, it is expected to settle steadily and cause less turbidity and oxygen demand than finer-grained sediments would cause. No appreciable effects on dissolved oxygen, pH, or temperature are anticipated because the dredged material has low levels of organics and low biological oxygen demand. Additionally, dredging activities would occur within the open ocean where the water column is subject to constant mixing and exchange with oxygen rich surface waters. Turbidity resulting from the dredging 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 temporary minor impacts on offshore water quality.

3.3.3.4 Alternative 3

The impacts to water quality from the renourishment portion of Alternative 3 would be the same as described above for Alternatives 1 and 2, depending on the sand source. Offshore impacts to water quality associated with the movement of sediment from either the north Wallops Island beach or Unnamed Shoal A to the renourishment area would be the same as described above for Alternatives 1 and 2, depending on the sand source. Additionally, offshore impacts to water quality could result from breakwater construction. Construction of the breakwaters would have the potential to result in sediment suspension during placement of the materials (e.g., marine mattresses, armor stone) and the movement of construction barges and vessels. Increases in suspended sediment would be temporary, localized, and would dissipate upon cessation of sediment disturbing activities. To construct the breakwater segments, each prefabricated geotextile marine mattresses would be floated out to its final location, and then lowered to the bottom by the weight of large rocks to minimize sediment resuspension. Rocks would be placed inside the geotextile mattress in a manner that limits sediment resuspension. Rocks used for armoring and to construct the breakwaters would be made of “clean” material, further minimizing the potential for release of suspended material into the water column. Crane barges would be continually moved during construction, and vessels carrying construction materials. Construction vessels would maintain at least 2 feet of clearance from the bottom of the ocean, or work only at tide levels sufficient to keep the barges off the ocean bottom to further minimize sediment disturbance. Expected increases to suspended sediment concentrations related to vessel activity during construction would likely be minimal relative to background levels. Breakwater construction activities may result in the accidental release of petroleum products, or other contaminants to offshore waters from the barge or tenders. Construction-related impacts would be considered temporary in nature, and would not likely be adverse; NASA would require its contractors to implement BMPs as well as site specific spill prevention and control measures for the water based activities.

3.4 Coastal Zone Management

The following discussion specifically refers to compliance with the Coastal Zone Management Act (CZMA) of 1972 (16 U.S.C. § 1451, et seq., as amended). In accordance with Section 307 of the CZMA and 15 CFR 930 subpart C, federal agency activities affecting a land or water use or natural resources of a state's coastal zone must be consistent to the maximum extent practicable with the enforceable policies of the state's coastal management program.

NASA prepared a Federal Consistency Determination (FCD) in conjunction with the *2010 Final SRIPP PEIS*. VDEQ concurred with NASA's determination of consistency; however, subsequent discussions with VDEQ indicate that a new FCD would be required for each beach renourishment cycle, including this Proposed Action.

3.4.1 Regulatory Context and Permitting

The VDEQ is the lead agency for the Virginia Coastal Zone Management (CZM) Program. Although federal lands are excluded from Virginia's CZM Program, any activity on federal land that has reasonably foreseeable coastal effects must be consistent with the enforceable policies of the CZM Program (VDEQ 2018). Enforceable policies of the CZM Program that must be considered when making an FCD include the following:

- **Fisheries Management.** Administered by VMRC, this program stresses the conservation and enhancement of shellfish and finfish resources and the promotion of commercial and recreational fisheries.
- **Subaqueous Lands Management**. Administered by VMRC, this program establishes conditions for granting permits to use state-owned bottomlands.
- **Wetlands Management**. Administered by VMRC and VDEQ, the wetlands management program preserves and protects tidal wetlands.
- **Dunes Management**. Administered by VMRC, the purpose of this program is to prevent the destruction or alteration of primary dunes.
- **Non-Point Source Pollution Control**. Administered by the Virginia Department of Conservation and Recreation, the Virginia Erosion and Sediment Control Law is intended to minimize non-point source pollution entering Virginia's waterways.
- **Point Source Pollution Control**. Administered by VDEQ, the Virginia Pollutant Discharge Elimination System permit program regulates point source discharges to Virginia's waterways.
- **Shoreline Sanitation**. Administered by the Virginia Department of Health, this program regulates the installation of septic tanks to protect public health and the environment.
- **Air Pollution Control**. Administered by VDEQ, this program implements the Clean Air Act through a legally enforceable State Implementation Plan.

- **Coastal Lands Management**. Administered by the Chesapeake Bay Local Assistance Department, the Chesapeake Bay Preservation Act guides land development in coastal areas to protect the Chesapeake Bay and its tributaries.

On February 22, 2016, USACE extended the permit NAO-1992-1455 issued on March 10, 2011 for post-Hurricane Sandy renourishment. The permit expires on February 22, 2021. This permit authorizes the seawall extension and beach renourishment. The USACE has issued an Individual Permit for the Proposed Action for breakwater construction and renourishment (**Appendix I**). VDEQ has completed their review, waiving the requirement for a permit for the proposed action in lieu of USACE and VMRC permits (VDEQ 2018). VMRC has previously a issued an extension to Permit #10-2003, which was originally issued on February 2, 2016 for rehabilitation of the seawall and some beach renourishment. The permit expires in 2021 (VMRC 2016). VMRC conducted a public hearing in Accomack County on January 2, 2019, then presented the project to the full Commission in a hearing on January 22, 2019, where it was approved with a unanimous vote. On April 29, 2017, VMRC issued a final permit that includes the current design for beach renourishment and dredging at the north end of the island and a dune/beach permit for required dune impacts (**Appendix C**).

3.4.2 Affected Environment

Barrier islands such as Metompkin, Assawoman, Wallops, and Assateague Islands are elongated, narrow landforms that consist largely of unconsolidated and shifting sand and lie parallel to the shoreline between the open ocean and the mainland. These islands provide protection to the mainland, recreation resources, important natural habitats, and valuable economic opportunities to the county. The northern end of Wallops Island also contains coastal primary sand dunes that serve as protective barriers from the effects of flooding and erosion caused by coastal storms. The Coastal Barrier Resources Act (Public Law 97-348, 16 U.S.C. 3501-3510), enacted in 1982, designated various undeveloped coastal barrier islands as units in the Coastal Barrier Resources System. Designated units are ineligible for direct or indirect federal financial assistance programs that could support development on coastal barrier islands; exceptions are made for certain emergency and research activities.

3.4.3 Environmental Consequences

3.4.3.1 No Action Alternative

Under the No Action Alternative, the proposed breakwater construction, dredging, and beach renourishment would not occur. Therefore, there would be no project related impacts to Virginia’s CZM.

3.4.3.2 Impacts Common to all Alternatives

The activities proposed would affect resources within Virginia’s Coastal Zone. Therefore, NASA prepared an FCD that found its Proposed Action to be consistent with the enforceable policies of Virginia’s CZM Program. On December 6, 2018, NASA submitted its FCD to VDEQ for concurrence. In a letter dated January 17, 2019, VDEQ concurred with NASA’s determination, provided that all applicable permits and approvals are obtained. Refer to **Appendix D** for the FCD and the VDEQ response.

3.4.3.3 Applicable Permits

NASA consulted with VMRC to determine the applicability of its existing permit to the Proposed Action. On April 29, 2017, VMRC issued a final permit that includes the current design for beach renourishment and dredging at the north end of the island and a dune/beach permit for required dune impacts (**Appendix**

D). VDEQ has waived the requirement for a permit for the proposed action in lieu of USACE and VMRC permits (VDEQ 2018).

3.5 AIR QUALITY

The discussion of air quality is focused on the atmospheric layer at or below 3,000 feet above ground level, which the EPA accepts as the nominal height of the atmosphere mixing layer in assessing contributions of emissions to ground level ambient air quality under the Clean Air Act (CAA) (EPA 1992) for criteria and hazardous air pollutants (HAPs).

Section 3.1.9 of the *2010 Final SRIPP PEIS* describes in detail the regulatory context and types and quantities of air pollutants emitted from NASA's activities on Wallops Island. This section provides both a summary and updated information obtained since that time.

3.5.1 AFFECTED ENVIRONMENT

The affected region for the air quality analysis is limited to the Northeastern Virginia Intrastate Air Quality Control Region, as defined in 40 CFR Part 81.144, which includes Accomack County.

3.5.1.1 Criteria Pollutants

Air quality in a given location is described by the concentration of various pollutants in the atmosphere. The significance of the pollutant concentration is determined by comparing it to the federal and state ambient air quality standards. The CAA, and its subsequent amendments, established the National Ambient Air Quality Standards (NAAQS) for seven "criteria" pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than 10 (PM_{10}) and 2.5 ($PM_{2.5}$) microns in diameter, and lead (Pb). These standards represent the maximum allowable atmospheric concentrations that may occur while ensuring protection of public health and welfare, with a reasonable margin of safety. Areas that exceed a federal air quality standard are designated as non-attainment areas. Wallops Island is located in Accomack County, an attainment area for all criteria pollutants; therefore, a General Conformity Review under Section 176(c) of the CAA does not apply to this project.

Hazardous Air Pollutants (HAPs)

In addition to the criteria pollutants, the EPA currently designates 187 substances as HAPs under the federal CAA. HAPs are air pollutants known or suspected to cause cancer or other serious health effects, or adverse environmental and ecological effects (EPA 2015). NAAQS are not established for these pollutants; however, the EPA developed rules that limit emissions of HAPs from specific industrial sources.

HAP emissions are typically one or more orders of magnitude smaller than concurrent emissions of criteria air pollutants, and only become a concern when large amounts of fuel are consumed during a single activity or in one location. Mobile sources operating as a result of the Proposed Action would be functioning intermittently over a large area and would produce negligible ambient HAPs in a localized area not located near any publicly accessible areas. For these reasons, HAPs are not further evaluated in the analysis.

3.5.1.2 Climate Change

Climate change refers to long term shifts in temperature, precipitation, and weather patterns which are the result of numerous natural and anthropogenic (human-induced) factors. Greenhouse gases (GHGs) are compounds that contribute to the greenhouse effect—a natural phenomenon in which gases trap heat within the lowest portion of the earth's atmosphere, causing heating at the surface of the earth. The EPA has specifically identified carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride as GHGs (EPA 2009). Carbon dioxide (CO_2), methane, and nitrous oxide occur naturally in the atmosphere. These gases influence the global climate by trapping heat in the atmosphere that would otherwise escape to space. The heating effect from these gases, primarily as a result of anthropogenic activities, is considered the primary cause of the global warming observed over the last 50 years (EPA 2009).

Each GHG is assigned a global warming potential (GWP), which is the ability to trap heat, and is standardized to CO_2, which has a GWP value of one. Six other primary greenhouse gases have GWPs: 25 for methane, 298 for nitrous oxide, 124 to 14,800 for hydrofluorocarbons, 7,390 to greater than 17,340 for perfluorocarbons, 17,200 for nitrogen trifluoride, and up to 22,800 for sulfur hexafluoride. Emissions of a GHG is multiplied by its GWP to calculate the total equivalent emissions of carbon dioxide (CO_2e). The dominant GHG emitted is CO_2, mostly from fossil fuel combustion (81.6 percent) (EPA 2018a).

Executive Oder 13834, *Efficient Federal Operations*, issued on May 17, 2018, establishes policy for federal agencies to reduce waste, cut costs, and enhance resilience of federal infrastructure and operations. On August 1, 2016, the CEQ issued final guidance on the consideration of GHG emissions and climate change in NEPA review (CEQ 2016). The guidance clarified that NEPA review requires federal agencies to consider the effects of GHG emissions and climate change when evaluating Proposed Actions:

> *"Analyzing a proposed action's GHG emissions and the effects of climate change relevant to a proposed action—particularly how climate change may change an action's environmental effects—can provide useful information to decision makers and the public."*

The guidance also emphasized that agency analyses should be commensurate with projected GHG emissions and climate impacts, and should employ appropriate quantitative or qualitative analytical methods to ensure useful information is available to inform the public and the decision-making process in distinguishing between alternatives and mitigations (CEQ 2016). Additionally, the guidance recommended that an agency should take into account the ways in which a changing climate may impact the proposed action and any alternative actions (CEQ 2016). However, pursuant to Executive Order 13783, *Promoting Energy Independence and Economic Growth*, CEQ's guidance was withdrawn for further consideration in March of 2017. Regardless, it is NASA's policy to continue to follow the CEQ guidance on GHG emissions and climate change in NEPA review until directed otherwise by amendments to the guidance or regulation.

3.5.2 Environmental Consequences

The primary emissions from the Proposed Action would result from the burning of fossil fuels in mobile sources (e.g., dredges, earth moving equipment, etc.). For the purposes of evaluating air quality impacts in this EA, emissions are considered to be minor if the Proposed Action would result in an increase of 250 tons per year or less for any criteria pollutant. The 250 tons per year value is used by the EPA in its New Source Review Prevention of Significant Deterioration standards for major stationary sources in areas that meet the NAAQS as an indicator for impact analysis. No similar regulatory thresholds are available for mobile source emissions. Lacking any mobile source emission regulatory thresholds, this threshold is used to equitably assess and compare mobile source emissions. Emission-assumptions and calculations are provided in **Appendix E**. A discussion of potential climate change impacts to Wallops Island is included in **Section 4.0, Cumulative Impacts.**

3.5.2.1 No Action Alternative

Under the No Action Alternative, the proposed breakwater construction, dredging, and beach renourishment would not occur. Therefore, there would be no project related impacts to air quality.

3.5.2.2 Alternative 1

Implementation of Alternative 1 would involve use of dump trucks, bulldozers, mobile generators, tractor scrapers, and loaders. Sand excavated from the surface of north Wallops Island beach by the scraper would be transported to the renourishment area, where it would be spread and graded by bulldozers. The operation would be a 24-hour, 7-day operation, over a 3-month period. The average distance traveled by dump truck would be 3.25 miles, with a maximum overall length from the northern area of north Wallops Island beach to the southern portion of the renourishment area extending 9 miles overall. Based on an average 12 cubic yard capacity of a 10 wheel dump truck, is estimated that 108,000 loads would be required to move the sand.

As shown in **Table 3.5-1**, Emissions would not exceed the comparative threshold for any of the criteria pollutants. As a result, no significant impacts on air quality would be anticipated from implementing this activity.

Table 3.5-1. Estimated Annual Emissions in Tons per Year from Implementation of Alternative 1

	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2e
Alternative 1 Emissions Only	11.15	33.74	174.72	0.20	5.73	5.56	20,175
Comparative Threshold	250	250	250	250	250	250	NA
Exceeded (Yes/No)	No	No	No	No	No	No	NA

The proposed activities would contribute directly to GHG emissions from fossil fuel combustion. A total of 20,175 tons of CO_2e would be generated. To put these emissions in perspective, 20,175 tons of GHGs is the equivalent of 3,942 cars driving the national average of 11,500 miles for one year (EPA 2018b). These GHG emissions would only be generated during the activity period. While the GHG emissions alone would not be enough to cause global warming, in combination with past and future emissions from all other sources, they would contribute incrementally to the global warming that produces the adverse effects of climate change.

3.5.2.3 Alternative 2

Alternative 2 would remove sand from Unnamed Shoal A using a trailing suction dredge system. The material collected from the subsurface floor would be pumped into the self-contained hopper in the dredge vessel. When full, the vessel would move to the area where a submerged pipeline would be installed, approximately 17 miles from the dredge area. The contents of the hopper would be pumped into the pipeline, which itself would have pumps to move the materials to the renourishment area ashore. The pipeline is estimated to be up to 2 miles long. The vessel pumps are estimated to run 70 percent of the time and for 30 percent of the time the vessel is transporting materials to the pipeline and returning to the dredge area. It is assumed that two dredge vessels would be in operation for the time period. The pipeline is estimated to be located in 10 different locations during the course of the project (approximately every 0.2 miles along the renourishment stretch) and bulldozers would spread and grade the sand at each location. Because of losses associated with the hopper collection and transport, the total amount of sand estimated as required has been increased by 25 percent to 1.625 million cubic yards. Additionally, the hopper capacity has been reduced to 3,000 cubic yards. The process of dredging and placing the sand is expected to last approximately 3 months, with 10 percent of the schedule allocated for bad weather and/or equipment downtime.

As shown in **Table 3.5-2**, emissions would not exceed the comparative threshold for any of the criteria pollutants. As a result, no significant impacts on air quality would be anticipated from implementing this activity.

Table 3.5-2. Estimated Annual Emissions in Tons per Year from Implementation of Alternative 2

	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2e
Alternative 2 Emissions Only	4.40	54.40	227.90	0.20	8.70	8.5	18,059
Comparative Threshold	250	250	250	250	250	250	NA
Exceeded (Yes/No)	No	No	No	No	No	No	NA

The proposed activities would contribute directly to GHG emissions from fossil fuel combustion. A total of 18,059 tons of CO_2e would be generated. To put these emissions in perspective, 18,059 tons of GHGs is the equivalent of 3,529 cars driving the national average of 11,500 miles for one year (EPA 2018b). These GHG emissions would only be generated during the activity period. While the GHG emissions generated alone would not be enough to cause global warming, in combination with past and future emissions from all other sources they would contribute incrementally to the global warming that produces the adverse effects of climate change.

3.5.2.4 Alternative 3

Under Alternative 3, in addition to renourishment of the shoreline infrastructure protection area, six breakwater structures would be constructed in the water approximately 200 feet offshore and parallel to the beach. Because the breakwaters are located offshore, it is assumed for the purpose of this analysis that the stone would be transported via barge from the Norfolk area. A barge-mounted excavator would be used to place the stone in the specified breakwater areas, and each breakwater structure would extend 130 feet with an exposed top width of 10 feet. The construction time for the breakwaters has been estimated at 6 to 9 months. Construction would occur daily for 16 hours/day. Approximately 5 barge loads of material would arrive daily for placement in the breakwater areas. Emissions have been estimated using 2 barges with excavators. **Table 3.5-3** provides the total emissions that would result from combining the breakwater construction with each renourishment alternative. Emissions from breakwater construction would not exceed the comparative threshold for any of the criteria pollutants. As a result, no significant impacts on air quality would be anticipated from implementing this activity.

Table 3.5-3. Estimated Annual Emissions in Tons per Year from Implementation of Alternative 3

	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2e
Comparative Threshold	250	250	250	250	250	250	NA
Alternative 3 + Alternative 1	13.52	49.18	190.48	0.27	21.63	5.90	31,011
Exceeded (Yes/No)	No	No	No	No	No	No	NA
Alternative 3 + Alternative 2	7.38	71.91	249.89	0.25	25.93	8.99	29,679
Exceeded (Yes/No)	No	No	No	No	No	No	NA

The proposed breakwater construction would contribute directly to GHG emissions from fossil fuel combustion. Depending on the source of sand utilized, Alternative 1 or 2, a total of 31,011 or 29,679 tons of CO_2e, respectively, would, be generated as a result of implementing Alternative 3. To put these emissions in perspective, they represent the equivalent of 6,059 and 5,799 cars driving the national average of 11,500 miles for one year (EPA 2018b).

Combining the emissions from breakwater construction with beach renourishment activities would increase annual emissions, but would not exceed the comparative threshold for any of the criteria pollutants. Breakwater construction with beach renourishment using material from the north island (Alternative 3 + Alternative 1) would generate the largest increase in annual emissions, and would equal the comparative threshold for NO_x. For this reason, as well as to reduce GHG emissions, the following mitigation actions are recommended to ensure that no significant impacts to air quality from NOx emissions would be anticipated from Alternative 3:

- Implement and enforce idling restrictions,
- Mandate use of newer equipment meeting late-model (Tier IV) engine emission requirements,
- Require that equipment engines are maintained and tuned to meet EPA certification requirements, and control fugitive dust as practical.

3.6 Noise

Noise is often defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, diminishes the quality of the environment, or is otherwise annoying. The impact of noise is described through the use of noise metrics which depend on the nature of the event and who or what is affected by the sound. The following section provides metrics for in-air and underwater noise.

3.6.1 Affected Environment

3.6.1.1.1 Airborne Noise

Airborne noise is represented by a variety of metrics that are used to quantify the noise environment. Human hearing is more sensitive to medium and high frequencies than to low and very high frequencies, so it is common to use maximum A-weighted decibel (dBA) metrics (also shown as dB L_{Amax}) to represent the maximum sound level over a duration of an event such as an aircraft overflight. A-weighting provides a good approximation of the response of the average human ear and correlates well with the average person's judgment of the relative loudness of a noise event.

The project area would be dominated by noise from wind and wave action along the shoreline. Background noise levels in the area range from 30 to almost 50 dBA, with a constant low level of low-frequency sound likely caused by wind and waves. The southern end of Wallops Island has slightly higher sound levels ranging from 40 to 50 dBA, which is likely due to the proximity to the surf zone (NASA 2013). Noise levels increase during rocket launch activities and other operations at WFF; however, these noise levels are occasional and temporary in nature.

3.6.1.1.2 Underwater Noise

Underwater noise behaves much like noise in the air but, due to the denser medium, the sound waves can propagate much farther in-water. Unlike airborne noise, underwater noise is not weighted to match frequencies that can be heard by the human ear. Two common descriptors of underwater noise are instantaneous peak sound pressure level (dB_{peak}) and the Root Mean Square (dB_{RMS}) pressure level during the impulse. The dB_{peak} is the instantaneous maximum overpressure or underpressure observed during each sound pulse and can be presented in Pascals (Pa) or sound pressure level in dB, referenced to a pressure of 1 micropascal at one meter (dB re:1µPa-m). The dB_{RMS} is the square root of the energy divided by the duration of the sound pulse. This level is often used by the NMFS to describe disturbance related effects to marine mammals from underwater impulse sounds. Potential injury to fish from noise is estimated using the dB_{peak} metric (Washington State Department of Transportation [WSDOT] 2015).

During the initial beach fill in summer 2012, NASA partnered with BOEM and USACE to record background in-water noise levels at both the offshore borrow area and the nearshore pumpout area. Data were collected at two listening depths at each site; approximately 10- and 30-foot depths at Unnamed Shoal A and 10 and 20 foot depths at the nearshore sites. During the study, the majority of data were collected when winds were at least 4 to 7 miles per hour and wave heights were at least 1 to 2 feet. Therefore, the data do not reflect "calm" sea conditions.

Background sound pressure levels (SPLs) averaged 117 dB across all sampling days, sites, water depths and weather conditions. Minimum measured SPLs ranged from 91 dB to 107 dB depending on sampling location and water depth; maximum levels ranged from approximately 128 dB to just under 148 dB (Rein *et. al* 2014). Highest SPLs were found at frequencies of less than 200 hertz. The authors note that sea state and the associated sounds generated by waves interacting with the survey vessel likely contributed to the elevated readings.

3.6.2 Environmental Consequences

3.6.2.1 No Action Alternative

Under the No Action Alternative, breakwater construction and beach renourishment would not occur. As such, the shoreline would continue to be dominated by the sounds of winds and wave action.

3.6.2.2 Alternative 1

The operation of heavy equipment along the beach would be the most pronounced source of noise under Alternative 1. This would include engine noise, back-up alarms, and generators running lighting. Heavy construction vehicles, the major source of noise during construction projects, are constantly moving in unpredictable patterns; therefore no one receptor is expected to be exposed to construction noise of long duration. However, during the backpassing of sand from the north to the south, heavy equipment would continually traverse the length of the island. Therefore, conservative estimates of "point source" noise levels can be determined using construction equipment noise level data collected by the Federal Highway Administration (FHWA) (2006). Assuming the immediate work site would include four bulldozers, a front-end loader, and two generators (one for office power, one for nighttime lighting), the total received sound level at 50 feet from the site would be approximately 90 dBA. Typically, sound drops off at a rate of 6 dB for each doubling of the distance from a point source (FHWA 2007). Employing this methodology, noise levels would fall within the upper range of background levels (50 dBA) at approximately 0.9 mile from the work site. The nearest residence is over 1.5 miles away from the project area.

However, it should be noted that wind and surf conditions would play a major role in dictating the distances at which the construction-related sounds could be heard by nearby receivers. Studies have shown that the effects of wind on sound propagation can be substantial, with upwind attenuation approaching 25 to 30 dB more than downwind at the same distance from the source (Wiener and Keast 1959). Therefore, received construction-related noise levels would vary, however, they would not be expected to be substantial.

Under Alternative 1, the underwater noise environment could be altered by land-based equipment operating in and near the intertidal zone. Sand would be removed from the north Wallops Island beach and moved south to the deposition area and distributed using heavy equipment. Noise from the equipment may be detectable in the underwater environment, but may be masked by the noise of the surf. For instance, the noise of heavy D8 bulldozers was imperceptible through half-meter surf, to the unaided ear of scuba divers 260 feet offshore during a similar beach renourishment (M. Lybolt personal observation). The intensity of potential noise impacts to the underwater environment would be low and the duration of impacts, if created, would be temporary.

3.6.2.3 Alternative 2

Airborne noise for Alternative 2 would be very similar to that described in Alternative 1. Heavy equipment would continue to be the primary source of project related noise. Additionally, there would be some noise from the dredge outfall pipe, as it pumped the sand slurry onto the beach. Under this Alternative, noise would likely remain concentrated near the dredge discharge pipe and move steadily northward as the project progressed.

It is expected that in-water noise levels generated by the Proposed Action would be similar to those reported by Rein *et. al* (2014), which summarizes recorded noise levels from hopper dredges operating in the nearshore waters off Wallops Island. Though the referenced study presents noise levels from three individual dredges, the noise levels presented for this analysis were logarithmically averaged into a single SPL for each activity in the dredging cycle. Similar to in-air noise, the distance to which project related underwater noise would be potentially audible varies with environmental conditions like surf, wind, waves, and water temperature.

Based upon data collected by Rein *et. al* (2014), sediment removal and the transition from transit to pumpout would be expected to produce the highest noise levels at an estimated source level (SL) of 172 dB at 3 feet. The two quietest dredging activities would be expected to be seawater pumpout (flushing pipes) and transiting (unloaded) to the borrow site, with expected SLs of approximately 159 and 163 dB at 3 feet, respectively.

These expected noise levels generally correlate with those presented in the *2010 Final SRIPP PEIS*, which were based upon levels recorded by Clarke *et al.* (2003). However, the new information does suggest that SLs and the region of elevated noise around the dredges could be higher than originally anticipated, although not substantially different. In-water noise imparts are discussed in more detail in **Section 3.10, Marine Mammals**. Based upon attenuation rates observed by Rein *et. al* (2014), it would be expected that at distances approximately 1.6 to 1.9 miles from the source, underwater noise generated by the dredges would attenuate to background levels.

3.6.2.4 Alternative 3

In-air noise impacts would be the same as those identified for Alternatives 1 and 2.

In-water noise would be the same as those identified for Alternative 2, with the addition of the breakwater construction. This would involve the use of a barge and excavator to place large stone in the water to construct the breakwater. It is anticipated that the barge would be anchored in place using “spuds”, a set of 1 to 4 vertical steel beams that are lowered into the seafloor through slides on the barge hull and raised each time the barge is repositioned. Most spuds rely on gravity but some applications require spuds to be pressed into the sediment. Spuds are moved using mechanical or hydraulic winches; no additional vibratory or impact noise would be produced. Therefore, it is unlikely there would be any detrimental underwater noise impacts from breakwater construction.

3.7 BENTHOS

Bottom dwelling invertebrates provide a critical link in the productivity of the marine waters off of Wallops Island. The benthos includes organisms that live on the sediment surface (epifauna) such as starfish and sand dollars, as well as organisms that live within the sediment (infauna) such as clams and worms. The majority of the benthos live in the upper 6 inches of sediment. Benthic organisms are an important food resource for fish, including those caught by recreational and commercial fishermen.

Section 3.2.5 of the *2010 Final SRIPP PEIS* describes in detail the benthic organisms that inhabit the project site. This section provides a summary.

3.7.1 AFFECTED ENVIRONMENT

Air-breathing crustaceans such as ghost crabs (*Ocypode quadrata*) dominate the uppermost zone of the Wallops Island beach, while the swash zone is dominated by isopods, amphipods, polychaetes, and mole crabs (*Emerita talpoida*). Below the mid-tide line is the surf zone where coquina clams (*Donax variabilis*) and a variety of amphipods are prevalent. All such organisms are important prey species for a variety of waterbirds and fish. Studies reviewed in preparing the *2010 Final SRIPP PEIS* indicated that manually nourished beaches can be devoid of living benthos for up to a year following project completion.

As presented in Section 3.2.5 of the *2010 Final SRIPP PEIS*, 2009 underwater photographic studies conducted of Unnamed Shoal A during the development of the *2010 Final SRIPP PEIS* determined that the dominant epifaunal benthos included sand dollars (*Echinarachinus parma*), hermit crabs (*Pagurus* spp.), crabs (*Libinia* spp., *Cancer* spp.), moon shell (*Polinices* spp.), and whelk (*Busycon* spp.).

Similar to the discussion regarding onshore benthic resources, while the dredged area may not have fully recovered to 2014 pre-dredge conditions, it is reasonable to expect that the benthos in the affected area have recovered considerably.

3.7.2 ENVIRONMENTAL CONSEQUENCES

Section 4.3.5 of the *2010 Final SRIPP PEIS* describes in detail the expected effects of dredging and beach nourishment on benthic organisms. This section provides both a summary and updated information obtained since its publication.

3.7.2.1 No Action Alternative

Under the No Action Alternative, the proposed beach renourishment would not occur. Therefore, there would be no project related impacts to benthos, along the beach, in the intertidal zone, nearshore, or offshore. The offshore borrow area would continue to recover from previous dredging operations.

3.7.2.2 Alternative 1

Under Alternative 1, organisms living in the sandy beach area of the northern part of Wallops Island would experience direct mortality from the sand removal and relocation. This would be due to disturbance and crushing from excavators removing sand and burial in the renourishment area. The physical oceanographic conditions would be essentially unchanged, and after the renourishment reaches equilibrium, there would be no net change in the physical environment available for benthos.

Recovery time of benthos in the surf zone renourishment area under Alternative 1 could be more rapid than under Alternative 2 because the sediment is more closely matched. Burlas *et al.* (2001) estimated that the recovery time for benthos in a 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. Dalfsen and Essink (2001) noted that recolonization is generally defined by two patterns: the rapid development of “opportunistic” species, and the subsequent recovery of community composition and structure. The USACE recently reviewed the subject, and benthos recovery times for scenarios similar to the proposed action ranged from about 6 months to about 2 years (USACE 2015). Under Alternative 1, it is expected that organisms from adjacent areas would recolonize the new beach in relatively short time (i.e., on the order of 6 to 12 months post-project).

Under Alternative 1, there would be no offshore dredging. Therefore there would be no project related impacts to benthic organisms at the offshore borrow area.

3.7.2.3 Alternative 2

Impacts from renourishment activities to benthic organisms living onshore and in the nearshore environment would be similar to those described under Alternative 1 with two differences. Impacts to onshore benthos at the north Wallops Island beach borrow area would be eliminated. Under Alternative 2, the fill material would be slightly different than native material and the rate of recovery could be slower than under Alternative 1.

Within the OCS borrow area, bottom dwelling organisms would be entrained in the dredge. Based upon reports by biological monitors onboard the dredges during the initial beach fill cycle, the most commonly encountered macrobenthos included horseshoe crab (*Limulus polyphemus*), whelk (*Busycon canaliculatum*), and blue crabs (*Callinectes sapidus*).

Because of the dynamic nature of OCS benthic communities and their variability over time, the recovery of benthos at offshore borrow areas varies. A summary of post-dredge faunal recovery rates in Europe by Hitchcock, Newell, and Seiderer (2002) show a range from several weeks to more than ten years. Recovery rates for borrow areas in a recent review by USACE were similar, and ranged from several months to no detectable recovery (USACE 2015). The most rapid recovery rates were observed for highly mobile organisms (i.e., several months up to two years); whereas the longest recovery periods (i.e., a decade or more) were associated with sessile and uncommon low-fecundity benthos. Given the benthic assemblages known from Unnamed Shoal A, recovery of most benthos would be likely within two years.

3.7.2.4 Alternative 3

Under Alternative 3, impacts to benthos living nearshore and onshore would be the same as those described for Alternative 1 or for Alternative 2, with the addition of bottom disturbance for the construction of the breakwaters. Direct mortality of all benthos within the footprint of breakwater construction would be likely. The footprint of the breakwaters would be permanently converted from sand to approximately 0.34 acres of new hardbottom habitat. However, because the regional coastline has very little hardbottom habitat in the surf zone the concept of recovery is not applicable and colonization of the breakwaters would provide habitat for an essentially novel community of benthos. Potential direct benefits to native benthos would be minimal, but the breakwaters would provide attachment points for sessile creatures as well as refuge and cover for mobile macrobenthos such as polychete worms or amphipods and could offer some minor beneficial impacts in the long term.

Offshore impacts to benthos from Alternative 3 would be identical to either Alternative 1 or Alternative 2, depending on the sand source.

3.8 WILDLIFE

This discussion of wildlife addresses the variety of species found on and near the onshore and offshore environments of Wallops Island.

3.8.1 AFFECTED ENVIRONMENT

Section 3.2.2 of the *2010 Final SRIPP PEIS* describes in detail the wildlife species that may inhabit the project site. This section provides both a summary and updated information obtained since its publication.

Wallops Island is home to a diverse array of wildlife species. The Assateague Island National Seashore extends from the northern (Maryland) portion of Assateague Island through Virginia. The southern (Virginia) portion located closest to Wallops Island is part of Chincoteague National Wildlife Refuge (CNWR). Assawoman Island to the south of Wallops is also owned by the USFWS and is part of CNWR. Both protected areas provide high quality habitat for a variety of wildlife.

3.8.1.1 Onshore

Avifauna: The Wallops Island beach provides important nesting and foraging habitat for a number of migratory waterbirds, including gulls, terns, and sandpipers. Waterbird numbers on the beach peak during the fall and spring migrations, during which the beach provides stopover habitat for resting and feeding as the birds transit between breeding and wintering grounds. Important food sources include fish mollusks, insects, worms, and crustaceans.

Recently filled beaches are expected to be mostly devoid of food sources making habitat value limited. However, since the post-Hurricane Sandy beach fill, recruitment has likely replenished the invertebrate food sources for foraging avifauna to near normal levels. Also noteworthy is that following the initial fill cycle, the most northern end of Wallops Island (which would remain unaffected by the Proposed Action) has developed an expansive area of tidal pools; these are expected to be important sources of forage for bird species.

In accordance with its Protected Species Monitoring Program, NASA continues to conduct regular monitoring of the Wallops Island beach between March and September to determine the level of bird nesting activity within and adjacent to the project area. The most recent Protected Species Monitoring Reports observed one American oystercatcher (*Haematopus palliatus*) nest in 2017 and in 2018 with no chicks surviving to fledge (NASA 2017, NASA 2018). No Wilson’s plover (*Charadrius wilsonia*) nests were observed for 2017 or 2018. Wallop’s staff also monitor for piping plover (*Charadrius melodus*) and the red knot (*Caladris canutus rufa*), and these are discussed in **Section 3.11, Special Status Species**. No colonial waterbird nesting activity has been observed on the Wallops Island beach since NASA began its regular beach nesting bird surveys in spring 2010 (NASA 2018). In general, the wildlife abundances measured under the monitoring program have remained constant since 2010, or have declined (NASA 2016, NASA 2017, NASA 2018).

Herpetofauna: Though Wallops Island is home to a number of amphibians and reptiles, the species most likely affected by activities on or adjacent to the beach is the diamondback terrapin (*Malaclemys* *terrapin*), which in the past has regularly nested on the north beach and locations on the west (bay) side of the island. However now that portions of the rock seawall have sand overtopping them, the species has easier access to the beach for its late spring to early summer nesting. During the initial 2012 beach fill, the diamondback terrapin was observed frequently within the project site during the late May to early June timeframe. Sea turtles are discussed in **Section 3.11, Special Status Species**.

3.8.1.2 Offshore

Seabirds including scoters, loons, and gannets use the offshore portion of the project area as foraging grounds during winter months.

Existing scientific literature supports that recovery of the forage value of a dredged shoal likely occurs within 2 years. Therefore, similar to the discussion above regarding the nearshore environment, given that the last dredging occurred within the borrow area on Unnamed Shoal A during 2014, it is expected that the forage value of the affected area has returned to pre-dredge conditions.

3.8.2 Environmental Consequences

3.8.2.1 No Action Alternative

Under the No Action Alternative, there would be no project related impacts onshore or offshore to wildlife in the vicinity of Wallops Island.

3.8.2.2 Alternative 1

3.8.2.2.1 Onshore

Avifauna: Temporary noise and visual disturbances from construction equipment and personnel could adversely affect beach foraging and nesting birds. Direct effects could include eliciting a startle or flee response, which for foraging birds could temporarily interrupt feeding activities or cause individuals to relocate to other areas of the beach. If nesting birds were to flush from nests, it could lead to an elevated risk of egg overheating or predation. It would also be possible for equipment to inadvertently crush or bury nests or chicks if the nests were undetected. Adverse effects would also occur from a reduction in available food sources during and following the placement of sand on the Wallops Island shoreline. Potential impacts to wildlife would be reduced by the avoidance measures employed for Special Status Species (i.e., no activity at the north Wallops Island borrow area from piping plover and loggerhead sea turtle nesting season).

However, beach renourishment would occur well south of the areas of the beach that have historically hosted the greatest level of nesting activity. It is unknown to what extent the newly created Wallops Island beach in the shoreline infrastructure protection area would be used by waterbirds. The actual usage patterns would play a large role in dictating potential impacts. Effects on prey availability are expected to be a contributing factor, and given that the newly placed beach is likely in a biologically suppressed state, it is possible that bird species would congregate closer to more forage-rich areas outside of the affected area. As discussed in **Section 3.7, Benthos**, available forage would most likely recover within one year.

Long term, the renourished beach could create suitable waterbird nesting habitat. At a time when storm intensity and frequency are expected to increase, having an elevated, sparsely vegetated beach and dune along the entire length of Wallops Island is expected to be of notable benefit to all beach nesting species.

Herpetofauna: Diamondback terrapins, while noted to be abundant on Wallops Island, have only been found on the west (bay) side of the island and are not a protected species. Therefore, no potential impact is anticipated to this species and no mitigation would be required. However, NASA would continue to monitor this species to the extent practicable.

3.8.2.2.2 Offshore

Under Alternative 1, there would be no project related impacts offshore, as no OCS dredging would occur.

3.8.2.3 Alternative 2

3.8.2.3.1 Onshore

Avifauna: Impacts to avifuana would be similar to those described under Alternative 1, as construction equipment would move sand pumped from the offshore borrow area into the areas to be renourished.

Herpetofauna: Impacts to herpetofauna would be similar to those described under Alternative 1, as construction equipment would move sand pumped from the offshore borrow area into the areas to be renourished.

3.8.2.3.2 Offshore

Dredging Unnamed Shoal A would be done in a way so as not to substantially change shoal topography and to minimize the impact to the availability of seabird food sources as considered in the *2010 Final SRIPP PEIS*. Though the additional dredging would increase the water depths at the borrow area, diving species could still effectively forage on the shoal. As discussed in **Section 3.7, Benthos**, forage sources would most likely recover within two years. All additional sand would be removed within areas already disturbed; therefore it would not expand the footprint of the area having reduced available forage following the dredge event. Both adjacent undisturbed areas on Unnamed Shoal A and neighboring shoals would provide adequate forage should seabirds avoid the directly affected area. Additionally, the dredge portion of the project is expected to be completed within a 3-month window. Impacts from disturbance would be limited to that active dredging phase.

3.8.2.4 Alternative 3

3.8.2.4.1 Onshore

Avifauna: Impacts to avifuana would be similar to those described under Alternative 1, as construction equipment would move sand pumped from the offshore borrow area into the areas to be renourished.

Herpetofauna: Impacts to herpetofauna would be similar to those described under Alternative 1, as construction equipment would move sand pumped from the offshore borrow area into the areas to be renourished.

3.8.2.4.2 Offshore

Impacts to wildlife under Alternative 3 would be similar to those described under Alternative 2, with the additional disturbance from the construction of offshore breakwaters. The breakwaters would alter the nearshore bottom and create adverse impacts from direct disturbance during construction. Post-construction of the breakwaters would potentially provide resting areas for avifauna. It is unlikely that the breakwaters would contribute to any lasting negative impacts to offshore wildlife in the vicinity of Wallops Island.

3.9 Fisheries and Essential Fish Habitat

3.9.1 Regulatory Context

In accordance with the Magnuson-Stevens Fishery Conservation and Management Act of 1976, federal agencies must consult with the National Marine Fisheries Service (NMFS) for activities that may adversely affect Essential Fish Habitat (EFH) that is designated in a federal Fisheries Management Plan. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Both the offshore borrow area and the nearshore discharge location are designated EFH for multiple life stages of managed fish species, therefore the EFH consultation requirement applies to the Proposed Action.

A separate EFH Assessment was prepared (**Appendix F**), which references extensive previous EFH consultations that occurred in conjunction with the *2010 Final SRIPP PEIS* and the *2013 Post-Hurricane Sandy EA* and summarizes the affected environment and environmental consequences to EFH under the Proposed Action. Previous EFH consultations concurred that beach restoration would not substantially adversely affect EFH. Note that using sand from the north Wallops Island beach for renourishment, under either Alternative 1 or Alternative 3, would result in a smaller spatial footprint and less intense stressors than use of materials from Unnamed Shoal A (under Alternatives 1 or 3) and prior actions. NASA anticipates that the magnitude of potential consequences under Alternative 1 and Alternative 3 would be smaller than similar actions. In a letter dated November 19, 2018, NMFS concurred with NASA's determination stating that the project will not substantially adversely affect EFH, if the following conservation recommendations are initiated:

1. If Alternative 2 is implemented, target accretion areas of Unnamed Shoal A for dredging to obtain the necessary beach fill material.
2. If Alternative 2 is implemented, dredge over a large area, leaving undisturbed areas between dredged areas to provide for benthic recruitment and recolonization of impacted areas and avoid creating deep pits; follow the existing bathymetry/morphology of shoal to the extent possible, limit depth of cut not to exceed 10 ft. and confirm by conducting post-dredge survey.
3. Construct proposed offshore breakwaters with sand tombola such that the beach connects with the structures to reduce starving down-drift beaches of sand.
4. If Alternative 1 is implemented, conduct bi-annual post-construction monitoring of the accretion area at northern end of Wallops Island and adjacent erosion area at Chincoteague Inlet. Adaptively manage any unforeseen consequences of "backpassing" sand to the southern project area.

3.9.2 Affected Environment

Most major invertebrate groups are found on inshore and nearshore sandy areas including mollusks (e.g., clams and whelks), crustaceans (e.g., crabs, shrimp, and amphipods), and polychaetes (marine worms). Inshore tidal marsh grasses of WFF act as nursery grounds for a variety of fish species including the spot (*Leiostomus xanthurus*), the northern pipefish (*Syngnathus fuscus*), the dusky pipefish (*Syngnathus floridae*), and bay anchovy (*Anchoa mitchilli*) (USFWS 2015). Salinity and water depth play major roles in determining which coastal fish species are present in bays and inlets. An example of this is the sandbar shark (*Carcharhinus plumbeus*), which is common in summer months if the inshore channels are at least 12 feet deep and the salinity is at least 30 parts per thousand (Chesapeake Bay Program 2009).

Common finfish in both inshore and nearshore waters of WFF include the Atlantic croaker (*Micropogonias undulates*), sandbar shark, sand shark (*Carcharisa taurus*), smooth dogfish (*Mustelus canis*), smooth butterfly ray (*Gymnura micrura*), bluefish (*Pomatomidae saltatrix*), spot, and summer flounder (*Paralichthys dentatus*) (NASA 2016).

The Endangered Species Act (ESA)-listed Atlantic Sturgeon and Giant Manta Ray are discussed briefly in **Section 3.11, Special Status Species**. They could be present, but their low abundance and distribution makes project related impacts possible but not plausible. As described in section 3.11, trained observers would be onboard the dredge(s) to monitor for protected species. If any are encountered, NASA will require its contractor to slow the vessel to a safe speed to allow the protected species to leave the vicinity before continuing operations.

3.9.2.1.1 Fisheries

The project area associated with using sand from the north Wallops Island beach is geographically coincident with 21 managed fishery species. Unnamed Shoal A is geographically coincident with an additional nine managed fishery species. Commercially important shellfish fisheries include the sea scallop (*Plactopecten magellanicus*) and blue crab. Other nearshore shellfish fisheries species include decapod crustaceans, stomatopod crustaceans, and cephalopods. Common finfish fisheries in the waters near WFF include the menhaden (*Brevoortia tyrannus*), Atlantic croaker (*Micropogonias undulatus*), summer flounder, and bluefish.

Chincoteague is one of six major ports in Virginia where large, ocean-going fishing vessels unload their catches (McCay and Cieri 2000). Throughout Virginia, the total value of the commercial fishery is dominated by two species: sea scallop and menhaden. Prominent but relatively minor commercial and recreational fishery species also include blue crab, northern quahog clam (*Mercenaria mercenaria*), Atlantic croaker, summer flounder, and striped bass (*Morone saxatilis*) (NMFS 2018a; 2018b).

3.9.2.1.2 Essential Fish Habitat

The project area associated with using sand from the north Wallops Island beach is geographically coincident with eight EFH designations, no habitat areas of concern (HAPC) designations, and 21 managed species (**Table 3.9-1**). Unnamed Shoal A is geographically coincident with an additional three EFH designations, no HAPC designations, and an additional nine managed species. Only two EFH habitat types occur within the project area, water column and unconsolidated sand.

Table 3.9-1. Essential Fish Habitat and Managed Species for the Proposed Action Area on North Wallops Island Beach

Species	Scientific Name	Life Stage				
		Eggs	Larvae	Juveniles	Adults	Spawning Adults
Northeast Multispecies Fishery Management Plan – Amendment 14 (New England FMC)						
Red hake	*Urophycis chuss*	X	X	X		
Windowpane flounder	*Scopthalmus aquosus*	X	X	X	X	X
Northeast Skate Complex Fishery Management Plan – Amendment 2 (New England FMC)						
Clearnose skate	*Raja eglanteria*			X	X	
Winter skate	*Leucoraja ocellata*			X	X	

<table>
<tr><th colspan="7">Table 3.9-1. Essential Fish Habitat and Managed Species for the Proposed Action Area on North Wallops Island Beach</th></tr>
<tr><th rowspan="2">Species</th><th rowspan="2">Scientific Name</th><th colspan="5">Life Stage</th></tr>
<tr><th>Eggs</th><th>Larvae</th><th>Juveniles</th><th>Adults</th><th>Spawning Adults</th></tr>
<tr><td colspan="7">Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan – Amendment 12 (Mid-Atlantic FMC)</td></tr>
<tr><td>Black sea bass</td><td>Centropristis striata</td><td>X</td><td>X</td><td>X</td><td>X</td><td></td></tr>
<tr><td>Summer flounder</td><td>Paralichthys dentatus</td><td>X(1)</td><td>X</td><td>X</td><td>X</td><td></td></tr>
<tr><td colspan="7">Atlantic Herring Fishery Management Plan – Amendment 3 (New England FMC)</td></tr>
<tr><td>Atlantic sea herring</td><td>Clupea harengus</td><td>X(2)</td><td>X</td><td>X</td><td>X</td><td>X(2)</td></tr>
<tr><td colspan="7">Atlantic Bluefish Fishery Management Plan – Amendment 1 (Mid-Atlantic FMC)</td></tr>
<tr><td>Bluefish</td><td>Pomatomus saltatrix</td><td>X</td><td>X</td><td>X</td><td>X</td><td></td></tr>
<tr><td colspan="7">Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan – Amendment 11 (Mid-Atlantic FMC)</td></tr>
<tr><td>Atlantic butterfish</td><td>Peprilus triacanthus</td><td>X(3)</td><td>X(3)</td><td>X(3)</td><td>X(3)</td><td>X(3)</td></tr>
<tr><td colspan="7">Coastal Migratory Pelagics(4) – Amendment 26 (South Atlantic FMC)</td></tr>
<tr><td>Cobia(4)</td><td>Rachycentron canadum</td><td>X(4)</td><td>X(4)</td><td>X(4)</td><td>X(4)</td><td></td></tr>
<tr><td>King mackerel(4)</td><td>Scomberomorus cavalla</td><td>X(4)</td><td>X(4)</td><td>X(4)</td><td>X(4)</td><td></td></tr>
<tr><td>Spanish mackerel(4)</td><td>Scomberomorus maculatus</td><td>X(4)</td><td>X(4)</td><td>X(4)</td><td>X(4)</td><td></td></tr>
<tr><td colspan="7">Atlantic Highly Migratory Species Fishery Management Plan – Amendment 10 (Secretarial)</td></tr>
<tr><td>Albacore tuna*</td><td>Thunnus alalunga</td><td></td><td></td><td>X(4)</td><td></td><td></td></tr>
<tr><td>Skipjack tuna*</td><td>Katsuwonus pelamis</td><td></td><td></td><td>X(4)(5)</td><td>X(4)</td><td></td></tr>
<tr><td>Atlantic angel shark</td><td>Squatina dumeril</td><td colspan="5">X</td></tr>
<tr><td>Blacktip shark* (Atlantic stock)</td><td>Carcharhinus limbatus</td><td colspan="2">X</td><td>X</td><td>X</td><td></td></tr>
<tr><td>Common thresher shark</td><td>Alopias vulpinus</td><td colspan="5">X</td></tr>
<tr><td>Dusky shark</td><td>Carcharhinus obscurus</td><td colspan="2">X</td><td>X(5)</td><td>X(5)</td><td></td></tr>
<tr><td>Sand tiger shark</td><td>Carcharias taurus</td><td colspan="2">X</td><td>X</td><td>X</td><td>(6)</td></tr>
<tr><td>Sandbar shark</td><td>Carcharhinus plumbeus</td><td colspan="2">X</td><td>X</td><td>X</td><td>(6)</td></tr>
<tr><td>Smoothhound shark complex* (Atlantic stock)</td><td>Mustelus canis</td><td colspan="5">X</td></tr>
</table>

Notes: (*) Not covered under previous EFH consultations for the Proposed Action Area.
(1) Less likely in affected area under Alternative 1 and Alternative 3. Eggs are most likely from 30 to 360 feet. (9 to 110 meters [m]).
(2) Less likely in affected area under Alternative 1 and Alternative 3. Eggs and spawning adults are most likely from 15 to 300 feet. (5 to 90 m).
(3) Less likely in affected area under Alternative 1 and Alternative 3. All life stages are most likely deeper than 30 feet. (10 m).
(4) Coastal migratory pelagics and some highly migratory species are not year round residents of the Proposed Action Area and are generally absent in winter. These species are much less likely in the affected area under Alternative 1 and Alternative 3.
(5) Less likely in affected area under Alternative 1 and Alternative 3. Juveniles and adults are most likely deeper than 60 feet. (20 m).
(6) No HAPC near the Proposed Action area, but HAPC is approximately 60 mi (100 km) north and south, at Delaware Bay and Chesapeake Bay.
Legend: FMC = Fishery Management Council.

Completion of the proposed offshore breakwaters under Alternative 3 would convert approximately 0.34 acres of unconsolidated sand into hardbottom seafloor EFH. However, because the regional coastline has very little hardbottom habitat in the surf zone the potential direct benefits to designated EFH or managed species would be minimal. For a discussion of impacts to benthos, refer to **Section 3.7**.

Table 3.9-1 was excerpted from the separate EFH Assessment. Other EFH elements are incorporated by reference to minimize duplication.

3.9.3 ENVIRONMENTAL CONSEQUENCES

3.9.3.1 No Action Alternative

Under the No Action Alternative, the proposed breakwater construction, dredging, and beach renourishment would not occur. Therefore, there would be no project related impacts to fisheries and EFH.

3.9.3.2 Alternative 1

The nature and intensity of turbidity and water quality stressors imposed under Alternative 1 would be measurable, but would be substantially less than in previous consultations. Hauling sand by truck from the north Wallops Island beach would not require the large volumes of water to move sand slurries through pipes from a dredge site, and consequently would not produce a similarly intense turbidity plume. Taken together, turbidity and water quality stressors imposed on EFH and managed species would be substantially less than in previous consultations, e.g., stressors would be concentrated within the swash zone, projected to dissipate approximately 1,000 to 2,000 feet alongshore, and to last only several hours after cessation of work. Physical strike and disturbance stressors would be limited to vehicles operating in the surf zone. Other potential stressors imposed under Alternative 1 (i.e., artificial lighting, noise, ingestion, entanglement, and chemical stressors) are not relevant because their nature and magnitude is discountable, stressor and receptor are not co-located, and EFH and managed species have little to no meaningful susceptibilities in this context. Therefore, these other stressors were not carried forward for analysis for Alternative 1.

Most motile fishery species would be displaced from the project area under Alternative 1. Displacement would range from temporary to long term, and most consequences would be temporary or short term. Sessile fishery species (e.g., clams) are conservatively assumed to have 100 percent mortality within the project area under Alternative 1, and species recovery could begin almost immediately after completion of the renourishment activities.

3.9.3.2.1 Nearshore

Under Alternative 1, all of the nearshore intertidal and subtidal fishery species and EFH would be exposed to moderate and episodic turbidity stressors for the duration of the project. Construction equipment and materials would displace water column EFH, fish species, and their prey.

In accordance with NMFS conservation recommendation for EFH, NASA would continue to conduct bi-annual post-construction monitoring of the accretion area at northern end of Wallops Island and adjacent erosion area at Chincoteague Inlet and would adaptively manage any unforeseen consequences of "backpassing" sand to the southern project area.

3.9.3.2.2 Offshore

Under Alternative 1 there would be no dredging of sand from the Unnamed Shoal A and no offshore impact to fishery species and EFH.

3.9.3.3 Alternative 2

The nature and intensity of turbidity and water quality stressors and physical strike and disturbance stressors imposed under Alternative 2 would be identical to prior permitted actions. Most motile fishery species would be displaced from the project area without injury or mortality under Alternative 2. Displacement would range from temporary to long term, with most consequences temporary or short term. Sessile fishery species (e.g., clams) are conservatively assumed to have 100 percent mortality within the entire project area under Alternative 2, and species recovery could begin almost immediately after completion of the action. Most consequences would be temporary to short term because the stressors are reduced to background intensity shortly after cessation of construction. Other potential stressors imposed under Alternative 2 (i.e., artificial lighting, noise, ingestion, entanglement, and chemical stressors) are not relevant because their nature and magnitude is discountable, stressor and receptor are not co-located, and EFH and managed species have little to no meaningful susceptibilities in this context. Therefore, these other stressors were not carried forward for analysis for Alternative 2.

3.9.3.3.1 Nearshore

The nature and intensity of stressors affecting nearshore fish and EFH under Alternative 2 would be identical to prior permitted actions (NASA 2010, 2013). Fishery species and EFH in the inshore waters of Chincoteague Bay could conceivably be temporarily affected by turbidity and vessel traffic but no other direct or indirect stressors would be imposed by the Proposed Action. Inshore impact is possible but not probable. At minimum, a conservative estimate is that impacts to nearshore fish would be temporary, and impacts to their benthic prey would be several months up to 2 years (see **Section 3.7.2, Benthos**).

3.9.3.3.2 Offshore

The consequences to fishery species and EFH under Alternative 2 would be identical to prior permitted actions (NASA 2010, 2013). Alternative 2 would affect approximately 206 acres of offshore shoal habitat, would have 100 percent mortality for sessile species in the area dredged, and would remove the seafloor habitat. Most motile fish species would be displaced without injury or mortality. But dredging Unnamed Shoal A under Alternative 2 would have greater incidence of injury or mortality to motile demersal species (e.g., flatfish, dogfish, angel shark), including mortality from entrainment into the sand excavation equipment. However, the probability of large-bodied animals being entrained through the dragheads is lower than during prior permitted actions because screening was added since 2014 to minimize potential uptake of Unexploded Ordnance (UXO). The overall magnitude of adverse impacts are expected to be minimal, temporary and localized.

In accordance with NMFS EFH conservation recommendations, NASA would

- target accretion areas of Unnamed Shoal A for dredging to obtain the necessary beach fill material;
- dredge over a large area, leaving undisturbed areas between dredged areas to provide for benthic recruitment and recolonization of impacted areas and avoid creating deep pits;
- follow the existing bathymetry/morphology of shoal to the extent possible;
- limit depth of cut not to exceed 10 feet; and
- confirm by conducting post-dredge survey.

3.9.3.4 Alternative 3

Under Alternative 3, impacts to fishery species and EFH nearshore and onshore would be the same as those described for Alternative 1 or for Alternative 2, with the addition of bottom disturbance for the construction of the breakwaters. The nature and intensity of turbidity and water quality stressors imposed by breakwater construction under Alternative 3 would be different, but not meaningfully increased relative to Alternative 1 and Alternative 2. Other potential stressors imposed under Alternative 3 by the addition of breakwater construction (i.e., artificial lighting, noise, ingestion, entanglement, and chemical stressors) are not relevant because their nature and magnitude is discountable, stressor and receptor are not co-located, and EFH and managed species have little to no meaningful susceptibilities in this context. Therefore, these other stressors were not carried forward for analysis for Alternative 3.

3.9.3.4.1 Nearshore

Most motile fishery species would be displaced from the entire breakwater footprint under Alternative 3. Displacement would range from temporary to long term, and most consequences would be temporary or short term, as recovery could begin almost immediately after completion of the action. Most motile fish species are attracted to structures, and the breakwater would likely cause localized increases in fish density. Sessile fishery species (e.g., clams) are conservatively assumed to have 100 percent mortality within the breakwater footprint. The footprint of the breakwaters would permanently convert approximately 0.34 acres of sand to hardbottom habitat. Colonization of the new habitat could begin almost immediately after completion of the breakwater construction. However, because the regional coastline has very little hardbottom habitat in the surf zone the concept of recovery is not applicable and colonization of the breakwaters would provide habitat for an essentially novel community of benthos. Potential direct benefits to native fishery species and EFH would be minimal.

In accordance with NMFS EFH conservation recommendations, and based upon the design elements of the breakwater construction, NASA anticipates that natural sand tombola would form that connect the beach with the breakwater structures, thereby, reducing the potential to starve down-drift beaches of sand.

3.9.3.4.2 Offshore

Offshore impacts to fishery species and EFH from Alternative 3 would be identical to either Alternative 1 or Alternative 2, depending on the sand source.

3.10 MARINE MAMMALS

3.10.1 REGULATORY CONTEXT

Marine mammals are protected under the Marine Mammal Protection Act (MMPA) of 1972. The MMPA protects all marine mammals and prohibits, with certain exceptions, the “take” of marine mammals in U.S. waters and by U.S. citizens on the high seas. The MMPA also prohibits the importation of marine mammals and marine mammal products into the U.S. NMFS maintains jurisdiction of the majority of the marine mammal species found worldwide. The USFWS has jurisdiction for eight marine mammal species that are not regulated by NMFS (i.e., walrus, polar bear, two marine otter species, three manatee species, and the dugong) (USFWS 2018a).

Under the MMPA, NMFS has defined noise-related levels of harassment for marine mammals. The current Level A (injury) threshold is 190 and 180 dB_{RMS} for pinnipeds (e.g., seals) and cetaceans (e.g., whales and dolphins), respectively. The current Level B (disturbance) threshold for underwater impulse noise (e.g., pile driving) for both cetaceans and pinnipeds is 160 dB_{RMS} from a non-continuous noise source. The Level B (disturbance) threshold for continuous noise (e.g., dredging) is 120 dB_{RMS} for both cetaceans and pinnipeds.

3.10.2 AFFECTED ENVIRONMENT

Section 3.2.9 of the *2010 Final SRIPP PEIS* describes in detail the marine mammals that may occur within the project area. This section provides a summary. Federally listed (i.e., ESA) species are discussed in **Section 3.11, Special Status Species** of this EA.

Of the approximately nineteen marine mammal species not listed by ESA that could occur within or adjacent to the project area, the bottlenose dolphin (*Tursiops truncatus*) is the most common, with the potential to occur at any time of year but most commonly encountered during non-winter months. During winter, the species is rarely observed north of the North Carolina-Virginia border. Those individuals encountered would be expected to be the coastal morphotype; the offshore morphotype are primarily found farther offshore.

3.10.3 Environmental Consequences

3.10.3.1 No Action Alternative

Under the No Action Alternative, there would be no project related impacts to marine mammals.

3.10.3.2 Alternative 1

Under Alternative 1, there would be no dredging or offshore construction activities. Therefore, there would be little to no impact to marine mammals, aside from the potential for increased turbidity in the very nearshore environment during the sand placement activities. These impacts would be minor, would occur in relatively shallow water, and would be temporary in nature. No long term impacts to marine mammals would occur under Alternative 1.

3.10.3.3 Alternative 2

Potential adverse impacts to marine mammals would be associated with physical disturbance to habitats during dredging and placement of material which would result in temporary increases in-water turbidity, a reduction in prey availability, vessel strike, and increased noise from vessel activities. However, given the relatively slow speed of the dredge, the limited extent of habitat affected, and with the implementation of mitigation measures described below, effects are expected to be minimal.

During the development of the *2013 Post-Hurricane Sandy EA*, NASA participated in a study (Reine *et al*. 2014) to better characterize dredge noise within its project site. Reine *et al.* (2014) found that in-water noise levels associated with dredging would not reach the 180 and 190 dB_{RMS} Level A thresholds (for cetaceans and pinnipeds, respectively); 160 dB_{RMS} non-continuous Level B would only be reached several yards from the dredge; and 120 dB_{RMS} continuous noise Level B would be reached at between 0.1 and 1.2 miles from the dredge, depending on the specific activity within the dredging cycle.

As with previous projects that involved dredging, NASA would ensure that an NMFS-approved bridge watch is stationed on each dredge at all times of year to scan the horizon for up to 1.2 miles for marine mammals. At this distance, marine mammals could be readily detected with the aid of binoculars. Should an individual be detected, the vessel would be required to turn off its pumps until the animal has left the immediate vicinity, upon which the dredging activity could resume.

In consideration of the above described mitigation measures, it would be highly unlikely that marine mammals within or adjacent to the project area would be subjected to noise levels in excess of those prescribed by the MMPA. Therefore, the Proposed Action would not result in the harassment of any non-listed marine mammals. In 2012, NMFS issued a revised Biological Opinion based on the best available information, and concluded that the effects of dredge noise on listed species of whales are discountable (see **Section 3.11, Special Status Species**).

3.10.3.4 Alternative 3

Under Alternative 3, impacts to marine mammals would be similar to those described under Alternatives 1 or 2, depending on the source of sand for renourishment, with the additional construction of breakwaters at two locations approximately 200 feet offshore, in shallow (4 to 8 feet deep) water. During breakwater construction, barge-mounted heavy equipment would place geotextile mattresses and large stones, per the breakwater design. Due to the shallow water, larger marine mammals would likely not be in the vicinity and therefore, would not be impacted. Bottlenose dolphins may be found at these water depths, but would likely avoid the area due to construction activity and noise. Disturbances to any potential foraging or movement of bottlenose dolphins would be temporary, and there would be no long term impacts to marine mammals under Alternative 3.

3.11 Special Status Species

Special status species include any species which is listed, or proposed for listing, as threatened or endangered by the USFWS or NMFS under the provisions of the ESA; species protected under other federal laws including the Bald and Golden Eagle Protection Act; species that are considered to be threatened or endangered under Virginia's ESA; or those species or habitats of conservation concern identified by the Commonwealth of Virginia. Marine mammals are also protected under federal regulations and are discussed in **Section 3.10, Marine Mammals**.

3.11.1 Regulatory Context

Section 7 of the ESA requires federal agencies to evaluate the effects of their actions on listed species and consult with either the USFWS or NMFS if the agency determines that its action "may affect" a listed species or designated critical habitat.

The Virginia ESA (29 VAC 1-563 – 29.1-570) is administered by Virginia Department of Game and Inland Fisheries and prohibits the taking, transportation, processing, sale, or offer for sale of any federally or state-listed threatened or endangered species. As a federal agency, NASA voluntarily complies with Virginia's ESA.

3.11.2 Affected Environment

Section 3.2.10 of the *2010 Final SRIPP PEIS* describes in detail the federally listed species that inhabit the project site. This section provides both a summary and updated information obtained since its publication.

3.11.2.1.1 Onshore

A review of the federal threatened and endangered species list for Accomack County indicates that the species potentially within the project area have not changed from those discussed in the *2010 Final SRIPP PEIS*, with the exception of the addition of the Northern long-eared bat (*Myotis septentrionalis*) (USFWS 2018b). In preparing the *2010 Final SRIPP PEIS*, NASA determined that project activities may affect the threatened seabeach amaranth (*Amaranthus pumilus*), threatened piping plover, threatened red knot, and several species of nesting sea turtles, including loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempii*), and Atlantic green (*Chelonia mydas*). Although there is suitable seabeach amaranth habitat present on the Wallops Island beach, recent biological surveys have not identified any of these listed plants (NASA 2016a). While habitat does exist on Wallops Island and within the boundaries of WFF for the Northern long-eared bat, no habitat exists within the project area. Therefore, seabeach amaranth and the Northern long-eared bat are not discussed further, and this section will focus on piping plovers, red knots, and sea turtles.

The Virginia Department of Game and Inland Fisheries (VDGIF) maintains a listing of endangered, threatened, and species of greatest conservation need. Federal-level listings are mirrored in state-level listings. While no other state-listed plants, reptiles, or mammals have been documented in the project area, two state-listed birds Wilson's plover (*Charadrius wilsonia*) and gull-billed tern (*Sterna nilotica*) are present (VDGIF 2018).

In accordance with its Protected Species Monitoring Program, NASA continues to conduct regular monitoring of the Wallops Island beach between March and September to determine the level of federally-listed bird and sea turtle nesting activity within and adjacent to the project area. In general, the wildlife abundances measured under the monitoring program have stayed about the same since 2010, or have declined (NASA 2016, NASA 2017, NASA 2018).

Piping Plover: Since 2010, NASA has conducted annual piping plover surveys 3 to 4 times weekly between March and September. Six piping plover (*Charadrius melodus*) nests were observed in 2017 with four chicks surviving to fledge, and three nests were observed in 2018 with three chicks surviving to fledge (NASA 2017, NASA 2018).

Red Knot: NASA has observed and recorded red knot (*Caladris canutus rufa*) numbers since 2010. Red knot counts were 415 birds in 2017 and 393 in 2018. Since 2010 the high was over 3,000 birds in 2012 and the low was less than 100 birds in 2014 (NASA 2017, NASA 2018).

Sea Turtles: While NASA has observed loggerhead sea turtles and sea turtle nesting activity in the past, numbers are low and some years have no observations of sea turtle nesting. Between 2010 and 2013 NASA observed a total of 8 nests and 5 false crawls on Wallops Island beach. DNA analysis determined that all 4 nests in 2010 were dug by a single female loggerhead sea turtle (NASA 2010b; USFWS 2016). No sea turtle nesting activity was observed in 2014, 2015, 2016, 2017, and 2018 (NASA 2017, NASA 2018).

Gull-billed Terns and Wilson's Plovers: Since 2010, no nesting activity has been observed on Wallops Island for either gull-billed terns or Wilson's plovers.

3.11.2.1.2 Offshore

In preparing the *2010 Final SRIPP PEIS*, NASA determined that project activities have the potential to affect in-water sea turtles (species listed above under **Section 3.11.2.1.1 Onshore**) and several whale species, including right whale (*Eubalaena glacialis*), fin whale (*Balaenoptera physalus*), sperm whale (*Physeter macrocephalus*), sei whale (*Balaenoptera borealis*), and blue whale (*Balaenoptera musculus*). Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) was added into the Supplemental Biological Assessment (NASA 2011b), Biological Opinion (NMFS 2012), and the *2013 Post-Hurricane Sandy EA* (incorporated by reference into this section). The NMFS issued a revised 2012 Biological Opinion based on the best available information, and concluded that the effects of dredge noise on listed species of whales are discountable. Protected species monitoring conducted by observers onboard the three dredges during the post-Sandy beach fill cycle reported no in-water sightings of listed species.

The giant manta ray (*Manta birostris*) was listed as threatened in January of 2018. It is found worldwide in tropical, subtropical, and temperate oceanic waters and near productive coastlines. It is sometimes found in waters as cool at 66° F and one individual was recently observed just offshore of Assateague Island (Swann 2018). Though not observed inside Chincoteague Inlet, the giant manta ray has been observed in other estuarine waters near oceanic inlets (NOAA 2018).

The VDGIF maintains a listing of endangered, threatened, and species of greatest conservation need, including marine animals. Federal-level listings are mirrored in state-level listings, and there are no other state-level listed marine plants or animals known from the proposed project area (VDGIF 2018).

3.11.3 Environmental Consequences

3.11.3.1 No Action Alternative

Under the No Action Alternative, there would be no project related impacts to any special status species onshore or offshore at Wallops Island.

3.11.3.2 Alternative 1

The north Wallops Island beach borrow area under Alternative 1 is within the historical nesting areas utilized by piping plover and loggerhead sea turtles.

Avifauna: Impacts on piping plover and red knot would be generally the same as those discussed for non-listed avian species in **Section 3.8, Wildlife** of this EA. In summary, these effects would include the potential for startle or disruption of foraging, reduction in prey availability, and for plovers, the potential for disruption of courtship and nesting activities.

In a letter dated December 14, 2018, to the USFWS Virginia Field office, NASA submitted its determinations of impacts from the proposed action to threatened and endangered species. The USFWS issued a Biological Opinion on June 7, 2019, and concur with NASA's determinations that the SERP is not likely to adversely affect the northern long-eared bat, roseate tern, hawksbill sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, green sea turtle, and seabeach amaranth. The Biological Opinion included an Incidental Take Statement for red knot, piping plover, and loggerhead sea turtle, anticipating the incidental take of 17 plovers during the beach backpassing and renourishment activities and 12 individuals in the subsequent two years as habitat improves. The USFWS anticipates incidental take of 180 red knots in the first year of activities and 90 in each of the 2 years following beach renourishment, as a result of disturbance from heavy equipment and decreased habitat suitability for foraging during spring migration. As such, the Biological Opinion requires the following measures to minimize impacts to these species.

- Sand excavation on north Wallops Island will not begin until after the last plover chick has fledged or the last loggerhead has hatched, whichever is later.
- Preparation and distribution of a fact sheet containing this information to all project personnel.
- Minimization of foot traffic during construction.
- Inspection of all vehicles for leaks immediately prior to work in beach habitat.
- Notification to the USFWS regarding the projected and actual start dates, progress, and completion of the project and verify that the 5.4 miles of beach habitat alteration was not exceeded and all conservation measures were followed.

- Submission of an annual report summarizing the survey and monitoring efforts, location and status of all occurrences of listed species recorded, and any additional relevant information to the USFWS by December 31 of each year.

The VMRC permit for this project prescribes a number of terms and conditions that also aim to reduce impacts to special status species as detailed in the conditions listed below.

- Activities shall not begin until the last piping plover or American oystercatcher chicks have fledged or the last sea turtle nest has hatched or been deemed nonviable by VDGIF staff, whichever is later.
- Every effort shall be made to complete activities by March 15 of any year. If work must continue past the March 15, deadline, daily monitoring for red knot migrants and nesting piping plovers and American oystercatchers shall begin on March 15 and continue until the last chicks of either species fledges. Daily sea turtle nest patrols shall begin on May 1, and continue until the last nest hatches or is deemed nonviable by VDGIF staff.
- If a piping plover or sea turtle nest is found before sand mining and renourishment activities are completed, all activities must cease until the WFF staff has notified the USFWS and VDGIF and VDGIF has completed an on-site determination about whether or not construction activities may continue.
- If an American oystercatcher nest is found before sand mining and renourishment activities are completed, all activities must cease until the VDGIF staff has completed an on-site determination about whether or not construction activities may continue.
- Predator screens will be placed over sea turtle nests and predator exclosures shall be erected around all piping plover nests.
- Equipment and materials shall be staged in upland areas westward of the beach and outside of sensitive habitats (e.g., marshes, mudflats, dunes).

If a piping plover or sea turtle nest is found before sand mining and renourishment activities are complete, VMRC has committed to arriving on site to evaluate nests within an average of 24 hours (maximum of 48 hours) after receiving a report of a nest.

Herpetofauna: Impacts to nesting sea turtles could include interference with nesting attempts during nighttime construction activity (particularly artificial lighting) on the beach, unintentional burial of a newly dug nest if it were to go undetected, disorientation of hatchlings (due to project related light sources), or obstruction to hatchlings during their emergence and subsequent trip to the ocean.

It is unlikely that that the replenished beach would prove unsuitable to nesting turtles because the beach fill material is not substantially different from nearby native beaches. Moreover, as evidenced by the sea turtle nesting that occurred on the Wallops Island beach during the initial beach fill cycle, it is possible that the additional elevated beach would provide suitable nesting habitat, a net benefit to the species. The USFWS Biological Opinion anticipates the incidental take of 1 adult loggerhead sea turtle and 1 loggerhead nest (1 nest equaling 128 hatchling turtles) to result from beach renourishment that may bury nests or place sand of a grain size that does not support loggerhead nesting attempts.

Atlantic Sturgeon and Giant Manta Ray: Under Alternative 1, no impacts to Atlantic sturgeon or giant manta ray are anticipated, as no in-water work would occur. Impacts would be limited to temporary increased turbidity in the nearshore environment as sand placement occurs.

Cetaceans: Under Alternative 1, no impacts to cetaceans are anticipated, as no in-water work would occur. Impacts would be limited to temporary increased turbidity in the nearshore environment as sand placement occurs.

3.11.3.3 Alternative 2

Avifauna: Impacts to avifauna from renourishment activities under Alternative 2 would be similar to those described under Alternative 1. No impacts are plausible to piping plover or red knot from the dredge operating at Unnamed Shoal A.

Herpetofauna: Impacts to sea turtles under Alternative 2 would be similar to those described for Alternative 1, with the addition of impacts from the dredge operating at Unnamed Shoal A. Impacts on in-water sea turtles could include entrainment in the dredge, interaction with the sediment plume, reduction in available forage, direct strike, and disturbance due to vessel created noise. However, the probability of interaction is very low because turtle numbers in the area are low. Nesting females number few to zero, and there were zero observations of sea turtles by protected species observers onboard each of the three dredges during the two prior fill cycles. Additionally, the probability of large-bodied animals being entrained through the dragheads is lower than during prior permitted actions because of turtle deflectors on the dragheads, implementation of NMFS BO Terms and Conditions (NMFS 2012 and **Section 3.11.3.5, Section 7 Consultations**), and screening to minimize potential uptake of UXO. The NMFS anticipates incidental take of 1 adult sea turtle for every 1.6 million cubic yards of offshore dredging as a result of entrainment – in addition to the USFWS anticipated incidental take on land.

Atlantic Sturgeon: Impacts to the Atlantic sturgeon would be similar to those of in-water sea turtles and could include entrainment in the dredge, interaction with the sediment plume, reduction in available forage, direct strike, and disturbance due to vessel created noise. However, given the limited number of sturgeon expected to use the borrow area as habitat and the limited portion of available habitat that would be affected, the potential for interaction is limited. Similar to in-water sea turtles, this conclusion is supported by the recently completed initial beach fill cycle. Endangered species observers stationed onboard each of the three dredges did not observe an Atlantic sturgeon. NMFS anticipates incidental take of 1 Atlantic sturgeon for every 9.4 million cubic yards of offshore dredging as a result of entrainment.

Giant Manta Ray: Impacts to the giant manta rays would be similar to those of Atlantic sturgeon with the exception of entrainment in the dredge. Considering the behavior and distribution of giant manta rays relative to the operating parameters of hopper dredges, it is not anticipated that dredging entrainment poses a risk. Additionally, the probability of large-bodied animals being entrained through the dragheads is lower than during prior permitted actions because of turtle deflectors on the dragheads and screening to minimize potential uptake of UXO. Giant manta rays were not federally listed during the previous dredging event so protected species observers did not search for them.

Cetaceans: Impacts to cetaceans under Alternative 2 may include reduction in available forage, direct strike, and disturbance due to vessel created noise. According to the July 22, 2010, NMFS Biological Opinion, the potential of marine mammal strikes would be mitigated by operating the dredges at low speeds. Dredge speeds are anticipated to be approximately 3 knots while dredging and 10 knots while transiting between the borrow site and the nearshore pump-out buoy. Therefore, there would be a low risk of vessel strike. NMFS issued a revised 2012 Biological Opinion based on the best available information, and concluded that the effects of dredge noise on listed species of whales are discountable because it is extremely unlikely for listed whales to be within 1 kilometer (km; 0.6 miles) of the dredge. In addition, NASA would ensure that the dredge contractor followed the updated mitigation measures summarized in the NMFS BO (summarized in **Section 3.11.3.5, Section 7 Consultations**) including protected species observers and all dredge pumps turned off upon a whale observation within 1 km of the dredge.

3.11.3.4 Alternative 3

Avifauna: Impacts to avifauna under Alternative 3 would be similar to those described under Alternative 1 or 2 depending upon the sand source, with the addition of disturbance caused by breakwater construction. The breakwaters are planned to be constructed well south of the historical areas used by piping plover and red knots, and would be constructed approximately 200 feet offshore of the renourished shoreline. It is unlikely that any long term impacts would occur from breakwater construction to listed bird species.

Herpetofauna: Impacts to sea turtles from Alternative 3 would be similar to those described under Alternative 1 or 2 depending upon the sand source, with the addition of disturbance caused by breakwater construction. The construction of breakwaters could potentially cause disturbance and area avoidance by sea turtles, depending on the time of year construction was initiated. Additionally, if work continued throughout the night, lighting could cause confusion for swimming sea turtle hatchlings. Although breakwaters have been shown to impact the ingress and egress of nesting sea turtles and hatchlings, it is unlikely that six breakwaters with a total length of 780 feet (4 percent of the 19,000 foot replenishment project) would provide a significant impediment to sea turtle ingress and egress of the beach.

Atlantic Sturgeon and Giant Manta Ray: Impacts to Atlantic Sturgeon and Giant Manta Ray would be similar to those described under Alternative 1 or 2 depending upon the sand source, with the addition of potential disturbance during breakwater construction. These species are highly mobile and would likely avoid the breakwater construction area during construction activities. Long term impacts due to breakwater construction would be unlikely.

Cetaceans: Impacts to cetaceans under Alternative 3 would be the same as those under Alternative 1 or 2 depending upon the sand source, with the addition of the disturbance during breakwater construction. During breakwater construction, barge-mounted heavy equipment would place large stone, per breakwater design in approximately 8 feet of water. It is extremely unlikely that larger marine mammals would be in water this shallow and potential for impact is discountable.

3.11.3.5 Section 7 Consultations

On March 20, 2013, USFWS responded that the impacts resulting from the beach renourishment proposed by the *2013 Post-Hurricane Sandy EA* would be within that already considered in its July 30, 2010 programmatic Biological Opinion (BO). USFWS also submitted a newer consolidated BO in June 2016 to replace and consolidate opinions and terms for ongoing operations at WFF that included a 2-7 year cycle for beach renourishment (USFWS 2016).

On March 21, 2013, NMFS determined that the action proposed in the *2013 Post-Hurricane Sandy EA* were not significantly differ from the actions considered in the 2012 NMFS Biological Opinion and did not warrant re-initiation. On September 26, 2014, following discovery of UXO in a hopper intake basket, NMFS concurred with NASA's determination that installation of UXO screens would prevent onboard observers from monitoring intake baskets after each load, thereby focusing observer efforts on inspecting the dragheads versus the baskets for the presence of entrained or impinged protected species remains.

In developing the BOs, NMFS and USFWS provided mandatory terms and conditions that NASA must follow to reduce potential effects to listed species. As such, NASA and USACE would ensure that their contractors implemented these measures on their behalf. These measures include all specifications in Incidental Take Statements, Terms and Conditions, Reasonable and Prudent Measures, and other mitigation measures stipulated in each BO for dredging, backpassing, and renourishment.

NASA re-initiated informal consultation with NMFS and USFWS in 2018. On November 20, 2018, NMFS responded to NASA's submittal of additional effects analysis, that based on the effect analysis from the previous consultations, the information provided regarding changes to the project description, and the fact that no new listed species or designated critical habitat overlap with the action area, impacts from the proposed actions in this SERP EA do not warrant re-initiation of consultation. NASA reinitiated consultation with the USFWS on September 27, 2018, and subsequently on December 14, 2018, provided background supporting information. The December correspondence summarized NASA's conclusion that impacts associated with the project would be substantially the same as those considered in the 2010 and 2016 BOs: that is these proposed activities *may affect, are likely to adversely* affect piping plovers, red knots, and loggerhead sea turtles; proposed observation of time of year restrictions to minimize impacts to listed species; and requested USFWS concurrence with the determination. On June 7, 2019, the USFWS issued a consolidated Biological Opinion which included concurrence with NASA's determinations of effect for northern long-eared bat, roseate tern, hawksbill sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, green sea turtle, and sea beach amaranth. The Biological Opinion included incidental take statement for piping plover, red knot, and loggerhead sea turtle and included several terms and conditions required to minimize impacts (refer to Section 3.11.3.2 above). Correspondence related to special status species consultation for this EA are included as **Appendix G**.

3.12 Cultural Resources

Cultural resources are defined as prehistoric or historic sites, buildings, structures, objects, or other physical evidence of human activity that are considered important to a culture or community for scientific, traditional, or religious reasons.

3.12.1 Regulatory Context

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and as implemented by 36 CFR Part 800, requires federal agencies to consider the effects of their actions on historic properties before undertaking a project. A historic property is defined as any cultural resource that is included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). The NRHP, administered by the National Park Service (NPS), is the official inventory of cultural resources that are significant in American history, prehistory, architecture, archaeology, engineering, and culture. The NRHP also includes National Historic Landmarks. In consideration of 36 CFR 800, federal agencies are required to initiate consultation with the State Historic Preservation Office (SHPO) informing them of the planned action and requesting their comments or concerns.

In accordance with Sections 106 and 110 of the NHPA, NASA developed a Programmatic Agreement with the Virginia SHPO and Advisory Council on Historic Preservation to outline how WFF manages its cultural resources as an integral part of its operations and missions (NASA 2014, 2016c). As part of this process, NASA identified a number of parties who have an interest in, or knowledge of, cultural resources at WFF and included them in the development of the terms of the Programmatic Agreement.

3.12.2 Affected Environment

3.12.2.1 Aboveground Resources

Section 3.3.7 of the 2010 *Final SRIPP PEIS* describes in detail the effects on cultural resources that may occur within or adjacent to the project site. One NRHP-eligible resource has been identified at WFF: the Wallops Beach Life Saving Station (DHR ID #001-0027-0100; WFF #V-065) and the associated Coast Guard Observation Tower (DHR ID #001-0027-0101; WFF #V-070). The resources were surveyed in the 2004 *Historic Resources Survey and Eligibility Report* (NASA 2015). The survey determined the Wallops Beach Life Saving Station (DHR ID #001-0027-0100; WFF #V-065) to be eligible for listing in the NRHP under both Criterion A and Criterion C for its association with the Coast Guard and for architectural significance for exemplifying the Colonial Revival Style. The Coast Guard Observation Tower (DHR ID #001-0027-0101; WFF #V-070) was not considered eligible individually but as a contributing structure to the Life Saving Station.

WFF considered various options for the Wallops Beach Life Saving Station and Coast Guard Observation Tower disposition including their removal from WFF and transfer from Federal ownership or demolition or deconstruction. In accordance with the mitigation terms of the Programmatic Agreement, WFF prepared a Historic American Building Survey (HABS)/Historic American Engineer Record (HAER) recordation of the Station and Observation Tower and short documentary video of their history (VDHR 2016a). VDHR accepted the HABS/HAER recordation and documentary and concurred with the disposition proposals (VDHR 2016b). Currently, NASA and the General Services Administration are considering moving and transferring the building to a private buyer (Miller personal communication 2018).

NASA has prepared two architectural resource surveys at WFF since the *2010 Final SRIPP PEIS.* In 2011, a Section 110 architectural survey identified and evaluated buildings and structures built between 1956 and 1965. Out of the total 76 buildings and structures that were identified, 34 are located on Wallops Island. None were recommended eligible for listing in the NRHP. The VDHR concurred with these findings in 2011 (NASA 2015).

In 2018, a reconnaissance-level architectural survey of buildings and structures built between 1965 and 1981 and one resource constructed in 1963 was conducted. The survey identified and evaluated 52 resources, 16 of which are located on Wallops Island, and concluded that none of the resources were eligible for listing in the NRHP (NASA 2018b). The VDHR concurred with these findings in August 2018 (VDHR 2018).

3.12.2.2 Archaeological Resources

The Area of Potential Effects (APE) for archaeology is defined as the area where ground disturbing activities would take place. For the SERP EA, this includes areas of beach renourishment, sand dredging, and construction of offshore breakwaters.

Two archaeological surveys were completed to investigate the APE for the *2010 Final SRIPP PEIS.* In 2009, an investigation of the proposed groin, breakwater, and shoreline that would be impacted by the SRIPP project was completed. This investigation included pedestrian survey of the Wallops Island shoreline, archaeological monitoring of the installation of geotextile tubes along the shoreline, a diving survey of the proposed groin location, and a remote sensing survey of the proposed breakwater area. The investigation did not identify any archaeological resources in the areas and no additional work was recommended (Randolph et *al*. 2009).

The second investigation for the Final SRIPP EIS was conducted in 2010. This survey investigated the proposed offshore sand borrow areas using underwater remote sensing. No underwater archaeological resources were identified during the survey and no additional work was recommended for the borrow area (Randolph *et al.* 2010).

No previously identified archaeological sites are located in the APE for the project. Three previously identified archaeological sites are located on Wallops Island in the vicinity of the APE. The Military Earthworks site (44AC0089) is a Revolutionary War gun emplacement located at the northern end of Wallops Island. The site was subjected to additional investigations and recommended eligible for listing on the NRHP. Site 44AC0159 is an unnamed site located at the southern end of Wallops Island. The site is described as a shell pile or shell midden and has been determined not eligible for listing on the NRHP. Site 44AC0459 is a trash scatter associated with the Coast Guard Life Saving Station and Observation Tower. This site was also determined not eligible for the NRHP (NASA 2015).

3.12.3 Environmental Consequences

3.12.3.1 No Action Alternative

Under the No Action Alternative, the proposed renourishment of the beach and breakwater construction would not occur. Therefore, cultural resources would not be impacted.

3.12.3.2 Alternative 1

North Wallops Island has been previously surveyed for cultural resources. Only the Wallops Beach Life Saving Station (DHR ID #001-0027-0100; WFF #V-065) and the Coast Guard Observation Tower (DHR ID #001-0027-0101) are considered eligible for listing in the NRHP. Potential effects are likely to be minimal since the resources are located approximately 3,000 feet north of the APE. If sand from north Wallops Island beach were used for the renourishment of the shoreline, the potential effects are likely to be visual effects occurring during the harvesting phase. The visual effects would be short term and would not affect the integrity of the resource. Construction may create noise, but that would be minimal.

Previous surveys of the APE for archaeological resources did not identify any archaeological resources; therefore, the proposed project would have no effect on NRHP-eligible archaeological sites. The inadvertent discovery of any previously unidentified archaeological resources would result in immediate cessation of work and notification of the WFF Cultural Resources Manager, who would contact the VDHR and Native American Tribes as appropriate.

3.12.3.3 Alternative 2

Previous surveys of Unnamed Shoal A and the pumpout buoy area did not identify any archaeological resources; therefore, the proposed project would have no effect on NRHP-eligible archaeological sites.

3.12.3.4 Alternative 3

Potential impact to cultural resources from beach renourishment would be the same as those described for Alternative 1 and 2, depending on the sand source. Additionally, prior surveys were conducted of the pumpout buoy area utilized during offshore dredging. Breakwaters would be constructed within the pumpout buoy APE. As these surveys did not identify any archaeological resources, breakwater construction would have no effect on NRHP-eligible archaeological sites.

3.12.3.5 Section 106 Consultations

While preparing the *2010 Final SRIPP PEIS*, NASA consulted with the VDHR on the potential effects of the Proposed Action on historic properties. VDHR concurred with NASA's determination that the Proposed Action would have no adverse effect on historic properties. NASA requested comments from VDHR regarding potential impacts to historic resources by the proposed Shoreline Enhancement and Restoration Project prior to preparation of this EA. On August 14, 2018, the VDHR issued a finding of No Historic Properties Affected (VDHR 2018). Correspondence between NASA and the VDHR is included in **Appendix H** of this EA.

Three Native American Tribes were consulted during the scoping period for this EA, including the Pamunkey Indian Tribe, the Pocomoke Indian Nation, and the Catawba Indian Nation. The contact information for the tribes is listed in Chapter 6. The Pamunkey Indian Tribe became a federally recognized tribe in 2016. During scoping for this EA, the tribe requested to be notified in the event of the inadvertent discovery of archaeological resources (Gray 2018). The Thomasina E. Jordan Indian Tribes of Virginia Federal Recognition Act of 2017 (U.S. Public Law 115-121) federally recognized the Chickahominy Indian Tribe, the Chickahominy Indian Tribe – Eastern Division, the Upper Mattaponi Tribe, the Rappahannock Tribe, Inc., the Monacan Indian Nation, and the Nansemond Indian Tribe as Native American tribes in January 2018. These tribes will be notified of the public draft of the EA.

3.13 Recreation Resources

Recreation resources include primarily outdoor recreational activities that occur away from a participant's residence. This includes natural resources and built facilities that are designated or available for public recreational use. The setting, activity, and other resources that influence recreation are also considered.

3.13.1 Affected Environment

There is one main area on Wallops Island designated for recreational use by permanently badged WFF employees, tenants, contractors, and their guests: a beach area north of the seawall and south of the beach cable barrier. In 2017, launch of non-motorized watercraft from U-070 and the North Island dock areas, and fishing and shell-fishing at the edge of these wetland areas was authorized. These areas are open after operational hours to permanently badged WFF employees and their guests unless temporarily restricted for mission/launch hazards. The northern portion of this recreational area is closed annually from March through August during piping plover and sea turtle nesting season. A second area designated for recreational use, the marsh under the Wallops Island Bridge that runs along the Virginia Inside Passage of the Intracoastal Waterway, is open year round; however, it may only be accessed via boat.

Virginia's Eastern Shore is a popular tourist destination. Many tourists and vacationers visit Accomack County throughout the late spring, summer, and early fall. Regional attractions include the Assateague Island National Seashore and CNWR. The Wallops Island National Wildlife Refuge is located south of the WFF Visitor Center and is under the jurisdiction of the USFWS. This refuge is not open to the general public. South of Wallops Island is Assawoman Island, a 1,420 acre parcel managed as part of the CNWR by the USFWS. The remainder of the CNWR lies mostly east and north of Wallops Island on Chincoteague Island. A string of undeveloped barrier islands, managed by The Nature Conservancy as part of the Virginia Coast Reserve, extends south down the coast to the mouth of the Chesapeake Bay.

Winter hunting season draws people to hunt local game including dove, quail, deer, and many types of geese and ducks. The Wallops Island shoreline is also a popular location for local fishermen who surf fish or fish from boats in the nearshore environment. Recreational boaters and divers utilize the marine waters offshore. Annually, ongoing operations at the WFF, including rocket launches and testing, result in issuance of Notices to Mariners for approximately 128 events totaling 467 hours (Miller personal communication 2018).

3.13.2 Environmental Consequences

3.13.2.1 No Action Alternative

If the Proposed Action were not implemented, no change to existing recreational opportunities would occur. The north Wallops Island beach would continue to be used by employees for recreation, subject to seasonal restrictions.

3.13.2.2 Alternative 1

If sand from the north Wallops Island beach were used for the renourishment of the shoreline infrastructure protection area, sand would be excavated to the mean low water line. The area would be closed during the excavation and transport phases of the project and a portion of the beach used by employees for recreation would be removed, potentially limiting recreation opportunities in the short term. However, this area is expected to continue to accrete as a result of the littoral transport of sand from the renourished beach as well as from Assateague Island and to fully recover within 5 to 6 years.

3.13.2.3 Alternative 2

Using sand from Unnamed Shoal A to renourish the shoreline infrastructure protection area would not affect recreational opportunities on land, however recreational boating in the immediate area would be limited during the excavation of material from the shoal and transporting sediment from the borrow area to the discharge site would result in an increase in boat and barge traffic. However, as stated in the *2010 Final SRIPP PEIS*, a Notice to Mariners would be issued, when necessary, to notify boaters in advance so that they can select alternate routes without substantially affecting their activities or experience.

3.13.2.4 Alternative 3

Alternative 3 would involve renourishing the shoreline infrastructure protection area using sand from the north Wallops Island beach or Unnamed Shoal A and the resulting impacts would be the same as those described for Alternatives 1 and 2. Additionally, a series of offshore breakwaters would be constructed resulting in boat and barge traffic for the duration of construction. Impacts are expected to be similar to those described for Alternative 2 though the construction would occur nearshore in relatively shallow water, unlikely to affect recreational fishing or boating. Breakwater construction would be outside the Wallops Island beach and would not impact recreational users.

4.0 CUMULATIVE EFFECTS

The cumulative effects analysis (CEA) is important to understanding how multiple actions that occur in a particular time and area affect the environment. The CEQ regulations (40 CFR § 1508.7) define cumulative impacts as:

> *"…the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions."*

Whereas the individual impacts of one project in a particular area or region may not be considered significant, numerous projects in the same area or region may cumulatively result in significant impacts. Cumulative effects are most likely to arise when a relationship exists between a Proposed Action and other actions occurring in a similar location or during a similar time period. Actions overlapping with or in proximity to the Proposed Action would be expected to have more potential for a relationship than those more geographically separated. Similarly, actions that coincide in time, even partially, have the potential for cumulative effects.

4.1 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

Establishing an appropriate scope for cumulative effects analysis is vital to producing a meaningful analysis that appropriately informs agency decision-making. This involves properly delineating geographic and temporal boundaries within which to identify other activities that could contribute to cumulative impacts to resources; and providing an appropriate level of detail of those activities so their contribution to cumulative impacts is clear.

CEQ guidance advises that geographic boundaries for cumulative effects analysis should incorporate ecologically relevant boundaries, depending on the resource in question (CEQ 1997). EPA notes that geographic boundaries should not be extended to the point that the analysis "becomes unwieldy and useless for decision-making" and advises that the proper spatial scope of the analysis include the geographic areas that sustain the resources of concern (EPA 1999). On establishing an appropriate temporal scope, EPA advises estimating the length of time the effects of the Proposed Action would last (EPA 1999). Considering this, the focus of this CEA includes the projects and activities that affect Wallops Island (particularly the shoreline) that have occurred or are anticipated to occur in the next 5 years, at which time impacts are anticipated to have diminished to allow for a recovery state of analyzed resources.

CEQ (2005) provides guidance on the level of effort and detail that is appropriate in CEA:

> "*The scope of the cumulative impact analysis is related to the magnitude of the environmental impacts of the proposed action. Proposed actions of limited scope typically do not require as comprehensive an assessment of cumulative impacts as proposed actions that have significant environmental impacts over a large area. Proposed actions that are typically finalized with a Finding of No Significant Impact usually involve only a limited cumulative impact assessment to confirm that the effects of the proposed action do not reach a point of significant environmental impacts."*

Following this guidance, this CEA focuses only on those resources evaluated in Chapter 3 of this document that are expected to be measurably affected by the Proposed Action (see **Table 4.1-1**).

Table 4.1-1. Resources Considered in Cumulative Effects Analysis	
Resource	**Considered in Cumulative Effects Analysis?**
Coastal Geology and Processes	No, negligible impacts identified in this EA
Water Quality	No, negligible impacts identified in this EA
Coastal Zone Management	No, negligible impacts identified in this EA
Air Quality	No, negligible impacts identified in this EA
Noise	No, negligible impacts identified in this EA
Benthos	Section 4.3.1
Wildlife	Section 4.3.2
Fisheries and Essential Fish Habitat	Section 4.3.3
Marine Mammals	No, negligible impacts identified in this EA
Special Status Species	Section 4.3.4
Cultural Resources	No, negligible impacts identified in this EA
Recreation Resources	No, negligible impacts identified in this EA

4.2 PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS

The sections below provide a summary of the actions considered in this CEA. Section 4.7 of the *2010 Final SRIPP PEIS* provides a detailed CEA for all potentially affected resource areas throughout the 50-year design life of the shoreline restoration program, including effects of past actions dating to federal settlement of Wallops Island in the early 1940s. Section 3.4 of the *2013 Final Post-Hurricane Sandy EA* documents activities that occurred or were planned to occur after the publication of the *2010 Final SRIPP PEIS*. Both of these documents are incorporated by reference here. NASA is currently preparing a twenty-year planning horizon “master plan” PEIS, and accordingly it considered the relevance of those actions to this CEA. The launch activities detailed in that PEIS may overlap in location and time with the Proposed Action.

4.2.1 ONGOING OPERATIONS

A number of past and ongoing activities are detailed in the *2010 Final SRIPP PEIS, 2013 Final Post-Hurricane Sandy EA* including launch range operations for launches of suborbital and orbital rocket missions as well as targets and projectiles; operations of Mid-Atlantic Regional Spaceport Unmanned Aerial Systems airstrip and Payload Processing Facility, both on the north end of Wallops Island; Protective Service Division security patrolling; and protected species monitoring. NASA’s *2018 Draft Site-wide PEIS* included these continuing actions and foreseeable future actions including replacement of the causeway bridge, maintenance dredging, and a north Wallops Island deep water port operations area.

4.2.2 WALLOPS ISLAND SHORELINE STABILIZATION ACTIVITIES

The *2010 Final SRIPP PEIS* evaluated extending the existing rock seawall on Wallops Island by up to 4,600 feet south of its southernmost point and renourishing 3.7 miles of shoreline with sand dredged from an OCS sand shoal. An initial seawall extension of approximately 1,430 feet was implemented between August 2011 and March 2012 and further seawall extension may be completed in the future as funding becomes available. In addition, between April and August 2012, approximately 3,200,000 cubic yards of fill was placed along the Wallops Island shoreline (from approximately 1,500 feet north of the Wallops Island-Assawoman Island property boundary and extending north to the terminus of the existing rock seawall), creating an approximately 100 foot wide beach and dune (NASA 2016b).

The *2013 Final Post-Hurricane Sandy EA* evaluated the impacts of repairing damage to the rock seawall and renourishing the recently filled beach. Between July and September 2014, approximately 667,000 cubic yards of material was dredged from the same location as the initial beach fill and placed along the southern 13,000 feet of Wallops Island (NASA 2016b). With the exception of a shortened period between initial fill and the first renourishment, the proposed project was essentially the same as that described in the *2010 Final SRIPP PEIS*, which estimated that up to 806,000 cubic yards of material would be needed every three to seven years.

The *2010 Final SRIPP PEIS* examines the potential impacts of the project's 50-year design life, which includes beach renourishment occurring every three to seven years. Accordingly, over the next 5 years, an additional beach renourishment may occur. Sand for this renourishment could be sourced from offshore shoals or from the north Wallops Island beach.

4.2.3 Federal Navigation Projects

On a periodic basis, the USACE dredges the Chincoteague Inlet, just north of Wallops Island to maintain channel depth, typically removing 80,000 to 100,000 cubic yards of material from the channel and placing it in the Atlantic Ocean east of Wallops Island. The Inlet has not required dredging in recent years and was most recently dredged in September – October 2018 (see **Table 3.2-1**). Additionally, USACE occasionally dredges the navigation channel in Bogues Bay, just west of Wallops Island.

4.2.4 Recreational and Motorized Vehicle Use of Wallops Island Beach

The WFF Protective Services Division performs daily vehicle patrols of the Wallops Island beach according to a defined protocol. Patrols use the same points of access and operate within the intertidal zone, except under emergency conditions. A portion of the north Wallops Island beach is open to WFF employees for recreational use, subject to seasonal restrictions protective of nesting piping plovers and sea turtles. All areas south of the northern terminus of the rock seawall are closed to recreation year round in accordance with launch range safety regulations.

4.2.5 Pest and Predator Management

The U.S. Department of Agriculture Animal and Plant Health Inspection Service (APHIS) Division of Wildlife Services personnel perform regular predator removal on Wallops Island to control the depredation of eggs or young of beach nesting turtles and shorebirds (NASA 2013). Efforts focus primarily on the management of raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), red fox (*Vulpes vulpes*), laughing gull (*Larus atricilla*), herring gull (*Larus argentatus*), great black-backed gull (*Larus marinas*), fish crow (*Corvus ossifragus*), American crow (*Corvus brachyrhynchos*), and common grackle (*Quiscalus quiscula*). Activities are conducted year round as needed but are concentrated in the winter, spring, and early summer months to coincide with predator dispersal and with breeding and nesting.

4.2.6 Protected Species Monitoring

In accordance with the USFWS 2016 Biological Opinion, WFF administers a Protected Species Monitoring Plan, which establishes procedures for monitoring a number of protected species that are likely to occur at Wallops Island including: seabeach amaranth, red knot, piping plover, Wilson's plover, gull-billed terns, American oystercatcher, and sea turtles (NASA 2016a). Annually between March and September, NASA regularly performs 3 to 4 surveys per week of Wallops Island beach for these species as a component of its Natural Resources Management Program. Any nests discovered are identified with signage and predator exclosures. Program staff provide outreach to beach users, including security staff and recreational users (NASA 2013).

4.2.7 VESSEL TRAFFIC

Commercial, recreational, and military maritime traffic all use the area off the coast of Virginia, one of the busiest areas in the world for maritime traffic. Traffic Separation Schemes (TSS), defined in 33 CFR Part 167 – *Offshore Traffic Separation Schemes,* are used to regulate ship traffic at busy confined areas by routing and separating opposing ship traffic. One-way ship traffic lanes that are marked by buoys. The nearest TSS lanes to WFF are the southernmost approaches to the Delaware Bay, which are approximately 50 nautical miles (nm) north of Wallops Island, and the northernmost lanes of the Chesapeake Bay approach, which are approximately 55 nm south of Wallops Island.

4.2.8 U.S. NAVY ATLANTIC FLEET TESTING AND TRAINING ACTIVITIES

The Navy conducts ongoing military readiness training and research, development, testing, and evaluation activities within the Atlantic Fleet Testing and Training (AFTT) area, which includes the Virginia Capes Operations Area located off Virginia and North Carolina (U.S. Navy 2017).

4.2.9 CLIMATE CHANGE AND RESILIENCY

The Eastern Shore lies within one of the U.S's most vulnerable coastal regions. Coastal Virginia is especially susceptible to the impacts of climate change, primarily resulting from sea level rise and increased storm intensity. Sea levels are rising at three to four times the global average and storms are intensifying. Sea-level rise rates on Virginia's Eastern Shore show a MSL rise of between 4.5 to 7 feet by 2100. On the Eastern Shore, tens of millions of dollars have been spent on traditional "gray" infrastructure approaches, such as sea walls, groins, jetties, bulkheads and revetments, as defenses against mounting coastal hazards. Often, the gray infrastructure has only exacerbated the area's vulnerability and undermined the region's abundant natural resilience by interrupting critical environmental processes.

Currently, 12 % of Chincoteague Island, which is close proximity to Wallops Island, experiences chronic inundation, or tidal flooding. Under a low impact forecast scenario, the percentage of land in this locality experiencing chronic inundation will increase to 74% by 2100. Under the intermediate impact forecast scenario, 34% of the land area will reach this level of flooding by 2035, with 85% by 2100. In the high impact scenario, Chincoteague Island is virtually completely inundated by 2100 (UCS 2017).

The Main Base of Wallops Flight Facility sits at approximately 42 feet above sea level. As a result, chronic inundation is not likely to threaten all of the facility, though some low lying areas will experience the threat. Storm surge, however, could be very damaging, particularly if coupled with increased sea levels and rising tide cycles.

While the exact extent of inundation of the coastal, Atlantic-facing areas of the Eastern Shore are not currently known, the general long term impacts of chronic flooding and storm flooding potentials will be significant, altering the geography, and placing great strain on existing infrastructure. Long term coastal resilience master planning such as Governor Northam has called for in his recent Executive Order (EO 24 2018) are required to assess the best methods of coastal protection where practicable. The populated areas of the Eastern Shore and other areas of coastal Virginia will necessarily change as communities and citizens are ultimately relocated to reduced impact areas as a result of permanent flooding of low lying areas.

4.3 POTENTIAL CUMULATIVE EFFECTS

4.3.1 BENTHOS

Despite the minor increase in frequency of shoreline renourishment as compared to that which was assessed in the *2010 Final SRIPP PEIS*, the nature of potential cumulative impacts to benthos would be the same with or without this Proposed Action. Shoreline stabilization, replacement of the causeway bridge, maintenance dredging, a north Wallops Island deep water port operations area, Navy AFTT actions, and federal navigation projects would expose the benthos to infrequent but repeated impacts that are essentially identical to the Proposed Action. The consequences of each action results in delayed recovery, but does not cumulatively degrade the capacity for recovery.

4.3.2 WILDLIFE

The impacts to wildlife, particularly birds and sea turtles, resulting from the Proposed Action would add to those resulting from other past, present, and reasonably foreseeable projects. These include: disturbance from human presence, noise, and lighting associated with WFF infrastructure and its use; accidental injury or death resulting from vehicle use on beaches; and potential impacts to benthic prey base resulting from this and other shoreline stabilization projects. Additionally the creation of foraging and nesting habitat for birds and sea turtles could offset negative impacts from other activities occurring on or near the project area and add to the beneficial impacts of predator control projects.

4.3.3 ESSENTIAL FISH HABITAT

Despite the minor increase in frequency of shoreline renourishment as compared to that which was assessed in the *2010 Final SRIPP PEIS*, the nature of potential cumulative impacts to fisheries and EFH would be the same with or without the Proposed Action. Shoreline stabilization, replacement of the causeway bridge, maintenance dredging, a north Wallops Island deep water port operations area, Navy AFTT actions, and federal navigation projects will expose fisheries and EFH to infrequent but repeated impacts that are essentially identical to the Proposed Action. The consequences of each action results in delayed recovery, but does not cumulatively degrade the capacity for recovery of fisheries and EFH.

4.3.4 SPECIAL STATUS SPECIES

Impacts to special status species on land are similar to those described above for wildlife. A reduction in nesting habitat for piping plovers and loggerhead sea turtles and foraging habitat for red knot would result if sand from the north Wallops Island beach were used for renourishment. Disturbance from lighting, noise, and human presence could also occur. Additionally, inadvertent loss of individuals or eggs could occur if sand movement from this beach occurred during the breeding season and onsite monitors did not detect nests. These potential negative impacts to special status species on land could add to disturbance resulting from ongoing use of adjacent roads and infrastructure, beach patrols and species monitoring. The potential exists for nesting habitat to be created in the area renourished resulting in possible countervailing impacts when considered with past, present and reasonably foreseeable activities.

The proposed offshore work could result in the impacts to in-water sea turtles, protected fish, and whales including entrainment in the dredge, interaction with the sediment plume, reduction in available forage, and disturbance due to vessel created sounds. Though such impacts are considered unlikely, they could add to impacts resulting from federal navigation projects, launch events, replacement of the causeway bridge, maintenance dredging, a north Wallops Island deep water port operations area, Navy AFTT actions, and ongoing shoreline stabilization activities.

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Hoffman, Chareé	Technical Review, Quality Control	B.S. Biology Years of Experience: 18
Lowenthal, John	Water Quality	B.S. Biology M.S. Biology/Plant Ecology Years of Experience: 31
Lengel, Sonja	Cultural Resources	B.F.A. Interior Design M.S. Historic Preservation Years of Experience: 10
Lybolt, Matt	EFH and Fisheries, Biological Resources Review	B.S. Biology M.S. Biological Oceanography Ph.D. Marine Ecology Years of Experience: 18
Simpson, Sharon	Production Coordinator	A.S. Science Years of Experience: 19

NAME	TITLE/AREA OF RESPONSIBILITY	EDUCATION AND EXPERIENCE
Swain, Ken	Technical Review	B.S. Geology M.S. Geology, Coastal Processes Years of Experience: 23
Thursby, Lori	Cultural Resources	B.S. Environmental Design in Architecture M.S. Architectural History Years of Experience: 22
Wetland Design and Restoration		
Priest, Walter	Coastal Geology	B.S. in Biology M.S. in Biology Years of Experience: 44

APPENDIX A
SCOPING LETTERS

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COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

February 27, 2018

NASA Wallops Flight Facility
ATTN: SERP Project
34200 Fulton Street
Building F-160 I Room Cl 65
Wallops Island, Virginia 23337
email: wff-shoreline@mail.nasa.gov

RE: NASA's proposed Shoreline Enhancement and Restoration Project at Wallops Island, Virginia

Dear Ms. Miller:

This letter is in response to the scoping request for the above-referenced project.

As you may know, the Department of Environmental Quality, through its Office of Environmental Impact Review (DEQ-OEIR), is responsible for coordinating Virginia's review of federal environmental documents prepared pursuant to the National Environmental Policy Act (NEPA) and responding to appropriate federal officials on behalf of the Commonwealth. Similarly, DEQ-OEIR coordinates Virginia's review of federal consistency documents prepared pursuant to the Coastal Zone Management Act which applies to all federal activities which are reasonably likely to affect any land or water use or natural resources of Virginia's designated coastal resources management area must be consistent with the enforceable policies Virginia Coastal Zone Management (CZM) Program.

DOCUMENT SUBMISSIONS

In order to ensure an effective coordinated review of the NEPA document and federal consistency documentation, notification of the NEPA document and federal consistency documentation should be sent directly to OEIR. We request that you submit one electronic to eir@deq.virginia.gov (10 MB maximum) or make the documents available for download at a website, file transfer protocol (ftp) site or the VITA LFT file share system (Requires an "invitation" for access. An invitation request should be sent to eir@deq.virginia.gov.). We request that the review of these two documents be done concurrently, if possible.

The NEPA document and the federal consistency documentation (if applicable) should include U.S. Geological Survey topographic maps as part of their information. We strongly encourage you to issue shape files with the NEPA document. In addition, project details should be adequately described for the benefit of the reviewers.

ENVIRONMENTAL REVIEW UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT: PROJECT SCOPING AND AGENCY INVOLVEMENT

As you may know, NEPA (PL 91-190, 1969) and its implementing regulations (Title 40, *Code of Federal Regulations*, Parts 1500-1508) requires a draft and final Environmental Impact Statement (EIS) for federal activities or undertakings that are federally licensed or federally funded which will or may give rise to significant impacts upon the human environment. An EIS carries more stringent public participation requirements than an Environmental Assessment (EA) and provides more time and detail for comments and public decision-making. The possibility that an EIS may be required for the proposed project should not be overlooked in your planning for this project. Accordingly, we refer to "NEPA document" in the remainder of this letter.

While this Office does not participate in scoping efforts beyond the advice given herein, other agencies are free to provide scoping comments concerning the preparation of the NEPA document. Accordingly, we are providing notice of your scoping request to several state agencies and those localities and Planning District Commissions, including but not limited to:

Department of Environmental Quality:
- DEQ Regional Office*
- Air Division*
- Office of Wetlands and Stream Protection*
- Office of Local Government Programs*
- Division of Land Protection and Revitalization
- Office of Stormwater Management*

Department of Conservation and Recreation
Department of Health*
Department of Agriculture and Consumer Services
Department of Game and Inland Fisheries*
Virginia Marine Resources Commission*
Department of Historic Resources
Department of Mines, Minerals, and Energy
Department of Forestry
Department of Transportation

Note: The agencies noted with a star (*) administer one or more of the enforceable policies of the Virginia CZM Program.

FEDERAL CONSISTENCY UNDER THE COASTAL ZONE MANAGEMENT ACT

Pursuant to the federal Coastal Zone Management Act of 1972, as amended, and its implementing regulations in Title 15, *Code of Federal Regulations*, Part 930, federal activities, including permits, licenses, and federally funded projects, located in Virginia's Coastal Management Zone or those that can have reasonably foreseeable effects on Virginia's coastal uses or coastal resources must be conducted in a manner which is consistent, to the maximum extent practicable, with the Virginia CZM Program.

Additional information on the Virginia's review for federal consistency documents can be found online at
http://www.deq.virginia.gov/Programs/EnvironmentalImpactReview/FederalConsistencyReviews.aspx

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DATA BASE ASSISTANCE

Below is a list of databases that may assist you in the preparation of a NEPA document:

- DEQ Online Database: Virginia Environmental Geographic Information Systems

  Information on Permitted Solid Waste Management Facilities, Impaired Waters, Petroleum Releases, Registered Petroleum Facilities, Permitted Discharge (Virginia Pollution Discharge Elimination System Permits) Facilities, Resource Conservation and Recovery Act (RCRA) Sites, Water Monitoring Stations, National Wetlands Inventory:
    - www.deq.virginia.gov/ConnectWithDEQ/VEGIS.aspx

- DEQ Virginia Coastal Geospatial and Educational Mapping System (GEMS)

  Virginia's coastal resource data and maps; coastal laws and policies; facts on coastal resource values; and direct links to collaborating agencies responsible for current data:
    - http://128.172.160.131/gems2/

- MARCO Mid-Atlantic Ocean Data Portal

  The Mid-Atlantic Ocean Data Portal is a publicly available online toolkit and resource center that consolidates available data and enables users to visualize and analyze ocean resources and human use information such as fishing grounds, recreational areas, shipping lanes, habitat areas, and energy sites, among others.

  http://portal.midatlanticocean.org/visualize/#x=-73.24&y=38.93&z=7&logo=true&controls=true&basemap=Ocean&tab=data&legends=false&layers=true

- DHR Data Sharing System.

  Survey records in the DHR inventory:

    - www.dhr.virginia.gov/archives/data_sharing_sys.htm

- DCR Natural Heritage Search

  Produces lists of resources that occur in specific counties, watersheds or physiographic regions:
    - www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml

- DGIF Fish and Wildlife Information Service

  Information about Virginia's Wildlife resources:
    - http://vafwis.org/fwis/

- Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Database: Superfund Information Systems

Information on hazardous waste sites, potentially hazardous waste sites and remedial activities across the nation, including sites that are on the National Priorities List (NPL) or being considered for the NPL:

- www.epa.gov/superfund/sites/cursites/index.htm

- EPA RCRAInfo Search

  Information on hazardous waste facilities:
  - www.epa.gov/enviro/facts/rcrainfo/search.html

- EPA Envirofacts Database

  EPA Environmental Information, including EPA-Regulated Facilities and Toxics Release Inventory Reports:
  - www.epa.gov/enviro/index.html

- EPA NEPAssist Database

  Facilitates the environmental review process and project planning:
  http://nepaassisttool.epa.gov/nepaassist/entry.aspx

If you have questions about the environmental review process and/or the federal consistency review process, please feel free to contact me (telephone (804) 698-4204 or e-mail bettina.sullivan@deq.virginia.gov).

I hope this information is helpful to you.

Sincerely,

Bettina Rayfield, Program Manager
Environmental Impact Review and
Long-Range Priorities

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From: Robert Gray
To: Miller, Shari A. (WFF-2500)
Subject: RE: Request for Comments on NASA Wallops Flight Facility Proposed Shoreline Project
Date: Wednesday, February 28, 2018 10:48:20 AM

The Pamunkey Indian Tribe is not aware of any site of cultural or religious significance that would be affected by the project. We ask to be notified in the event of inadvertent discovery.

MY E-MAIL HAS RECENTLY CHANGED AND YOU MAY NEED TO UPDATE YOUR CONTACT LIST. ALSO NOTE MY PHONE # AND MAIL ADDRESS.

Robert Gray
Chief / Tribal Administrator
Pamunkey Indian Tribe
Phone: (804) 572-1225
E-mail: robert.gray@pamunkey.org

Mail Address
Pamunkey Indian Tribe
1054 Pocahontas Trail
King William, VA 23086

From: Miller, Shari A. (WFF-2500) [mailto:shari.a.miller@nasa.gov]
Sent: Tuesday, February 27, 2018 8:51 AM
Subject: Request for Comments on NASA Wallops Flight Facility Proposed Shoreline Project

Dear Potential Stakeholder,

In accordance with the National Environmental Policy Act of 1969 (NEPA), as amended, the National Aeronautics and Space Administration (NASA) is preparing an Environmental Assessment (EA) for its proposed Shoreline Enhancement and Restoration Project (SERP) at Wallops Island, in Accomack County, Virginia. As the U.S. Bureau of Ocean Energy Management and U.S. Army Corps of Engineers are serving as cooperating agencies.

The attached letter contains further information on this proposed project. NASA respectfully requests that you provide comments or concerns by March 29, 2018. For updates on the project, as well as ways to submit comments on the SERP EA, please visit the following website address: https://sites.wff.nasa.gov/code250/Tiered_Shoreline_Enhancement_and_Restoration_EA.html.

Please e-mail responses and inquiries to wff-shoreline@mail.nasa.gov or send responses via U.S. mail to the following address:

NASA Wallops Flight Facility
ATTN: SERP Project
34200 Fulton Street
Building F-160 / Room C165
Wallops Island, Virginia 23337

Sincerely,

Shari Miller

____
Shari A. Miller
Center NEPA Manager
Environmental Planning Lead
NASA Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov
http://sites.wff.nasa.gov/code250/

COUNTY OF ACCOMACK
OFFICE OF THE COUNTY ADMINISTRATOR
23296 COURTHOUSE AVE.
ROOM 203
P. O. BOX 388
ACCOMAC, VIRGINIA 23301
(757) 787-5700
(757) 824-5444
(757) 787-2468 FAX

Michael T. Mason, CPA
County Administrator

March 7, 2018

NASA Wallops Flight Facility
ATTN: SERP Project
34200 Fulton Street
Building F-160/Room C165
Wallops Island, Virginia 23337

RE: NASA's proposed Shoreline Enhancement and Restoration Project (SERP) at Wallops Islands

On behalf of the County of Accomack, Virginia Board of Supervisors, I write this letter in support of NASA's Shoreline Enhancement and Restoration Project (SERP) at Wallops Island, Virginia and the swift preparation of the Environmental Assessment (EA) associated with it.

It is of vital economic importance to Accomack County that continued steps are taken to protect the $1.2 billion in assets located on Wallops Island from storm-induced wave impacts thereby preserving the 1,700 jobs held by NASA servants, contractors and tenant personnel working on or in the general area of Wallops Island.

A great deal of investment has been made by Federal, State and local government to ensure NASA Wallops continues to meet ongoing and emerging needs in the science, defense, aerospace and commercial industries. It is only prudent that continued actions be pursued to protect these investments.

It is the County's hope that completion of the EA be achieved in an expeditious manner. Time is not on our side. Storms over the last few years have depleted defenses erected in 2014 to safeguard the island. While the shoreline has weathered these storms, they have taken their toll with shoreline sand volume at only 43% of the design levels.

It is with a sense of urgency that Accomack County supports this initiative and future actions to preserve Wallops Island. NASA is a valued partner of the County thus we hope this letter helps advance this project and our mutual goal of preserving the assets on Wallops Island.

Sincerely Yours,

Michael T. Mason, CPA
County Administrator

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 1111 East Main Street, Suite 1400, Richmond, VA 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

MEMORANDUM

TO: Shari A. Miller, Center NEPA Manager

FROM: Daniel Moore, Principal Environmental Planner

DATE: March 12, 2018

SUBJECT: Scoping Request – NASA Shoreline Enhancement and Restoration Project, Wallops Island, Virginia

We have reviewed the request for scoping comments for the proposed project and offer the following comments regarding consistency with the provisions of the *Chesapeake Bay Preservation Area Designation and Management Regulations* (Regulations):

Wallops Island is located along the shoreline of the Atlantic Ocean. As such it is outside of the Chesapeake Bay watershed and not subject to the Regulations and the *Chesapeake Bay Preservation Act*.

COMMONWEALTH of VIRGINIA

Marine Resources Commission
2600 Washington Avenue
Third Floor
Newport News, Virginia 23607

March 19, 2018

NASA Wallops Flight Facility
ATTN: SERP Project
34200 Fulton Street
Building F-160 / Room C165
Wallops Island, Virginia 23337

Re: Shoreline Enhancement and Restoration
Wallops Island (Scoping request)

Dear Sir or Madam:

You have inquired regarding the permitting requirements for Shoreline Enhancement and Restoration on Wallops Island. The Marine Resources Commission requires a permit for any activities that encroach upon or over, or take use of materials from the beds of the bays, ocean, rivers and streams, or creeks, which are the property of the Commonwealth.

In addition, since Accomack County has not yet adopted the model Coastal Primary Sand Dune Zoning Ordinance, the Commission is charged with reviewing the impacts associated with any projects that may fall within the Coastal Primary Sand Dunes/Beaches of Accomack County.

Based upon my review, it appears that all your proposed actions extending the seawall, beach nourishment, breakwaters and a southern end groin/jetty will require authorization from the Marine Resources Commission. The proposed dredged sits appear to be greater than 3 miles offshore therefore, that portion of the project will not require a permit from our agency.

We do have concerns that a southern end jetty may stop the existing longshore transport of sand to Assawoman Island. This would be especially so if funding could not be secured for the anticipated 3-7 year nourishment cycles. A series of offshore breakwaters would help alleviate some of our concerns with the nourishment cycles long term funding. If funding was not secured the existing longshore transport of sand to Assawoman Island would have less impact than a jetty. The impact to Assawoman Island from a jetty or breakwaters should be address.

An Agency of the Natural Resources Secretariat
www.mrc.virginia.gov
Telephone (757) 247-2200 (757) 247-2292 V/TDD Information and Emergency Hotline 1-800-541-4646 V/TDD

NASA Wallops Flight Facility
Page 2

If I may be of further assistance, please do not hesitate to contact me at (757) 414-0710.

Sincerely,

George H. Badger, III
Environmental Engineer

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

March 29, 2018

Ms. Shari A. Miller
NASA Wallops Flight Facility
34200 Fulton Street
Building F-160/Room C165
Wallops Island, Virginia 23337

RE: Public scoping for NASA's proposed Shoreline Enhancement and Restoration Project at Wallops Island, Virginia

Dear Ms. Miller:

Thank you for your correspondence to the U.S. Environmental Protection Agency (EPA) dated February 27, 2018 informing us of NASA's decision to prepare an Environmental Assessment (EA) for its proposed Shoreline Enhancement and Restoration Project (SERP) at Wallops Island, in Accomack County, Virginia. We look forward to reviewing the project in compliance with the National Environmental Policy Act (NEPA), Clear Air Act Section 309 and authorities under the Clean Water Act. The SERP is the second document being tiered from the February 2010 Programmatic Environmental Impact Statement (PEIS) in which NASA evaluated the potential environmental effects from various alternatives including extending an existing seawall, recurring beach nourishment, constructing a parallel nearshore breakwater and constructing a southern-end perpendicular groin. The preferred action of the PEIS consisted of extending the seawall and beach nourishment. These actions proved effective in protecting Wallops' facilities during the 2012 Superstorm Sandy, however, the beach suffered significant loss of material.

In June 2013, NASA released the Wallops Island Post-Hurricane Sandy Shoreline Repair Final Environmental Assessment (Shoreline Repair EA) which was tiered from the PEIS and evaluated potential impacts associated with an adjusted renourishment cycle and repair of the Wallops Island seawall. Since completing these actions in 2014, the shoreline has withstood several storm events, including Winter Storm Jonas, however the sand volume has been reduced to 43% of design levels. The purpose of the SERP EA is to continue reducing the potential for damage of assets on Wallops Island from storm-induced wave impacts and evaluation of the potential impacts associated with dredging of offshore sand from two marine sand sources, placement of dredged sand on Wallops Island beach, and construction of a series of parallel, offshore breakwaters.

We have some general recommendations for the scope of analysis for the proposed study:

Printed on 100% recycled/recyclable paper with 100% post-consumer fiber and process chlorine free.
Customer Service Hotline: 1-800-438-2474

- The NEPA document should include a clear explanation of the underlying purpose and need for the proposed action. The purpose and need statement is important because it helps explain why the proposed action is being undertaken, the objectives the project intends to achieve, the measures to determine how well alternatives meet need. The purpose of the proposed action is typically the specific objective of the activity. The need should explain the underlying problem for why the project is necessary.
- The EA should provide context for the study area, other efforts being performed in the area, communication planning, etc.
- Alternatives analysis should include the suite of activities or solutions that were considered and the rationale for not carrying these alternatives forward for detailed study. Please feel free to reach out EPA to discuss Alternatives moved forward to detailed study.
- Please indicate in the EA what permits will be sought and required from the Commonwealth and Federal governments.
- The study should evaluate and discuss secondary and cumulative impacts, as defined by CEQ (40 CFR 1508.7 and 1508.8), of the proposed actions. Impacts may be positive or adverse (see CEQ 1997- "Considering Cumulative Effects Under the National Environmental Policy Act").
- We recommend the EA include an analysis of how shoal A may have diminished in volume since the 2013 Shoreline Repair EA, whether it can sustain additional dredging as a source of material for beach nourishment and, if so, what impacts additional dredging may have on the habitat it provides for birds and invertebrates such as annelids, mollusks and crustaceans.
- Please evaluate and discuss any impacts the proposed actions may have on herpetofauna; and any proposed avoidance and minimization measures.
- Please include discussion of any anticipated habitat creation for species such as the Piping Plover or Diamondback Terrapin and any monitoring of these species that will be conducted.
- In the Shoreline Repair EA, the presence of additional sand within the nearshore system was anticipated to lead to the formation of offshore sand bars which would dissipate wave energy (p.3-9). It would be helpful if the EA documented if these offshore sandbars formed since the additional sand was incorporated into the nearshore system. Please describe how any offshore sandbars formed since the Shoreline Repair EA may influence the construction of offshore breakwaters proposed in the SERP.

EPA appreciates the opportunity to engage in the scoping and development of the documentation to satisfy the requirements of NEPA and the Clean Water Act. For any questions or assistance EPA can provide, please contact Mr. Aaron Blair at (215) 814-2748, blairaaronm@epa.gov.

Sincerely,

Barbara Rudnick
NEPA Program Manager
Office of Environmental Programs

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APPENDIX B
COMMENT LETTERS DRAFT EA

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From: Dell, Peter J (WFF-8400)
To: Miller, Shari A. (WFF-2500)
Subject: Fwd: Availability of NASA WFF Shoreline Enhancement and Restoration Project Draft Environmental Assessment
Date: Sunday, December 09, 2018 9:04:01 PM

This looks like it was a lot of work! Good Job.
I talked to John Saecker about breakwaters 3 or 4 years ago and it seemed like the way to go.
Just a consideration for the project and for an "alternative 4" - could you do the breakwaters, then see how well they back fill on their own before pumping more sand? I would expect that they would self populate with sand pretty quickly, which would reduce the funding required and the environmental impact. Could then use that money to put even more breakwaters in.
Not your concern, but not sure I like the idea of stealing so much sand from the rec beach.

Begin Forwarded Message:

From: "WFF-Information" <wff-information@mail.nasa.gov>
Subject: [wff700-all] [wff-all] Availability of NASA WFF Shoreline Enhancement and Restoration Project Draft Environmental Assessment
Date: 06 December 2018 09:50
To: "wff-all@lists.nasa.gov" <wff-all@lists.nasa.gov>

Dear Colleagues:

On behalf of NASA Goddard Space Flight Center's Wallops Flight Facility (WFF), I am pleased to announce the availability of the Draft Shoreline Enhancement and Restoration Project Environmental Assessment (SERP EA) for renourishment and protection of infrastructure at NASA Goddard Space Flight Center's Wallops Flight Facility, Accomack County, Virginia.

The SERP EA is being prepared to satisfy NASA's obligations under the National Environmental Policy Act of 1969 (NEPA) and will also serve as a means for ensuring compliance with a variety of other Federal statutes, including the Endangered Species Act, Marine Mammal Protection Act, Clean Water Act, National Historic Preservation Act, Coastal Zone Management Act, and the Magnuson-Stevens Fishery Conservation and Management Act. As the U.S. Bureau of Ocean Energy Management and U.S. Army Corps of Engineers may be involved in permitting certain aspects of the SERP, both are serving as cooperating agencies and, as such, have assisted NASA in preparing the EA and in participating in all regulatory consultations during the NEPA process.

The Draft SERP EA evaluates the environmental consequences of a range of reasonable alternatives that meet NASA's needs, as well as the needs of the other federal Cooperating Agencies, to restore the Wallops Island shoreline in order to reduce the potential for damage to, or loss of, NASA, U.S. Navy, and Virginia Commercial Spaceflight Authority's Mid-Atlantic Regional Spaceport assets on Wallops Island from wave impacts associated with storm events. The Proposed Action would involve placement of approximately 1.3 million cubic yards of sand in areas that have been eroded in recent storm events. Sand could come from the north Wallops Island beach or from offshore Unnamed Shoal A. Additionally, NASA may construct a series of parallel nearshore breakwater structures that would reduce the intensity of wave action and slow sediment transport.

An electronic version of the Draft SERP EA and additional project information is available on the project website at:
https://sites.wff.nasa.gov/code250/Tiered_Shoreline_Enhancement_and_Restoration_EA.html

The SERP EA is the second such document being tiered off of the February 2010 Programmatic Environmental Impact Statement for the Shoreline Restoration and Infrastructure Protection Program (SRIPP PEIS) available at https://sites.wff.nasa.gov/code250/final_sripp_peis_document.html.

This Draft SERP EA has been sent to you because public involvement is a very important part of the NEPA process. We respectfully request your written comments by **January 7, 2019**. All comments and questions should be submitted via one of the following options:

Mail: NASA Wallops Flight Facility

Draft SERP EA – Shari Miller
Mailstop: 250.W
Wallops Island, VA 23337
Phone: (757) 824-2327
Email: wff-shoreline@mail.nasa.gov

A limited number of hard copies are available on a first-request basis. Please contact Ms. Shari Miller at one of the options above to request hard copies of the Draft SERP EA.

Additionally, NASA WFF will be hosting a public poster-session meeting from **5 to 7 p.m. on Wednesday, December 19, 2018, at the WFF Visitor Center** to discuss the Draft SERP EA with interested parties. We encourage you to attend this meeting, to speak with members of the SERP EA team, and to learn more about WFF.

Thank you for your participation in this process.

Shari A. Miller
Center NEPA Manager
Environmental Planning Lead
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov
SIPRnet: Shari.Miller@nss.sgov.gov
https://code200-external.gsfc.nasa.gov/250-wff

The Nature Conservancy
Protecting nature. Preserving life.™

The Nature Conservancy in Virginia
Virginia Program
P.O. Box 158
11332 Brownsville Rd.
Nassawadox, VA 23413

tel 757-442-3049
fax 757-442-5418
nature.org

January 7, 2019

Mr. George Badger, Environmental Engineer
Virginia Marine Resources Commission
Habitat Management Division
2600 Washington Avenue, 3rd Floor
Newport News, VA 23607

Re: Comments on JPA# 18-1590
NASA Wallops Flight Facility Shoreline Enhancement and Restoration Project

Dear Mr. Badger,

On behalf of The Nature Conservancy in Virginia, I am writing to submit our official response to JPA# 18-1590, NASA Wallops Flight Facility Shoreline Enhancement and Restoration Project. NASA has requested approval by the Marine Resources Commission to excavate 1.3 million cubic yards of sand from 200 acres at the north end of Wallops Island, move it by dump truck, and spread it with bulldozers along 3.7 miles of the island shoreline. The proposed project also includes construction of six stone breakwaters, in two sets of three, approximately 200 feet from the shoreline in 4 to 8 feet of water. The project is based on the *2018 Draft NASA Wallops Flight Facility Shoreline Enhancement and Restoration Project (SERP) Environmental Assessment (EA)*, the *2013 Final Post-Hurricane Sandy EA*, and the *2010 Final Shoreline Restoration and Infrastructure Protection Program (SRIPP) Final Programmatic Environmental Impact Statement (PEIS)*.

The Conservancy appreciates the opportunity to comment to MRC on NASA's Joint Permit Application (JPA) for this critical project. We recognize the importance of this project in protecting Wallops Flight Facility, the Mid-Atlantic Regional Spaceport, and the U.S. Navy facilities located on Wallops Island and allowing them to continue their roles in our space program and national defense. We also recognize the economic importance of these facilities to the people of the Eastern Shore in Virginia and Maryland.

The Nature Conservancy's Background, Ownership, Investment, and Interest in Virginia's Barrier Islands

The Nature Conservancy (Conservancy) is the world's largest conservation organization, working in the United States and over 70 countries around the world to protect the lands and waters on which all life depends. We strive for conservation approaches that benefit both people and nature. The Conservancy is solution- and partnership-oriented, and we employ a

1

science-based approach to design creative solutions to conservation and development challenges. Our more than 4,000 staff live and work in hundreds of communities across the U.S. and around the world. We are supported by more than a million members, an international Board of Directors, and by state Boards of Trustees made up of local leaders in conservation, business, agriculture, academia, and philanthropy. We have helped conserve 20 million acres of land in the U.S. and more than 119 million acres with local partners around the world. Furthermore, the Conservancy has over 100 marine conservation projects around the globe including our work offshore in the Mid-Atlantic region.

The Eastern Shore of Virginia, flanked by the Atlantic Ocean to the east and the Chesapeake Bay to the west, is one of the nation's last remaining expanses of Atlantic coastal wilderness. It has been an area of intense investment and focus by the Conservancy for nearly 50 years, and represents one of our most iconic projects anywhere in the world. The landscape is diverse with mainland watersheds, marshes, tidal creeks, mudflats, coastal bays with oyster reefs and seagrass meadows, and barrier islands that are characteristic of coastal barrier systems globally. Here, the undeveloped barrier islands naturally migrate, helping to make them the largest natural functioning barrier system along the Atlantic Coast. The islands protect the large shallow coastal bays and expansive tidal salt marshes and mudflats that are critical breeding, nursery, and migratory habitat for a wide range of fish, bird and other coastal wildlife species. During the past 50 years, TNC, the U.S. Fish and Wildlife Service, and the National Park Service along with the Commonwealth of Virginia and other partners have invested more than $100 million to protect and restore 133,000 acres of coastal and mainland habitats, including 14 barrier islands, collectively known as the Virginia Coast Reserve (VCR). The Conservancy's island ownership includes part or all of Metompkin, Cedar, Parramore, Revel, Hog, Rogue, Cobb, Little Cobb, Ship Shoal, Godwin, Myrtle, Mink, and Smith Islands extending south from Wallops (attached map). In addition, and in collaboration with our state and federal partners, we have restored over 60 acres of oyster reef habitat, designated 2000 acres of oyster reef sanctuaries, and enabled the largest seagrass restoration project in the world—almost 9,000 acres. The region holds several recognitions including a United Nations Educational, Scientific and Cultural Organization (UNESCO) International Man and the Biosphere Reserve and a Western Hemisphere International Shorebird Reserve Network Site. Because of its characteristics, Virginia's Eastern Shore can be considered a "Resilience Hub": it possesses large continuous tracts of habitats and/or open space together with the potential to provide coastal communities with protection and buffering from sea level rise and flooding, while also supporting fish and wildlife.

This iconic wilderness has come to define the local culture and economy of Accomack and Northampton counties, which make up Virginia's 70-mile long Eastern Shore peninsula. This rural community relies on agriculture, fishing, tourism, aerospace, and national defense as main economic drivers. The natural conserved lands and waters of the Eastern Shore drive a highly productive commercial shellfish aquaculture industry and are a growing destination for nature-based tourism.

Review of JPA# 18-1590 and Draft NASA SERP-EA

After reviewing JPA# 18-1590, NASA's *2018 Draft SERP-EA*, *2013 Final Post-Hurricane Sandy EA*, and *2010 SRIPP PEIS,* the Conservancy recommends implementing Alternative 2, borrowing sand from offshore Unnamed Shoal A. This approach was already implemented

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once, in 2011, and was supported by the 2010 Record of Decision (ROD) for the Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Program (SRIPP). While borrowing the sand from offshore shoals has potential impacts to sediment transport and marine wildlife, we believe these impacts to be less critical than the loss of bird and turtle habitat that will result from "backpassing" sand from the north end of Wallops Island.

The Conservancy believes that Alternative 1, re-nourishing the beach by backpassing sand that has moved to the north end of Wallops Island, would be unacceptably disruptive to shorebird and turtle habitat, resulting in negative impacts to several species of conservation concern including some listed under the Endangered Species Act. Backpassing would remove accreted sand from the north end of Wallops island, where sand dunes, nesting habitat, and forage areas have formed since the 2014 replenishment. These habitats support the federally threatened Atlantic coast piping plover and the American oystercatcher, a Tier IIa Species of Greatest Conservation Need (SGCN) within Virginia's Wildlife Action Plan. This area also provides nesting habitat for the federally threatened loggerhead sea turtle, diamond-backed terrapin, (Tier II SGCN), and other species identified in Virginia's Wildlife Action Plan as SGCN. There is also potential habitat for the state endangered Wilson's plover. The federally threatened *rufa* subspecies of red knot also feeds here during their annual migrations along the Atlantic Flyway. Section C.2 of the 2010 ROD speaks to the impacts of backpassing sand: "Depending on the extent that the north beach is used, this option for renourishment fill material could have the most detrimental effects on shorebirds, a number of which have been designated as protected species at the Federal and state levels. Sand removal could expose nests to increased risk of flooding, temporarily reduce the availability of food sources, and it would alter the shoreline topography such that it may no longer be suitable habitat. Additionally, sea turtles could be adversely affected by compaction of the beach (leading to reduced quality of nesting habitat), and similar reduction in beach elevation, which in turn could lead to more frequent inundation and loss of nests."

While it is possible to conduct backpassing during the four-month non-nesting season from December through March, Section F.7 of the 2010 ROD deemed this impractical due to the longer period needed for a backpassing project. Another reason to not implement Alternative 1 is that the north beach accretion provides a sand reservoir that will allow the island to build westward during future storm-driven overwash events.

The "Proposed Action" on page 2-1 of the Draft SERP-EA states that NASA may also "construct a series of parallel near-shore breakwater structures that would reduce the intensity of wave action and slow sediment transport." Alternative 3 proposes two sets of three breakwaters 200 feet from the shoreline in four to six feet of water. Since NASA plans to replenish the beach every five years, the value and purpose of the breakwaters is not clearly offered or justified in the EA. As a result, we are skeptical about the effectiveness of the proposed breakwaters. The money saved in not building the breakwaters can offset the higher cost of borrowing sand from offshore, and lessen the likelihood of sand downdrift impacts to other barrier islands. If the breakwaters are built, monitoring and data analysis should be done to determine breakwater effectiveness and the extent of sand downdrift impacts, i.e., sand starving, to Assateague Island and Assawoman Island.

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To summarize our comments on NASA's JPA#18-1590, the Conservancy, as a nearby affected partner:

1. Appreciates the opportunity to provide input into the future success of NASA Wallops Flight Facility;
2. Recognizes the importance of the project to NASA, MARS, and U.S. Navy operations on Wallops Islands, as well as the economic importance to the people of the Eastern Shore in Maryland and Virginia;
3. Requests that the Marine Resources Commission deny JPA#18-1590 and request NASA to:
    a. Not implement Alternative 1, and instead implement Alternative 2, Renourishment Only With Sand From Unnamed Shoal A;
    b. Not undertake the construction of the nearshore detached parallel breakwaters included in Alternative 3, which would allow the cost savings to be used to pay for the offshore sand. If the breakwaters are built, monitoring and data analysis should be done to determine breakwater effectiveness and the extent of sand downdrift impacts, i.e., sand starving, to Assateague Island and Assawoman Island;

On behalf of The Nature Conservancy I would again like to thank you for the opportunity to comment on this important project. Please contact me at locke.ogens@tnc.org, or Virginia Coast Reserve Director Jill Bieri at jbieri@tnc.org, if you have any questions or would like to discuss.

Sincerely yours,

Locke W. Ogens
Virginia State Director

Attachment

cc (via email):

The Honorable Matthew Strickler, Virginia Secretary of Natural Resources

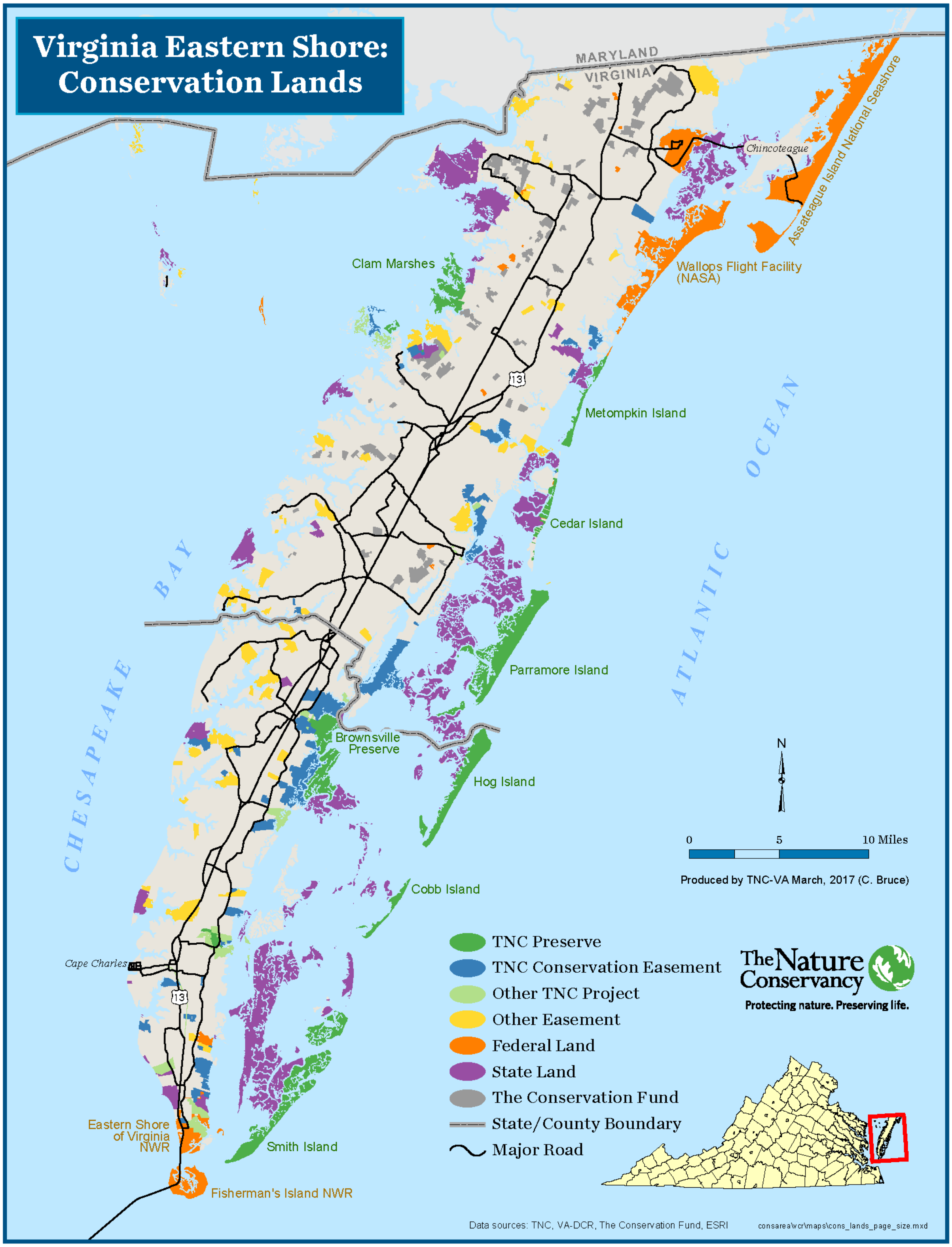
Shari Miller, Environmental Planning Lead, NASA Wallops Flight Facility

Paul Bull, Deputy Division Chief, NASA Wallops Flight Facility

Tylar Dean, Assistant Supervisor, Ecological Services, Virginia Field Office, USFWS

Nancy Finley, Refuge Manager, Chincoteague National Wildlife Refuge, USFWS

Deborah Darden, Superintendent, Assateague National Seashore, NPS



Virginia Eastern Shore: Conservation Lands
MARYLAND
VIRGINIA
Chincoteague
Assateague Island National Seashore
Wallops Flight Facility (NASA)
Clam Marshes
Metompkin Island
Cedar Island
Parramore Island
Brownsville Preserve
Hog Island
Cobb Island
Smith Island
Eastern Shore of Virginia NWR
Fisherman's Island NWR
Cape Charles
CHESAPEAKE BAY
ATLANTIC OCEAN
13
N
0 5 10 Miles
Produced by TNC-VA March, 2017 (C. Bruce)
TNC Preserve
TNC Conservation Easement
Other TNC Project
Other Easement
Federal Land
State Land
The Conservation Fund
State/County Boundary
Major Road
The Nature Conservancy
Protecting nature. Preserving life.
Data sources: TNC, VA-DCR, The Conservation Fund, ESRI
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COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

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Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

January 17, 2019

Shari Miller
ATTN: Code 250 W
National Aeronautics and Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337-5099

RE: Comments on the Draft Environmental Assessment and Federal Consistency Determination for the Wallops Flight Facility Shoreline Enhancement and Restoration Project proposed by the National Aeronautics and Space Administration, Accomack County, VA (DEQ 18-171F)

Dear Ms. Miller:

The Commonwealth of Virginia has completed its review of the above-referenced documents. The Department of Environmental Quality (DEQ) is responsible for coordinating Virginia's review of federal environmental documents submitted under the National Environmental Policy Act (NEPA) and responding to appropriate federal officials on behalf of the Commonwealth. DEQ is also responsible for coordinating Virginia's review of federal consistency documents submitted pursuant to the Coastal Zone Management Act (CZMA) and providing the state's response. This is in response to the December 2018 Draft Environmental Assessment (DEA) and Federal Consistency Determination (FCD) submitted by the National Aeronautics and Space Administration (NASA) for the above referenced project. The following agencies participated in the review of this proposal:

Department of Environmental Quality
Department of Game and Inland Fisheries (DGIF)
Department of Conservation and Recreation (DCR)
Department of Health (VDH)
Marine Resources Commission (MRC)
Virginia Institute of Marine Sciences (VIMS)

In addition, the Department of Historic Resources (DHR), Accomack-Northampton Planning District Commission and Accomack County were invited to comment on the proposal.

PROJECT DESCRIPTION

NASA proposes to conduct the Wallops Flight Facility (WFF) Shoreline Enhancement and Restoration Project on Wallops Island which fronts the Atlantic Ocean in Accomack County. The project involves the re-nourishment of the beach along the Wallops Island shoreline infrastructure protection area, utilizing approximately 1.3 million cubic yards of sand. The sand material would be taken from either the north Wallops Island beach (Alternative 1), which is an area that has been accreting due to transport of material from the south, or from Unnamed Shoal A (Alternative 2) which is an offshore sand ridge located seven miles east of Wallops Island in the outer continental shelf in the Atlantic Ocean, at the southern end of the Assateague ridge field. Unnamed Shoal A has been used as a sand source for prior re-nourishment projects (in 2012 and 2014). In addition, a series of six nearshore, detached, parallel breakwaters with a total length of 780 feet are proposed for construction approximately 200 feet offshore prior to the re-nourishment being completed (Alternative 3). Alternative 3 would be combined with Alternative 1 or 2, depending which is chosen, for the complete project scope. The DEA does not identify a preferred alternative. However, based on the information included in the Joint Permit Application (JPA) (#18-1590) that has been filed for this project and that is included as Appendix B of the DEA, a combination of Alternative 1 and 3 appears to be the de facto Preferred Alternative. Two state agencies that participated in the review of the DEA have expressed a strong preference for Alternative 2 (refer to the Preferred Alternative Recommendation section on page 19).

In addition, the DEA includes a Federal Consistency Determination (Appendix C) which finds the proposed action consistent to the maximum extent practicable with the enforceable policies of the Virginia Coastal Zone Management Program.

BACKGROUND

DEQ previously reviewed a Final Programmatic Environmental Impact Statement (PEIS) for the Shoreline Restoration and Infrastructure Protection Program (SRIPP) at Wallops Island (DEQ 10-156F) in November 2010. The purpose of the SRIPP was to reduce the potential for damage to, or loss of, existing NASA, U.S. Navy, and Mid-Atlantic Regional Spaceport assets on Wallops Island from wave impacts associated with storm events. The project involved extending the existing rock seawall a maximum of 4,600 feet south of its southernmost point and placing sand dredged from Unnamed Shoal A on the Wallops Island shoreline. The SRIPP also planned for re-nourishment cycles every five years, with a total of nine re-nourishment cycles over the 50-year lifecycle of the SRIPP. A Record of Decision (ROD) for this project was issued on December 13, 2010. In October 2012 Hurricane Sandy caused damage to the seawall and losses to the recently nourished beach. Repairs were made in September 2014, however the sand volume has been reduced by an average of 1,014,337 cubic yards compared to the 2014 sand volumes following storms in 2015 (Hurricane Joaquin), 2016 (Winter Storm Jonas) and 2018 (Winter Storm Riley). The constructed beach system has successfully reduced storm damage to the NASA Wallops Island launch range infrastructure but the seaward half of the beach berm has been lowered by more than three feet, thus reducing its effectiveness for future storm protection. The currently proposed action will address storm damage and sand loss that has occurred since the September 2014 repairs.

ENVIRONMENTAL IMPACTS AND MITIGATION

1. Surface Waters and Non-tidal Wetlands. According to the DEA (page 3-7), Alternative 1 (North Wallops Island beach borrow area) could have short-term near-shore water quality impacts related to construction activities and the potential for the accidental release of contaminants or petroleum products from construction vehicles. A turbidity plume would also be generated at the placement site. Impacts from Alternative 2 (Unnamed Shoal A borrow area) would be similar as sediment would become suspended in the water column during dredging and pump out operations. The impacts to offshore water quality are expected to be temporary. Offshore turbidity would similarly result from Alternative 3 during the breakwater construction. The DEA notes that DEQ is expected to waive the requirement for a permit in lieu of receipt of a permit from the U.S. Army Corps of Engineers (Corps) and VMRC. The FCD (Appendix C, C-11) states that vegetated wetlands will not be impacted by the project.

1(a) Agency Jurisdiction. The State Water Control Board promulgates Virginia's water regulations covering a variety of permits to include the Virginia Pollutant Discharge Elimination System Permit (VPDES) regulating point source discharges to surface waters, Virginia Pollution Abatement Permit regulating sewage sludge, storage and land application of biosolids, industrial wastes (sludge and wastewater), municipal wastewater, and animal wastes, the Surface and Groundwater Withdrawal Permit, and the Virginia Water Protection (VWP) Permit regulating impacts to streams, wetlands, and other surface waters. The VWP permit is a state permit which governs wetlands, surface water, and surface water withdrawals and impoundments. It also serves as §401 certification of the federal Clean Water Act §404 permits for dredge and fill activities in waters of the U.S. The VWP Permit Program is under the Office of Wetlands and Stream Protection, within the DEQ Division of Water Permitting. In addition to central office staff that review and issue VWP permits for transportation and water withdrawal projects, the six DEQ regional offices perform permit application reviews and issue permits for the covered activities:

- Clean Water Act, §401;
- Section 404(b)(i) Guidelines Mitigation Memorandum of Agreement (2/90);
- State Water Control Law, Virginia Code section 62.1-44.15:20 *et seq*.; and
- State Water Control *Regulations*, 9 VAC 25-210-10.

1(b) Agency Findings. The VWP program at the DEQ Tidewater Regional Office (TRO) notes that the JPA for this project was received on October 9, 2018 (#18-1590). On December 12, 2018, DEQ waived the requirement for a VWP permit pursuant to 9 VAC 25-210-220.B.

1(c) Requirement. Adhere to the VWP Waiver that has been issued for this project.

1(d) CZMA Federal Consistency. Provided the required VWP Permit Waiver is adhered to, this project would be consistent to the maximum extent practicable with the wetlands management enforceable policy of the CZM Program and the VWP Permit Program (see Federal Consistency under the CZMA section below for additional information).

2. Subaqueous Lands and Tidal Wetlands. The DEA (page 3-6) indicates that VMRC issued an extension to the existing permit 10-2003 which expires in 2021 and authorized the 2014 rehabilitation of the seawall and beach re-nourishment. Following submittal of an updated Joint Permit Application, VMRC determined that a new permit will be required for subaqueous lands impacts to include the current design for beach re-nourishment, and dredging at the north end of the Island.

The FCD (Appendix C, page C-11) indicates that nearshore subaqueous lands would be impacted by the proposal to nourish the beach and construct the breakwaters.

2(a) Agency Jurisdiction. The Virginia Marine Resources Commission regulates encroachments in, on or over state-owned subaqueous beds as well as tidal wetlands pursuant to Virginia Code §28.2-1200 through 1400. For nontidal waterways, VMRC states that it has been the policy of the Habitat Management Division to exert jurisdiction only over the beds of perennial streams where the upstream drainage area is 5 square miles or greater. The beds of such waterways are considered public below the ordinary high water line.

2(b) Agency Finding. VMRC stated that a JPA was received for this project on October 9, 2018 (JPA# 18-1590). The JPA is currently under review and any permit issued by the VMRC would specify the necessary special conditions for the project. VRMC did not indicate that tidal wetlands will be impacted.

2(c) Requirement. A VMRC permit for the submerged land encroachments is required. The applicant must adhere to any necessary special conditions included in the permit.

2(d) VIMS Finding. VIMS submitted comments to VMRC in response to NASA's JPA and provided a copy (attached) to DEQ in response to the DEA and FCD. VIMS notes that the project has the potential to alter local land and marine resources differently than would occur via natural processes. VIMS finds that the placement of the six stone breakwaters with sand nourishment landward of each structure will have a minimal direct impact on state-owned subaqueous resources. The proposed shoreline nourishment will result in temporary and minimal impacts to the littoral marine environment. VIMS concludes that minimal adverse impacts will result within the footprint of the shoreline stabilization features.

Chincoteague Inlet may be affected by the proposed sand borrowing from North Wallops Island. The mining will likely widen the inlet and result in subsequent shoaling to an unknown degree. If the sand borrowing does not occur from North Wallops Island, VIMS predicts an unknown degree of effect on Chincoteague Inlet if sand continues migrating north towards the inlet.

Refer to the attached letter dated January 8, 2019 for greater detail.

2(e) CZMA Federal Consistency. On the condition that a VMRC permit is approved for this project, this project would be consistent to the maximum extent practicable with the subaqueous lands management enforceable policy of the CZM Program (see Federal Consistency under the CZMA section below for additional information).

3. Dunes Management. The DEA (page 3-6) indicates that VMRC issued an extension to an existing permit 10-2003 (expires 2021) on February 2, 2016 for rehabilitation of the seawall and beach re-nourishment. Following submittal of an updated Joint Permit Application, VMRC determined that a new permit will be required for dune and beach impacts from the currently proposed scope of work for beach re-nourishment and dredging at the north end of the Island.

The FCD (Appendix C, page C-11) indicates that the project will restore the previously constructed dune system. A new permit will be required for the beach re-nourishment which will impact dunes.

3(a) Agency Jurisdiction. Dune protection is carried out pursuant to the Coastal Primary Sand Dune Protection Act and is intended to prevent destruction or alteration of primary dunes. This program is administered by the Marine Resources Commission (Virginia Code §28.2-1400 through §28.2-1420).

3(b) Agency Finding. VMRC stated that a JPA was received for this project on October 9, 2018 (JPA# 18-1590). The JPA is currently under review and any permit issued by the VMRC would specify the necessary special conditions for the project.

3(c) Requirement. A VMRC permit for the dune impacts from this project is required. The applicant must adhere to any necessary special conditions included in the permit.

3(d) VIMS Findings. VIMS submitted comments to VMRC in response to NASA's JPA and provided a copy (attached) to DEQ in response to the DEA and FCD. If North Wallops Island (Alternative 1) is used for the sand collection, beach and dunes resources will be removed within the footprint of the mining area. Adjacent beaches and dunes are expected to be destabilized as a result of the mining activity.

Indirect and remote impacts to marine resources may occur depending on the sand source and the altered long-term sand transport patterns that result from the proposed breakwaters. The proposed North Wallops Island mining site accreted very rapidly compared with expected natural accretion due to large volumes of additional sand that was placed to nourish Wallops Island migrating northward as a result of significant storm events. VIMS is confident that the area in question will not retain its post-mining form nor naturally fill again to its current profile from wave and tidal action. If the sand mining occurs at North Wallops Island, secondary erosional impacts to dunes and beaches adjacent to the mining area should be expected, but VIMS does not have near-term concerns for significant dune erosion.

The breakwater placement is expected to have an impact on the natural sediment transport to the north around Fishing Point and across Chincoteague inlet. The breakwaters will affect the rate and volume of sand transport in the vicinity of the structures, thus contributing to long-term effects to Northern Wallops Island as a result of disruption of northward sediment transport. However, once maximum sand capacity is reached at the breakwaters, longshore transport by wind and waves has the potential to occur at rates and volumes similar to natural processes.

Refer to the attached letter dated January 8, 2019 for greater detail.

3(e) VIMS Recommendations. Utilize an offshore source for the sand nourishment material, to eliminate direct impacts to beaches and dunes on northern Wallops Island. This site could be any approved offshore source, including Unnamed Shoal A (Alternative 2). If offshore sand is used, consider management strategies and structures that semi-contain the sand within and around the beach mining location at North Wallops Island to prevent an abnormally large volume of sand moving into Chincoteague inlet.

Continue the shoreline monitoring program to continue providing data to form the basis for future adaptive management.

Consider applying addition breakwaters, designed to contain all sand nourishment and nourish to the maximum capacity. This would stabilize the shoreline to the maximum extent possible while providing added protection to the Wallops Island shoreline and NASA infrastructure.

3(f) CZMA Federal Consistency. On the condition that a VMRC permit is approved for this project, this project would be consistent to the maximum extent practicable with the dunes management enforceable policy of the CZM Program (see Federal Consistency under the CZMA section below for additional information).

4. Erosion and Sediment Control and Stormwater Management. The DEA (page 1-3) notes that the purpose of the project is to reduce the rate of shoreline erosion along Wallops Island and re-nourish areas that have been depleted as a result of wind and wave action from storm activity.

The FCD (Appendix C, C-11) states that the construction period has the potential to increase non-point source runoff to the Atlantic Ocean and that Best Management Practices (BMPs) will be in place to mitigate these impacts.

4(a) Agency Jurisdiction. The DEQ Office of Stormwater Management administers the following laws and regulations governing construction activities:

- Virginia Erosion and Sediment Control (ECS) Law (§ 62.1-44.15:51 *et seq.*) and Regulations (9VAC25-840) (*VESCL&R*);
- Virginia Stormwater Management Act (§ 62.1-44.15:24 *et seq.*) (*VSWML)*;
- Virginia Stormwater Management Program (VSMP) regulation (9VAC25-870) (*VSWMR*); and
- 2014 General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Construction Activities (9VAC25-880).

In addition, DEQ is responsible for the Virginia Stormwater Management Program (VSMP) General Permit for Stormwater Discharges from Construction Activities related to Municipal Separate Storm Sewer Systems (MS4s) and construction activities for the control of stormwater discharges from MS4s and land disturbing activities under the Virginia Stormwater Management Program (9VAC25-890-40).

4(b) Requirements.

4(b)(i) Erosion and Sediment Control and Stormwater Management. NASA and its authorized agents conducting regulated land-disturbing activities on private and public lands in the state must comply with *VESCL&R* and Virginia Stormwater Management Laws and Regulations *(VSWML&R)*, including coverage under the general permit for stormwater discharges from construction activities, and other applicable federal non-point source pollution mandates (e.g. Clean Water Act-Section 313, federal consistency under the Coastal Zone Management Act). Clearing and grading activities, installation of staging areas, parking lots, roads, buildings, utilities, borrow areas, soil stockpiles, and related land-disturbing activities that result in the total land disturbance of equal to or greater than 10,000 square feet would be regulated by *VESCL&R*. Accordingly, NASA must prepare and implement an erosion and sediment control (ESC) plan to ensure compliance with state law and regulations. The ESC plan should be submitted to the DEQ for review for compliance. NASA is ultimately responsible for achieving project compliance through oversight of on-site contractors, regular field inspection, prompt action against non-compliant sites, and other mechanisms consistent with agency policy. A stormwater management plan may also be required.

4(b)(ii) Virginia Stormwater Management Program General Permit for Stormwater Discharges from Construction Activities (VAR10). The operator or owner of a construction activity involving land disturbance of equal to or greater than 1 acre is required to register for coverage under the General VPDES Permit for Discharges of Stormwater from Construction Activities and develop a project specific stormwater pollution prevention plan (SWPPP). The SWPPP must be prepared prior to submission of the registration statement for coverage under the General Permit, and it must address water quality and quantity in accordance with the *Virginia Stormwater Management Program (VSMP) Regulations*. General information and registration forms for the General Permit are available on DEQ's website at www.deq.virginia.gov/Programs/Water/StormwaterManagement/VSMPPermits/ConstructionGeneralPermit.aspx.

4(c) CZMA Federal Consistency. The project would be consistent to the maximum extent practicable with the nonpoint source pollution control enforceable policy of the Virginia CZM Program, provided the activities comply with the above requirements, and applicable permits are obtained as necessary (see Federal Consistency under the CZMA section below for additional information).

5. Point Source Pollution Control. The FCD (Appendix, page C-11) states that the project will not create a new point source discharge.

5(a) Agency Jurisdiction. The point source program is administered by the State Water Control Board pursuant to Virginia Code §62.1-44.15. Point source pollution control is accomplished through the implementation of the National Pollutant Discharge Elimination System (NPDES) permit program established pursuant to §402 of the federal Clean Water Act and administered in Virginia as the VPDES permit program. The Water Quality Certification requirements of §401 of the Clean Water Act of 1972 are administered under the Virginia Water Protection Permit program.

5(b) Agency Finding. TRO stated that the Wallops Flight Facility is covered under VPDES Individual Permit (VA0024457).

5(c) Agency Requirement. Adhere to the existing VPDES permit for this facility. Coordinate with DEQ TRO regarding any necessary permit modifications or map updates if there are any industrial-related activities that will discharge pollutants to surface waters or facility changes that may require map or permit revisions.

5(d) CZMA Federal Consistency. Provided adherence to the existing VPDES permit, and proper updates as necessary, the project would be consistent to the maximum extent practicable with the point source pollution control enforceable policy of the Virginia CZM Program (see Federal Consistency under the CZMA section below for additional information).

6. Chesapeake Bay Preservation Areas. The DEA (page 3-12) notes that Wallops Island is one of 12 barrier islands in Virginia that fronts the Atlantic Ocean. The FCD (Appendix C, page C-11) states that the project does not include land-disturbing activities that will impact the Chesapeake Bay or its tributaries.

6(a) Agency Jurisdiction. The DEQ Office of Local Government Programs (OLGP) administers the Chesapeake Bay Preservation Act (Virginia Code §62.1-44.15:67 *et seq.*) and Chesapeake Bay Preservation Area Designation and Management Regulations (9 VAC 25-830-10 *et seq.*). Each Tidewater locality must adopt a program based on the Chesapeake Bay Preservation Act and the Chesapeake Bay Preservation Area Designation and Management Regulations. The Act and regulations recognize local government responsibility for land use decisions and are designed to establish a framework for compliance without dictating precisely what local programs must look like. Local governments have flexibility to develop water quality preservation programs that reflect unique local characteristics and embody other community goals. Such flexibility also facilitates innovative and creative approaches in achieving program objectives. The regulations address nonpoint source pollution by identifying and protecting certain lands called Chesapeake Bay Preservation Areas. The regulations use a resource-based approach that recognizes differences between various land forms and treats them differently.

6(b) Agency Findings. The proposed project is located in the Atlantic Ocean watershed and is outside of the Chesapeake Bay watershed; thus there are no comments or requirements under the Chesapeake Bay Preservation Area Designation and Management Regulations or the *Chesapeake Bay Preservation Act*.

6(c) CZMA Federal Consistency. The project is located outside of the Chesapeake Bay watershed. Therefore, the project is consistent to the maximum extent practicable with the coastal lands management enforceable policy of the Virginia CZM Program (see Federal Consistency under the CZMA section below for additional information).

7. Air Pollution Control. According to the DEA (page 3-12), the primary source of air pollution associated with this project would be emissions from the operation of mobile sources such as dredges and earth moving equipment. The anticipated emissions from the activity would not exceed the EPA comparative threshold (250 tons per year) of any criteria pollutant, under which an emission would be considered minor.

7(a) Agency Jurisdiction. The DEQ Air Division, on behalf of the State Air Pollution Control Board, is responsible for developing regulations that implement Virginia's Air Pollution Control Law (Virginia Code §10.1-1300 *et seq.*). DEQ is charged with carrying out mandates of the state law and related regulations as well as Virginia's federal obligations under the Clean Air Act as amended in 1990. The objective is to protect and enhance public health and quality of life through control and mitigation of air pollution. The division ensures the safety and quality of air in Virginia by monitoring and analyzing air quality data, regulating sources of air pollution, and working with local, state and federal agencies to plan and implement strategies to protect Virginia's air quality. The appropriate DEQ regional office is directly responsible for the issuance of necessary permits to construct and operate all stationary sources in the region as well as monitoring emissions from these sources for compliance. In the case of certain projects, additional evaluation and demonstration must be made under the general conformity provisions of state and federal law.

The Air Division regulates emissions of air pollutants from industries and facilities and implements programs designed to ensure that Virginia meets national air quality standards. The most common regulations associated with major projects are:

- Open burning: 9 VAC 5-130 *et seq.*
- Fugitive dust control: 9 VAC 5-50-60 *et seq.*
- Permits for fuel-burning equipment: 9 VAC 5-80-1100 *et seq.*

7(b) Agency Findings. According to the DEQ Air Division, the project site is located in a designated ozone attainment area.

7(c) Requirements.

7(c)(i) Fugitive Dust. During construction, fugitive dust must be kept to a minimum by using control methods outlined in 9 VAC 5-50-60 *et seq.* of the *Regulations for the Control and Abatement of Air Pollution*. These precautions include, but are not limited to, the following:

- Use, where possible, of water or chemicals for dust control;
- Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials;
- Covering of open equipment for conveying materials; and
- Prompt removal of spilled or tracked dirt or other materials from paved streets and removal of dried sediments resulting from soil erosion.

7(c)(ii) Open Burning. If project activities include the open burning of construction material or the use of special incineration devices, this activity must meet the requirements under 9 VAC 5-130 *et seq.* of the *Regulations* for open burning, and may require a permit. The *Regulations* provide for, but do not require, the local adoption of a model ordinance concerning open burning. The applicant should contact locality officials to determine what local requirements, if any, exist.

7(d) CZMA Federal Consistency. The project will be consistent to the maximum extent practicable with the air pollution control enforceable policy of the CZM Program, provided adherence to the above requirements (see Federal Consistency under the CZMA section below for additional information).

8. Solid and Hazardous Wastes and Hazardous Materials. The DEA (page 3-2) states the 2010 Final SRIPP PEIS concluded that there would be a negligible impact on hazardous materials and waste from shoreline stabilization activities.

8(a) Agency Jurisdiction. On behalf of the Virginia Waste Management Board, the DEQ Division of Land Protection and Revitalization is responsible for carrying out the mandates of the Virginia Waste Management Act (Virginia Code §10.1-1400 *et seq*.), as well as meeting Virginia's federal obligations under the Resource Conservation and Recovery Act and the Comprehensive Environmental Response Compensation Liability Act (CERCLA), commonly known as Superfund. The DEQ Division of Land Protection and Revitalization also administers those laws and regulations on behalf of the State Water Control Board governing Petroleum Storage Tanks (Virginia Code §62.1-44.34:8 *et seq*.), including Aboveground Storage Tanks (9VAC25-91 *et seq*.) and Underground Storage Tanks (9VAC25-580 *et seq.* and 9VAC25-580-370 *et seq*.), also known as 'Virginia Tank Regulations', and § 62.1-44.34:14 et seq. which covers oil spills.

Virginia:

- Virginia Waste Management Act, Virginia Code § 10.1-1400 *et seq.*
- *Virginia Solid Waste Management Regulations*, 9 VAC 20-81
  - (9 VAC 20-81-620 applies to asbestos-containing materials)
- *Virginia Hazardous Waste Management Regulations*, 9 VAC 20-60
  - (9 VAC 20-60-261 applies to lead-based paints)
- *Virginia Regulations for the Transportation of Hazardous Materials*, 9 VAC 20-110.

Federal:

- Resource Conservation and Recovery Act (RCRA), 42 U.S. Code sections 6901 *et seq.*
- U.S. Department of Transportation *Rules for Transportation of Hazardous Materials*, 49 *Code of Federal Regulations*, Part 107
- Applicable rules contained in Title 40, *Code of Federal Regulations*.

8(b) Agency Findings. The DEQ TRO Petroleum storage tank cleanup, tank compliance/inspections, and waste permit programs had no comments on this proposal.

8(c) Requirements.

8(c)(i) Waste Management. Any soil or groundwater that is suspected of contamination or wastes that are generated during construction-related activities must be tested and disposed of in accordance with applicable federal, state, and local laws and regulations. All construction waste, including excess soil, must be characterized in accordance with the *Virginia Hazardous Waste Management Regulations* prior to disposal at an appropriate facility. It is the generator's responsibility to determine if solid waste meets the criteria of a hazardous waste and is subsequently managed appropriately.

8(c)(ii) Petroleum Releases. If evidence of a petroleum release is discovered during implementation of this project, it must be reported to DEQ, as authorized by Virginia Code § 62.1-44.34.8 through 9 and 9 VAC 25-580-10 *et seq*.

8(d) Pollution Prevention Recommendation. DEQ recommends that the NASA implement pollution prevention principles, including the reduction, reuse, and recycling of all solid wastes generated. All generation of hazardous wastes should be minimized and handled appropriately.

9. Pesticides and Herbicides. DEQ recommends that the use of herbicides or pesticides for construction or landscape maintenance should be in accordance with the principles of integrated pest management. The least toxic pesticides that are effective in controlling the target species should be used to the extent feasible. Contact the Department of Agriculture and Consumer Services at (804) 786-3501 for more information.

10. Natural Heritage Resources. The DEA (page 3-20) notes that Wallops Island is home to a diverse mixture of species both onshore and offshore. Wallops Island Beach provides an important nesting and foraging habitat for migratory waterbirds. It is also used by the diamondback terrapin as a nesting site. Per its Protected Species Monitoring Program, NASA conducts regular monitoring of Wallops Island Beach between March and September to determine the level of bird nesting activity within and adjacent to the project area. The offshore portion of the project area is used by seabirds during the winter months as foraging grounds.

Temporary noise and visual disturbances are likely to occur to foraging habitat. Additionally, the placement of sand on the shoreline during re-nourishment activities would result in a reduction of food sources.

10(a) Agency Jurisdiction.

10(a)(i) The Virginia Department of Conservation and Recreation's (DCR) Division of Natural Heritage (DNH). DNH's mission is conserving Virginia's biodiversity through inventory, protection and stewardship. The Virginia Natural Area Preserves Act (Virginia Code §10.1-209 through 217), authorized DCR to maintain a statewide database for conservation planning and project review, protect land for the conservation of biodiversity, and the protect and ecologically manage the natural heritage resources of Virginia (the habitats of rare, threatened and endangered species, significant natural communities, geologic sites, and other natural features).

10(a)(ii) Virginia Department of Agriculture and Consumer Services (VDACS): The Endangered Plant and Insect Species Act of 1979 (Virginia Code Chapter 39 §3.1-1020 through 1030) authorizes VDACS to conserve, protect and manage endangered and threatened species of plants and insects. Under a Memorandum of Agreement established between VDACS and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species.

10(b) Agency Findings. DCR's Division of Natural Heritage (DNH) searched its Biotics Data System for occurrences of natural heritage resources in the project vicinity. The Wallops – Assawoman Islands Conservation Site is located within the project site. Wallops – Assawoman Islands Conservation Site has been given a biodiversity significance ranking of B2, which represents a site of very high significance. Twenty-one natural heritage resources of concern were identified at this site. Refer to the attached DCR memorandum dated January 7, 2019 for a listing of the resources.

DCR supports the planned mitigation measures to reduce the probability and intensity of potential effects to protected species. According to DCR's species distribution model, Sea-beach amaranth (*Amaranthus pumilus*, G2/S1/LT/LT) may exist within the project site.

10(b)(i) State-listed Plant and Insect Species. DCR found that the proposed project will not affect any documented state-listed plants or insects.

10(b)(ii) State Natural Area Preserves. There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

10(c) Recommendations. Due to the legal status of some of the species found in the Wallops – Assawoman Islands Conservation Site, DCR recommends continued coordination with the US Fish and Wildlife Service (USFWS) to ensure compliance with protected species legislation.

Coordinate with DCR if any occurrences of Sea-beach amaranth are documented.

Contact DCR-DNH to secure updated information on natural heritage resources if the scope of the project changes and/or six months has passed before it is utilized. New and updated information is continually added to the Biotics Data System.

11. Wildlife Resources, Fisheries, and Protected Species. The DEA (page 3-20) notes that the Wallops Island Beach provides an important nesting and foraging habitat for migratory waterbirds including gulls, terns, and sandpipers. Waterbird numbers peak on the beach during the fall and spring migrations. Additionally, the diamondback terrapin has regularly nested on the north beach and locations on the bay side of the island. Seabirds use the offshore portion of the project area as foraging grounds during winter months. Temporary disturbances related to construction activity will include noise and visual impacts to these species. Foraging areas are anticipated to recover within one year for onshore areas and two years for offshore areas. Time-of-year restrictions would be followed for Special Status Species such as no activity at the north Wallops Island borrow area during piping plover and loggerhead sea turtle nesting season.

The EIR (page 3-23) notes that there are managed fishery species located in the area of Unnamed Shoal A and the north Wallops Island beach. Commercially important shellfish fisheries (sea scallop and blue crab) are also present. The Wallops Island beach project area is coincident with eight Essential Fish Habitat (EFH) designations, while unnamed Shoal A is coincident with an additional three EFH designations. The proposed project would episodically increase water turbidity and temporarily displace motile species. Benthos species are expected to have 100 percent mortality, though species recovery is expected to begin immediately after the beach replenishment is completed.

11(a) Agency Jurisdiction.

11(a)(i) The Virginia Department of Game and Inland Fisheries. DGIF, as the Commonwealth's wildlife and freshwater fish management agency, exercises enforcement and regulatory jurisdiction over wildlife and freshwater fish, including state- or federally-listed endangered or threatened species, but excluding listed insects (Virginia Code, Title 29.1). DGIF is a consulting agency under the U.S. Fish and Wildlife

Coordination Act (16 U.S.Code §661 *et seq.*) and provides environmental analysis of projects or permit applications coordinated through DEQ and several other state and federal agencies. DGIF determines likely impacts upon fish and wildlife resources and habitat, and recommends appropriate measures to avoid, reduce or compensate for those impacts. For more information, see the DGIF website at www.dgif.virginia.gov.

11(a)(ii) VDH Shellfish Sanitation. The VDH's Division of Shellfish Sanitation is responsible for protecting the health of the consumers of molluscan shellfish and crustacea by ensuring that shellfish growing waters are properly classified for harvesting, and that molluscan shellfish and crustacea processing facilities meet sanitation standards. The mission of this Division is to minimize the risk of disease from molluscan shellfish and crustacea products at the wholesale level by classifying shellfish waters for safe commercial and recreational harvest; by implementing a statewide regulatory inspection program for commercial processors and shippers; and by providing technical guidance and assistance to the shellfish and crustacea industries regarding technical and public health issues.

11(b) Agency Findings.

11(b)(i) DGIF. DGIF is concerned about the proposal to use the north end of Wallops Island for sand excavation due to the area supporting nesting federal-listed endangered piping plovers and American oystercatchers which are designated as a Tier IIa Species of Greatest Conservation Need. In addition, DGIF believes the area provides nesting habitat for the state-listed threatened Wilson's plover, the federally-listed threatened loggerhead sea turtle, diamondback terrapins (Tier II Species of Greatest Conservation Need (SGCN)), and other species that are identified in Virginia's Wildlife Action Plan as SGCN. DGIF believes that sand excavation in this area is likely to result in direct adverse impacts upon these species as well as long-term adverse impacts upon the substrate which provides the nesting habitat. Based on these concerns, DGIF does not support the removal of sand from the Wallops island beach (Alternative I).

DGIF believes that Alternative 2, using Unnamed Shoal Area A for sand collection, is preferable to removal from the north end of Wallops Island, assuming it is performed with Best Management Practices (BMPs) in place to minimize impacts upon the oceanic environment and its inhabitants. Alternative 2 is not without impacts upon benthic communities and the wildlife that rely on these communities; however, if the project moves forward, DGIF prefers the removal of sand from areas other than the north end of Wallops Island where listed species are known to nest.

DGIF understands that erosive action along this section of the Eastern Shore is primarily due to northerly near-shore currents that continually transport sand from the southern end of the island to the northern end. As such, it is not clear how breakwaters constructed parallel to the shore will be effective in reducing sand loss from the southern end. Therefore, it is expected that future beach nourishment and associated dredging/borrow areas will be necessary for long-term infrastructure protection. There was no information in the JPA that DGIF reviewed about how placement of fill and installation of breakwaters in this area will impact barrier islands to the south of this site, which are also populated by nesting birds and sea turtles. Without these additional details, it is difficult for DGIF make any determinations about regional wildlife dynamics and population effects resulting from the proposed project.

11(b)(ii) VDH. VDH DSS did not comment on the proposal.

11(b)(iii) VIMS. According to VIMS, the post-mining sand flat at North Wallops Island beach will create a temporary intertidal area that may be utilized by crabs and fishes endemic to the near-shore and surf zone. Some individuals may become trapped and experience mortality at low tide. This shoreline feature is not expected to persist and losses are expected to be short-term and minimal.

11(c) DGIF Recommendation. DGIF recommends that Alternative 2, Unnamed Shoal A, be chosen as the sand borrow site. Utilize BMPs to minimize impacts to the oceanic environment and marine wildlife.

Routinely monitor and survey the project area ahead of work being performed so that any new sea turtle or shorebird nesting activity and nesting locations can be protected from harm. Ahead of project commencement, develop a plan of action to address newly found nest sites so that the plan can be put into action immediately upon documentation of a site.

Time construction and beach fill operations to avoid avian and sea turtle nesting seasons. Adhere to a time-of-year restriction (TOYR) of April 1 through November 30 or until the last turtle hatches or the nest is determined to have failed.

Monitor invertebrates at the borrow site located at the north end of Wallops Island, if that area is used for sand excavation, so that long-term impacts on the island's benthic invertebrate forage base can be determined and addressed, as necessary.

Additional consideration should be given to the significant impacts the project is likely to have on local wildlife, particularly the listed and tiered species mentioned above. Coordinate with DGIF's Eastern Shore Biologist (Ruth Boettcher, 757-709-0766) to ensure appropriate consideration of wildlife and their habitats during project design and implementation.

11(d) DGIF Conclusion. DGIF defers the federal consistency determination to VMRC since the site drains to marine waters.

As proposed (using Alternative 1), DGIF determined that this project is likely to result in adverse impacts upon beach nesting birds and seas turtles. DGIF does not support the selection of Alternative 1. DGIF may determine that mitigation to compensate for unavoidable impacts upon these species is necessary.

DGIF recommends the selection of Alternative 2, using Unnamed Shoal Area A for sand collection, assuming it is performed with Best Management Practices (BMPs) in place to minimize impacts upon the oceanic environment and its inhabitants.

11(e) CZMA Federal Consistency. The proposed project will be consistent to the maximum extent practicable with the fisheries management enforceable policy of the CZM Program, provided NASA obtains and complies with any applicable conditions of a VMRC permit.

12. Public Water Supply. The DEA does not address impacts to public water supplies.

12(a) Agency Jurisdiction. The Virginia Department of Health (VDH) Office of Drinking Water reviews projects for the potential to impact public drinking water sources (groundwater wells, springs and surface water intakes). VDH administers both federal and state laws governing waterworks operation.

12(b) Agency Findings. VDH-ODW found that there are no apparent impacts to public drinking water sources as a result of this project.

13. Historic and Archeological Resources. The DEA (page 3-34) states that in accordance with Section 106 and 110 of the National Historic Preservation Act, NASA developed a Programmatic Agreement with the Virginia State Historic Preservation Office and Advisory Council on Historic Preservation. The agreement outlines how WFF manages cultural resources as a part of its operations and missions. Section 106 consultation was opened while NASA prepared the DEA and DHR issued a Finding of No Historic Properties Affected on August 14, 2018.

13(a) Agency Jurisdiction. The Department of Historic Resources (DHR) conducts reviews of projects to determine their effect on historic structures or cultural resources under its jurisdiction. DHR, as the designated State's Historic Preservation Office, ensures that federal actions comply with Section 106 of the National Historic Preservation Act of 1962 (NHPA), as amended, and its implementing regulation at 36 CFR Part 800. The NHPA requires federal agencies to consider the effects of federal projects on properties that are listed or eligible for listing on the National Register of Historic Places. Section 106 also applies if there are any federal involvements, such as licenses, permits, approvals or funding. DHR also provides comments to DEQ through the state environmental impact report review process.

13(b) Agency Findings. NASA consulted with DHR during development of the DEA and found that no historic properties will be affected (Appendix G). The agency has fulfilled its Section 106 responsibilities, according to the documentation provided with the DEA.

DHR did not provide additional comment on the DEA.

13(c) Agency Requirement. If for any reason the project cannot be completed as documented in the finding of No Historic Properties Affected, Section 106 coordination should be reopened.

14. Pollution Prevention. DEQ advocates that principles of pollution prevention and sustainability be used in all construction projects as well as in facility operations. Effective siting, planning, and on-site BMPs will help to ensure that environmental impacts are minimized. However, pollution prevention and sustainability techniques also include decisions related to construction materials, design, and operational procedures that will facilitate the reduction of wastes at the source.

14(a) Recommendations. We have several pollution prevention recommendations that may be helpful in the implementation of this project:

- Consider development of an effective Environmental Management System (EMS). An effective EMS will ensure that the proposed facility is committed to complying with environmental regulations, reducing risk, minimizing environmental impacts, setting environmental goals, and achieving improvements in its environmental performance. DEQ offers EMS development assistance and recognizes facilities with effective Environmental Management Systems through its Virginia Environmental Excellence Program (VEEP). VEEP provides recognition, annual permit fee discounts, and the possibility for alternative compliance methods.
- Consider environmental attributes when purchasing materials. For example, the extent of recycled material content, toxicity level, and amount of packaging should be considered and can be specified in purchasing contracts.
- Consider contractors' commitment to the environment (such as an EMS) when choosing contractors. Specifications regarding raw materials and construction practices can be included in contract documents and requests for proposals.
- Choose sustainable materials and practices for infrastructure construction and design. These could include asphalt and concrete containing recycled materials, and integrated pest management in landscaping, among other things.
- Integrate pollution prevention techniques into the facility maintenance and operation, to include inventory control for centralized storage of hazardous materials and source reduction (fixing leaks, energy efficient products). Maintenance facilities should have sufficient and suitable space to allow for effective inventory control and preventive maintenance.

DEQ's Office of Pollution Prevention provides information and technical assistance relating to pollution prevention techniques and EMS. For more information, contact DEQ's Office of Pollution Prevention, Meghann Quinn at (804) 698-4021.

FEDERAL CONSISTENCY UNDER THE COASTAL ZONE MANAGEMENT ACT

Pursuant to the Coastal Zone Management Act of 1972 (§ 1456(c)), as amended, and the federal consistency regulations implementing the CZMA (15 CFR Part 930, Subpart

C, § 930.30 *et seq.*), federal actions that can have reasonably foreseeable effects on Virginia's coastal uses or resources must be conducted in a manner which is consistent, to the maximum extent practicable, with the Virginia Coastal Zone Management (CZM) Program. The CZM Program is comprised of a network of programs administered by several agencies. In order to be consistent with the CZM Program, the federal agency must obtain all the applicable permits and approvals listed under the enforceable policies of the CZM Program prior to commencing the project.

Federal Consistency Public Participation
In accordance with 15 CFR § 930.2, public notice of the proposed action was published in the OEIR Program Newsletter and on DEQ's web site from December 14, 2018 to January 4, 2019. No public comments were received in response to the notice.

Federal Consistency Determination
A Federal Consistency Determination for the proposed Wallops Flight Facility Shoreline Enhancement and Restoration Project was included in Appendix C of the DEA received on December 6, 2018. The document provided an analysis of the project's impact on each of the nine enforceable policies. According to the FCD, the project will be consistent to the maximum extent practicable with Virginia's Coastal Zone Management Program.

The FCD states that proposed activity will have no effect on the following enforceable policies of the Coastal Zone Management Program: wetlands management, point source pollution control, coastal lands management and shoreline sanitation.

The project is expected to affect the following enforceable policies: fisheries management, subaqueous lands management, dunes management, non-point source pollution control, and air pollution control. These impacts and jurisdictional agency comments, recommendations, and requirements are discussed above in the "Environmental Impacts and Mitigation" section of this document.

Federal Consistency Conditional Concurrence
Based on our review of the FCD and the comments submitted by agencies administering the enforceable policies of the CZM Program, DEQ **conditionally concurs** that the proposal is consistent to the maximum extent practicable with the CZM Program provided all applicable permits and approvals are obtained as described below in the Regulatory and Coordination Needs section. VMRC is still evaluating the JPA for the project and a consistency decision will be made pending the approval of a VMRC permit for the project (refer to Item 2 and Item 3) in the Environmental Impacts and Mitigation section, pages 4 and 5).

If, prior to construction, the project should change significantly and any of the enforceable policies of the Virginia CZM Program would be affected, pursuant to 15 CFR 930.66, the applicant must submit supplemental information to DEQ for review and approval. Additionally, other state approvals which may apply to this project are not included in this consistency concurrence. Therefore, NASA must ensure that this project is operated in accordance with all applicable federal, state and local laws and regulations. NASA is encouraged to consider the Advisory Polices of the CZM Program as well (Attachment 2).

Condition of Concurrence with the FCD
The condition of the Commonwealth's concurrence includes the following authorization under the Virginia CZM Program:

- a permit issued by VMRC for encroachments on or over state-owned subaqueous beds authorized under § 28.2-1200 to §28.2-1213 of the Virginia Code.
- a permit issued by VMRC for encroachments on or over state-owned coastal primary sand dunes and beaches authorized under §28.2-1400 through §28.2-1420 of the Virginia Code.

In accordance with the *Federal Consistency Regulations* 15 CFR Part 930, section 930.4, this conditional concurrence is based on NASA obtaining the necessary authorizations prior to initiating project activities. If the requirements of section 930.4, sub-paragraphs (a)(1) through (a)(3) are not met, this conditional concurrence becomes an objection under 15 CFR Part 930, section 930.63.

PREFERRED ALTERNATIVE RECOMMENDATION

DGIF recommends **Alternative 2**, Unnamed Shoal A be utilized for sand collection. VIMS additionally recommend the use of an offshore site to obtain the sand for the beach re-nourishment. The offshore source could be any approved offshore site, including **Alternative 2,** Unnamed Shoal A. The other natural resource agencies that participated in this review did not make a recommendation for alternative selection.

REGULATORY AND COORDINATION NEEDS

1. Surface Waters and Wetlands. A VWP Individual Permit Waiver has been issued for this project. Coordinate with the DEQ TRO VWP Permit program (Jeff Hannah, 757-518-2146) with questions regarding VWP permitting requirements and the status of the JPA review.

2. Subaqueous Lands. A VMRC permit is required for the impacts to State-owned subaqueous bottom. The JPA is currently under review. Coordinate with VMRC (Lyle Varnell, 804-684-7764) with questions regarding the status of the JPA review or the required permit.

Contact VIMS (Emily Hein, 804-684-7482) with questions related to their findings or recommendations.

3. Erosion and Sediment Control and Stormwater Management.

3(a) Erosion and Sediment Control and Stormwater Management. This project must comply with Virginia's *Erosion and Sediment Control Law* (Virginia Code § 62.1-44.15:61) and *Regulations* (9 VAC 25-840-30 *et seq*.) and *Stormwater Management Law* (Virginia Code § 62.1-44.15:31) and *Regulations* (9 VAC 25-870-210 *et seq*.) as administered by DEQ. Activities that disturb equal to or greater than 10,000 square feet would be regulated by *VESCL&R* and *VSWML&R*. Erosion and sediment control, and stormwater management requirements should be coordinated with the DEQ Tidewater Regional Office, Janet Weyland (757-518-2151).

3(b) Virginia Stormwater Management Program General Permit for Stormwater Discharges from Construction Activities (VAR10). For projects involving land-disturbing activities of equal to or greater than one acre the project owner is required to register for coverage under the Virginia Stormwater Management Program General Permit for Discharges of Stormwater from Construction Activities (9 VAC 25-870-1 *et seq*.). Specific questions regarding the Stormwater Management Program requirements should be directed to DEQ, Holly Sepety at (804) 698-4039.

4. Point Source Pollution Control. The NASA must comply with its existing VPDES Individual Permit (VA0024457). Contact the DEQ TRO permit writer (Deanna Austin, 757-518-2008) as necessary for questions related to permit or map requirements as warranted due to project activities.

5. Air Quality Regulations. For more information, questions, and coordination related to air pollution control requirements, contact DEQ TRO, Laura Corl (757-518-2178).

6. Solid and Hazardous Wastes. All solid waste, hazardous waste, and hazardous materials must be managed in accordance with all applicable federal, state, and local environmental regulations. For additional information concerning location and availability of suitable waste management facilities in the project area or if free product, discolored soils, or other evidence of contaminated soils are encountered, contact DEQ-TRO, Sean Priest at (757) 518-2141.

7. Natural Heritage Resources. Contact DCR-DNH, Rene Hypes at (804) 371-2708, to secure updated information on natural heritage resources if the scope of the project changes and/or six months has passed before the project is implemented, since new and updated information is continually added to the Biotics Data System.

Contact DCR (Rene Hypes, 804-371-2709) if any occurrences of Sea-beach amaranth are documented once the project commences.

Due to the legal status of some of the species found in the Wallops – Assawoman Islands Conservation Site, coordinate with the USFWS (Troy Andersen, troy_andersen@fws.gov) to ensure compliance with protected species legislation.

8. Wildlife Resources, Fisheries, and Protected Species. Contact Amy Ewing (804-367-2211) with questions related to DGIF's comments and recommendations. DGIF recommends the selection of Alternative 2, Unnamed Shoal A for the sand borrow site.

9. Historic Resources. If for any reason the project cannot be completed as documented in the DHR finding of No Historic Properties Affected, Section 106 coordination should be reopened. Contact Laura Lavernia (804-482-8097) with questions.

10. Dunes Management. A VMRC permit is required for the impacts to beaches and dunes. The JPA is currently under review. Coordinate with VMRC (Lyle Varnell, 804-684-7764) with questions regarding the status of the JPA review or the required permit.

Contact VIMS (Emily Hein, 804-684-7482) with questions related to their findings or recommendations.

Thank you for the opportunity to review and respond to the Draft Environmental Assessment and Federal Consistency Determination for the Wallops Flight Facility Shoreline Enhancement and Restoration Project in Accomack County, VA. Detailed comments of reviewing agencies are attached for your review. Please contact me at (804) 698-4204 or Janine Howard at (804) 698-4299 for clarification of these comments.

Sincerely,

Bettina Rayfield, Program Manager
Environmental Impact Review

Ec: Amy Ewing, DGIF
Robbie Rhur, DCR
Arlene Warren, VDH
Roger Kirchen, DHR
Tony Watkinson, VMRC
Emily Hein, VIMS
Michael Mason, Accomack County
Elaine Meil, Accomack-Northampton Planning District Commission
Shari Miller, NASA

Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

Re: ESSLog# 39481_18-171F_WallopsShoreline_DGIF_AME20181218

1 message

Ewing, Amy <amy.ewing@dgif.virginia.gov> Mon, Jan 7, 2019 at 11:53 AM
To: "Howard, Janine" <janine.howard@deq.virginia.gov>

Hi Janine,
I have looked back over the project documents and offer the below comments per your questions. I thought the preferred alternative was Alt 1, but they were referring back to the SRIPP project. Confusing. Let me know if you continue to have any questions. Thanks!

1. Alternative 2 - using Unnamed Shoal Area A for sand collection: Although collection of sand from such areas is not without impacts upon benthic communities and the wildlife that rely upon them, we believe it preferable to removal from the north end of wallops island, assuming it is performed with BMPs in place to minimize impacts upon the oceanic environment and its inhabitants. So, if this project must move forward, we would prefer it include collection of sand from areas other than the north end of wallops, where we know listed species nest.

2. Re-nourishment cycle of 5 years. Thanks for clearing this up. No comments.

3. Federal Consistency: We defer to VMRC as this site drains to marine waters.

Thanks, Amy

VIRGINIA DGIF

Amy Ewing
Environmental Services Biologist
Manager, Fish and Wildlife Information Services
P 804.367.2211
Virginia Department of Game & Inland Fisheries
CONSERVE. CONNECT. PROTECT.
A 7870 Villa Park Drive, P.O. Box 90778, Henrico, VA 23228
www.dgif.virginia.gov

On Thu, Jan 3, 2019 at 3:18 PM Howard, Janine <janine.howard@deq.virginia.gov> wrote:

> Thanks Amy. Tuesday morning before 11am will work for me. I probably will need something in writing eventually, particularly if we decide to issue a conditional. So with that in mind if you could plan for having something to me by Jan 11th that would be great. That gives me time to edit the report as well as the needed time for it to go through internal review.
>
> Let me know if Tuesday AM for a chat works for you!
>
> Janine Howard
> Environmental Impact Review Coordinator
> Virginia Department of Environmental Quality
> 1111 East Main Street, Suite 1400
> Richmond, VA 23219
> 804-698-4299
>
> For program updates and public notices please subscribe to the OEIR News Feed
>
> On Thu, Jan 3, 2019 at 3:13 PM Ewing, Amy <amy.ewing@dgif.virginia.gov> wrote:

Hi Janine,
I'd be happy to discuss this with you. I am really busy right now....can we chat on Tuesday? If you need something sooner, that's ok too...I can get something to you via email. I guess I'm asking for your timeframe. Let me know when you need answers to your questions and then I'll figure out how to fit it in.

Amy

Amy Ewing
Environmental Services Biologist
Manager, Fish and Wildlife Information Services
P 804.367.2211
Virginia Department of Game & Inland Fisheries
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On Thu, Jan 3, 2019 at 2:57 PM Howard, Janine <janine.howard@deq.virginia.gov> wrote:
Hello Amy,

Thank you for your comments and I hope you had a great holiday as well!

I have a few follow-up questions with regard to your comments/recommendations and it may be necessary to have a quick call about it.

1. You comments are clear that DGIF does not support using North Wallops Island beach as a borrow area for this project (Alternative 1). However, the proposal includes Alternative 2 which would take sand from Unnamed Shoal A (offshore sand ridge located in the outer continental shelf at the southern end of the Assateague ridge field). Do you have any specific comments about that location and/or do you want to endorse that Alternative over Alternative 1? Alternative 3 involves the construction of the parallel breakwaters in addition to the beach nourishment from one of the aforementioned locations (Alt 3+1 or Alt 3+2). NASA does not identify a Preferred Alternative in the Draft Environmental Assessment.

2. With regard to the breakwaters (Alternative 3) you mention that the proposed re-nourishment frequency or type is not discussed. I believe this particular project builds on previously reviewed NEPA documents that specified renourishment cycles of every five years. Specifically I am referring to the Final Programmatic Environmental Impact Statement for the Shoreline Restoration and Infrastructure Protection Program (SRIPP) at Wallops Island (DEQ 10-156F) which was reviewed in November 2010. This project appears to be more of a one-off effort to make repairs/renourish the shoreline due to losses sustained in 2015 (Hurricane Joaquin), 2016 (Winter Storm Jonas) and 2018 (Winter Storm Riley).

3. This document includes a Federal Consistency Determination so we need to discuss how to address the fisheries management enforceable policy. Are we objecting or conditionally concurring with regarding to fisheries management and if it is conditional, what are the conditions?

I have attached VMRC's comment letter on this project for your reference. Based on the information in that letter I will conditionally concur (for subaqueous lands and dunes management), provided a VMRC permit is issued and that the included special conditions are adhered to. I mention this in case this has any bearing on how we want to proceed with regard to fisheries management.

Just FYI, I have to issue the response by January 22nd.

Thank you,

Janine

Janine Howard
Environmental Impact Review Coordinator
Virginia Department of Environmental Quality
1111 East Main Street, Suite 1400
Richmond, VA 23219
804-698-4299

For program updates and public notices please subscribe to the OEIR News Feed

On Tue, Dec 18, 2018 at 4:38 PM Ewing, Amy <amy.ewing@dgif.virginia.gov> wrote:

Janine,

Please see attached the comments we provided to MRC when they were looking for comments on the project. They constitute a valid response to your request for comments.

Thanks and happy holidays.

Amy

Amy Ewing
Environmental Services Biologist
Manager, Fish and Wildlife Information Services
P 804.367.2211
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A 7870 Villa Park Drive, P.O. Box 90778, Henrico, VA 23228
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Commonwealth of Virginia

Ewing, Amy <amy.ewing@dgif.virginia.gov>

ESSLog# 39481_20181590_WallopsShoreline_DGIF_AME20181116

1 message

Ewing, Amy <amy.ewing@dgif.virginia.gov> Fri, Nov 16, 2018 at 2:28 PM
To: George Badger <hank.badger@mrc.virginia.gov>
Cc: "Boettcher, Ruth" <ruth.boettcher@dgif.virginia.gov>

Hank,
We have reviewed the subject project that proposes to perform shoreline stabilization along Wallops Island shoreline in Accomac County, borrowing fill from the north end shoreline, depositing it along southern shorelines, and installing parallel breakwaters.

As stated during our 2010 review of of Wallops' Shoreline Restoration and Infrastructure Protection Program, similar in nature to what is currently being proposed, we are concerned about NASA using the north end of Wallops Island for sand excavation as we believe this area to support nesting federal Endangered piping plovers and American oystercatchers, designated a Tier IIa Species of Greatest Conservation Need. In addition, we believe this are provides nesting habitat for state Threatened Wilson's plovers, federal Threatened loggerhead sea turtles, diamond-backed terrapins (Tier II SGCN), and other species identified in Virginia's Wildlife Action Plan as Species of Greatest Conservation Need (SGCN). We believe that the excavation of sand from this area is likely to not only result in direct adverse impacts upon these species, but also result in long term adverse impacts upon the substrate which provides them nesting habitat. As such, we cannot support removal of sand from the proposed borrow area.

It is our understanding that erosive action along this section of the Eastern Shore is primarily due to northerly near-shore currents that continually transport sand from the southern end of the island to the northern end. As such, it is not clear how breakwaters constructed parallel to the shore will be effective in reducing sand loss from the southern end. Therefore, it is expected that future beach nourishment and associated dredging/borrow areas will be necessary for long-term infrastructure protection. However, there is no information in the application about proposed re-nourishment frequency or type. In addition, there is no information in the application about how placement of fill and installation of breakwaters in this area will impact barrier islands to the south of this site, islands populated by nesting birds and sea turtles. Without these additional details, it is difficult for us to make any determinations about regional wildlife dynamics and population effects resulting from the proposed project.

We recommend that the project area be routinely monitored and surveyed ahead of work being performed so that any new sea turtle or shorebird nesting activity and nesting locations can be protected from harm. We also recommend that a plan of action to address newly found nest sites be developed ahead of project commencement so that the plan can be enacted immediately upon documentation of a site, rather than waiting while coordination with the appropriate agencies is performed. We continue to recommend timing construction and beach fill operations to avoid avian and sea turtle nesting seasons (adherence to time of year restrictions), as indicated in the application. We note that the time of year restriction fro sea turtles is from April 1 thourhg November 30 OR until the last turtle hatches or the nest is determined to have failed. We recommend monitoring of the invertebrates at the borrow site located at the north end of Wallops Island, assuming this area used for sand excavation, so that the long-term impacts on the island's benthic invertebrate forage base can be determined and addressed, if necessary.

We recommend additional consideration about the significant impacts this project is likely to have on the local wildlife, particularly the listed and tiered species mentioned above. We recommend inclusion of greater detail within the application about the proposed actions, how they will affect nearby environs, and how imperiled wildlife and their habitats can be better protected from project activities and benefit them in the long-term. We recommend coordination with VDGIF's Eastern Shore Biologist, Ruth Boettcher, at 757-709-0766 or Ruther.Boettcher@dgif.virginia.gov to ensure appropriate consideration of wildlife and their habitats during project design and implementation.

If this project moves forward, as proposed, it is likely to result in adverse impacts upon beach nesting birds and sea turtles. As such, we cannot support the project. In addition, we may determine that mitigation to compensate for unavoidable impacts upon these species is necessary.

Thanks, Amy

Amy Ewing
Environmental Services Biologist
Manager, Fish and Wildlife Information Services
P 804.367.2211
Virginia Department of Game & Inland Fisheries
CONSERVE. CONNECT. PROTECT.
A 7870 Villa Park Drive, P.O. Box 90778, Henrico, VA 23228
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Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

Re: EXPEDITED REVIEW-NEW PROJECT NASA WFF Shoreline Restoration DEQ #18-171F

1 message

Warren, Arlene <arlene.warren@vdh.virginia.gov> Wed, Dec 19, 2018 at 3:42 PM
To: Janine Howard <janine.howard@deq.virginia.gov>

Project Name: Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Project
Project #: 18-171F
UPC #: N/A
Location: Accomack County

VDH – Office of Drinking Water has reviewed the above project. Below are our comments as they relate to proximity to **public drinking water sources** (groundwater wells, springs and surface water intakes). Potential impacts to public water distribution systems or sanitary sewage collection systems **must be verified by the local utility.**

There are no public groundwater wells within a 1-mile radius of the project site.

There are no surface water intakes located within a 5-mile radius of the project site.

The project is not within the watershed of any public surface water intakes.

There are no apparent impacts to public drinking water sources due to this project.
The Virginia Department of Health – Office of Drinking Water appreciates the opportunity to provide comments. If you have any questions, please let me know.

Best Regards,

Arlene Fields Warren

GIS Program Support Technician

Office of Drinking Water

Virginia Department of Health

109 Governor Street

Richmond, VA 23219

(804) 864-7781

On Tue, Dec 11, 2018 at 1:35 PM Fulcher, Valerie <valerie.fulcher@deq.virginia.gov> wrote:

> **Good afternoon - this is a new OEIR review request/project:**
>
> **Document Type: Draft Environmental Assessment/Federal Consistency Determination**
> **Project Sponsor: National Aeronautics and Space Administration**
> **Project Title: Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Project**
> **Location: Accomack County**

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Office of Research and Advisory Services

January 8, 2019

Mr. Hank Badger
Environmental Engineer, Sr.
Habitat Management Division
Virginia Marine Resources Commission
2600 Washington Avenue
Newport News, VA 23607

Dear Mr. Badger:

The Virginia Institute of Marine Science (VIMS) has completed its review of the proposed project on Wallops Island for the construction of six breakwaters upon state-owned subaqueous bottomlands, placement of sand landward of the breakwaters, nourishment of approximately 19,850 linear feet of beach, and removal of up to 1.3 million cubic yards of sand from a 150 acre area at the north end of the island for nourishment material. Personnel from the departments of Physical Sciences and Fisheries Science, and the Office of Research and Advisory Services contributed to these analyses.

The Virginia barrier islands are a series of dynamic geological features that function collectively as marine and coastal habitat; and also as protection for state-owned marshes and subaqueous bottomlands, public shellfish grounds, private aquaculture capital, and ultimately the oceanside uplands of the Eastern Shore. The continued integrity of the barrier islands is critical to the coastal bay ecosystem, coastal communities, and water-based economic development of the Eastern Shore. These islands are a largely integrated system connected through the flow of sand between the beaches, dunes, and shorefaces of individual islands and across islands in response to tidal currents, winds, waves, and storms (Rice *et al.*, 1976; Rice and Leatherman, 1983; McBride *et al.*, 2015). As such, shoreline modifications to one island must be analyzed for effects not only locally, but also for the potential to affect the natural processes of adjacent islands and waterways.

Wallops Island contains critical infrastructure highly vulnerable to ocean forces. Protective measures including beach nourishment and rock seawalls have been utilized in the past to address these threats, but events have shown that additional and alternative approaches are necessary. The proposed plan incorporates greater continuing control of shoreline processes than past projects, and these control elements expand the potential to alter natural barrier island processes. Ultimate outcomes of alterations to dynamic marine environments are difficult to foresee; however, elements of the project as proposed have the potential to alter local and remote marine resources beyond those resulting from natural processes.

The proposed project will significantly increase storm protection, especially directly leeward of the breakwaters, but is unlikely to provide the level of long-term protection necessary for the Wallops Island shoreline and upland infrastructure. The placement of six stone breakwaters with sand nourishment landward of each structure will have minimal direct impacts to state-owned subaqueous resources, and the additional nourishment of 19,850 feet of shoreline will result only in temporary and minimal impacts to the littoral marine environment. Therefore, minimal adverse environmental impacts will result within the footprint of these isolated shoreline stabilization actions. However, there is potential for remote and secondary impacts to marine resources dependent upon the proposed sand source and likely disruptions of

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littoral and longshore sand transport to adjacent shores due to the influences of the breakwaters. Below we discuss separate aspects of the proposed project and their likely environmental consequences, and also describe relational elements than may compound potential impacts to Wallops Island and beyond.

Sand Mining

Previous beach nourishment relied on offshore sand resources and resulted in only temporary protection due to erosion and sand migration during both storms and quiet-water conditions. This project proposes to mine sand from a 150-acre on-island area north of the target shoreline. The sediment in this area is dominated by previous beach nourishment material displaced by longshore transport. Although northern Wallops Island has been growing wider historically in response to natural barrier island and tidal-inlet processes, the mining site developed very rapidly compared with normal barrier island processes due to the large volume of artificially supplemented sand displaced northward by significant storm forces. The combination of these manmade and natural events subsequently created the current robust beach and dune environment at this northern end of the island. It is important to note that barrier island and tidal-inlet processes will continue to affect the geomorphology of this area, and its current configuration cannot be considered stable.

There are consequences to local barrier island geology from mining or allowing the area to remain intact. Beach and dune resources will be removed within the footprint of the area proposed for mining. Removal and relocation of this magnitude of sand will instantaneously (relative to general island geological processes) destabilize adjacent beaches and dunes, and the adjacent and local nearshore. The applicant reports that mining will occur above mean low water (MLW) and that the mean low water line will remain in its current location with a wide horizontal plane extending landward at the MLW elevation. This may be difficult to achieve, but even if successful, it is highly likely that the large remaining shoreface intertidal flat and the adjacent subaqueous shore component will undergo relatively rapid and significant erosion as the beach and nearshore adjusts towards an equilibrium profile. The applicant provided modeling that demonstrated sand movement back into this area from the south; however, we are not confident in those results due to the model relying on artificial parameters, a unidirectional wave field, and the assumption that the mined area will be geologically stagnant. Additionally, should the breakwaters be constructed and nourished as planned, they will reduce the rates and volumes of northerly longshore sand transport (as they are designed to do). The transport of sand alongshore from the north, around Fishing Point (the southern tip of Assateague Island), and bypassing Chincoteague Inlet to reach Wallops Island and its nearshore (Goettle, 1981; Morang *et al*., 2006) will surely continue, but it is highly unlikely that it will occur at rates necessary to reconstruct the mining area prior to its alteration by wind and wave forces. We have great confidence that this area will not retain its post-mining form nor naturally fill again with sand to near its current profile and volume in response to reworking by waves and tidal currents. The timing and processes necessary for this to occur cannot be accurately predetermined, but there will surely be alterations to adjacent island and nearshore geomorphology that may create vulnerabilities well beyond the mining footprint.

Should sand mining occur as planned, secondary erosional impacts to dunes and beaches adjacent to the limits of mining can be expected, but no near-term concerns for significant dune erosion are anticipated. Depending on the response of this and adjacent shoreline areas, the remaining dunes landward of the mined area may be positioned for increased vulnerability.

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Another concern for geomorphic alterations beyond those associated with natural processes involves the configuration of Chincoteague Inlet. Alterations to an inlet's geometry, e.g., through growth of, re-shaping of, or mining from the northern end of Wallops Island, can result in reworking of inlet sediments in order to maintain a stable cross-sectional area. It is probable that the mining area is affecting inlet dynamics by constricting inlet width, causing it to narrow and deepen to maintain its current cross-sectional area in equilibrium with its tidal prism (O'Brien, 1967; Jarrett, 1976; FitzGerald *et al*., 2012). Sand mining is likely to ultimately widen the inlet (particularly after the beach has returned to an equilibrium state) and may result in subsequent shoaling of the inlet to an unknown degree.

Fishing Point is a growing landmass that influences local geological processes; and this added variable cannot be ignored when attempting to determine potential effects of the proposed project beyond natural processes. Even without considering the potential impact to Chincoteague Inlet of natural or manmade changes in the width, volume, or shape of northern Wallops Island, the configuration of this dynamic inlet will surely be modified in response to geomorphic changes to Fishing Point. For example, a westward growth of Fishing Point would narrow the inlet, causing its channel to naturally shift westward or deepen in order to maintain its cross-sectional area. Given past natural changes observed within and around Chincoteague Inlet, and the relatively rapid removal of a large volume/area of sand combined with the influences of Fishing Point, some unknown degree and rate of changes to inlet geometry are expected.

We also anticipate an unknown degree of effect to Chincoteague Inlet if sand mining does not occur and sand from nourishment continues migrating north towards the inlet. The previous nourishment migrated to the north along an unobstructed linear path as demonstrated by the applicant's shoreline monitoring data. That volume of sand currently rests in a curvilinear embayment bounded to the north by a pre-existing headland spit or salient. This current shoreline configuration could modify transport processes and may provide for northerly sand transport to continue in smaller and continual volumes. If this occurs, the inlet is expected to receive migrating sand from this direction at a rate and degree more similar to natural processes.

The post-mining sand flat will create a large intertidal area that is available for exploitation by fishes and crabs endemic to the nearshore and surf zone. This abnormal habitat feature has the potential to trap species at low tide, and some level of mortality is expected. However, this shoreline configuration is relatively small in scale and is not expected to persist. Therefore, losses are likely to be minimal and generally short-term. Sea turtles and various shorebirds have been documented in the area targeted for mining, and potential impacts to these species are analyzed under authority of the Virginia Department of Game and Inland Fisheries, the United States Fish and Wildlife Service, and the National Oceanic and Atmospheric Administration's Office of Protected Resources. We recommend referencing their analyses regarding those particular species.

Breakwaters and Longshore Sand Transport

Regionally the dominant longshore sediment transport along the Eastern Shore barrier islands is to the south (Finkelstein and Ferland, 1987; Fenster *et al*., 2016). However, reversals of regional longshore transport are common at the downdrift side of inlets and shorelines influenced by wave fields created by remote offshore spits such as Fishing Point (Hayes *et al*., 1970; Hayes, 1980; Hayes, 1991). Such a

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scenario controls local sediment transport along northern Wallops Island, driving sediment to the north from a dynamic, migrating nodal zone located centrally along the length of the island; dominant sand transport south of this nodal point remains to the south (King *et al*., 2011). The opportunity for the breakwaters to disrupt natural and large-scale sand transport is dependent upon the path of sand migrating around Fishing Point and across Chincoteague Inlet (a primary source of sand for the barrier island system), whether or not the breakwaters are within the path of the migrating sand, and the sand-capturing capacity of the breakwaters. Sand supply and transport dynamics are critical to the entire barrier island system (McBride *et al*., 2015; Fenster *et al*., 2016), and disruption of natural processes is expected from the placement of breakwaters; indeed, it is the inherent strategy for breakwater design and application. It is reasonable to conclude that some scale of change to adjacent shoreline dynamics upon and beyond Wallops Island will occur, with the northern area of Assawoman Island particularly vulnerable to these influences.

The shoreline stabilization plan appears to reflect a minimalist approach designed to protect the most sensitive and vulnerable upland infrastructure. The sand nourishment between the breakwaters will rework beyond and within the footprint of the design shoreline in response to local wind and wave energy, with the breakwaters influencing rates and volumes of sand transport in the vicinity of the structures. The disruption of longshore transport by the breakwaters will affect the sand supply to areas north and south of the project footprint at an unknown distance. Disruption of northward longshore transport is expected to alter sand migration rates and the volume of sand available for the mined area, which has the added potential to contribute to long-term effects to northern Wallops Island. Whether or not this may directly contribute to eventual added erosion and an increased vulnerability to Commonwealth natural resources behind and adjacent to the northern end of Wallops Island cannot be interpreted from the available information.

A characteristic of breakwaters that can eventually self-mitigate potential adverse effects to barrier island sand supplies is their sand storage capacity, which is related to breakwater length and distance offshore (Chasten *et al*. 1993). Once maximum capacity is reached and the breakwaters are fully connected to shore, longshore sand transport by wind and waves has the potential to occur at rates and volumes more similar to natural processes. However, facilitation of this process depends heavily on breakwater design and the integration of the breakwaters into local shoreline processes. Furthermore, storm events can reduce sand volumes landward of the breakwaters to below maximum capacity, thus initiating a new cycle of sand transport disruption. Providing guidance on if, and when, these situations develop and establish as normal shoreline processes is infeasible. We assume and strongly recommend continuation of the shoreline monitoring program to continue providing an empirical basis for future adaptive management.

Conclusions and Recommendations

The continued and integrated geological and marine processes indigenous to the Virginia barrier islands creates challenging shoreline management problems and complicated scenarios from which to assess potential benefits or detriments to local natural resources. Accounting for these difficulties, we have confidence that (1) the breakwaters and beach nourishment will provide protection to Wallops Island, but for an unknown period of time; (2) the post-mining footprint and adjacent areas of northern Wallops Island will undergo relatively rapid changes that could affect the island and adjacent inlet beyond natural

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processes; and (3) the breakwaters will have some unknown degree of effect on longshore sand transport rates and volumes, both north and south of their locations.

To reduce uncertainties and potential adverse environmental impacts, strong consideration should be given to again utilizing offshore sand for nourishment. This would eliminate direct impacts to beaches and dunes on northern Wallops Island and significantly decrease likelihoods of rapid geological alterations and responses of the affected and adjacent beach, dunes, and shoreface. If offshore sand is used, we further recommend consideration of management strategies and structures that semi-contain the sand within and around the proposed beach mining location at the north end of the island to prevent the possibility of an abnormally large volume of sand moving into Chincoteague Inlet.

Some concerning environmental effects could be addressed by applying an additional number of breakwaters designed to contain all sand nourishment, and nourished to maximum capacity. This would stabilize the shoreline to the maximum extent possible while providing added protection for the Wallops Island shoreline and infrastructure. Until a full build-out scenario such as this occurs, frequent and unknown degrees of impact to natural shoreline and island processes should be expected. Continued protection of Wallops Island will undoubtedly require future beach nourishment that will introduce other large sand volumes to this environment, with related unknown concerns and consequences.

Please contact me if you have questions or require additional information.

Sincerely,

Lyle Varnell
Associate Director for Advisory Services

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Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

RE: EXPEDITED REVIEW-NEW PROJECT NASA WFF Shoreline Restoration DEQ #18-171F

1 message

Emily A. Hein <eahein@vims.edu> Thu, Jan 10, 2019 at 9:26 AM
To: "Howard, Janine" <janine.howard@deq.virginia.gov>

Good morning, Janine,

Our report recommends using an offshore source for the sand nourishment material. The source can be any approved offshore site, including Unnamed Shoal A referenced in the EA.

Please let me know if you have any additional questions.

Best,

Emily

Emily Hein

Assistant Director

Research & Advisory Services

eahein@vims.edu, 804-684-7482

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From: Emily A. Hein
Sent: Tuesday, January 08, 2019 3:15 PM
To: 'Howard, Janine' <janine.howard@deq.virginia.gov>
Subject: RE: EXPEDITED REVIEW-NEW PROJECT NASA WFF Shoreline Restoration DEQ #18-171F

COMMONWEALTH of VIRGINIA

Marine Resources Commission
2600 Washington Avenue
Third Floor
Newport News, Virginia 23607

Matthew J. Strickler
Secretary of Natural Resources

Steven G. Bowman
Commissioner

January 2, 2019

Department of Environmental Quality
Attn: Janine Howard
1111 East Main St.
Richmond, VA 23219

Re: Federal Consistency Determination and
Draft Environmental Assessment
Wallops Flight Facility Project

Dear Ms. Howard:

This will respond to the request for comments regarding the Federal Consistency Determination and Draft Environmental Assessment for the Wallops Flight Facility Shoreline Restoration and Infrastructure Protection project (DEQ #18-171F). Specifically, the National Aeronautics and Space Administration (NASA) has proposed to construct six approximately 150-foot long offshore breakwaters and place approximately 1.3 million cubic yards of sandy beach nourishment material landward of the breakwaters along approximately 19,850 feet of shoreline. The project is located at the Wallops Island facility in Accomack County, Virginia.

Please be advised that the Commission pursuant to Chapter 12, 13, & 14 of Title 28.2 of the Code of Virginia administers permits required for submerged lands, tidal wetlands, and beaches and dunes. As such, the Commission administers the enforceable policies of fisheries management, subaqueous lands, tidal wetlands, and coastal primary sand dunes and beaches which comprise some of Virginia's Coastal Zone Management Program.

We received the applicant's information on October 9, 2018, JPA #18-1590. This project is in the JPA review process and will require a permit from this agency for submerged land and coastal primary sand dune/beach encroachments. Our final consistency recommendation cannot be reached until completion of our permit review process. Once the applicant has receive a permit specifying any necessary special conditions from the Commission, the project will be consistent with our enforceable polices. Conditioned on the issuance of the VMRC permit, the Commission has no objection to the consistency findings provided by the applicant.

An Agency of the Natural Resources Secretariat
www.mrc.virginia.gov
Telephone (757) 247-2200 (757) 247-2292 V/TDD Information and Emergency Hotline 1-800-541-4646 V/TDD

Department of Environmental Quality
January 2, 2019
Page Two

Should you have any questions please contact me at (757) 414-0710 or by email at hank.badger@mrc.virginia.gov. Thank you for the opportunity to comment.

Sincerely,

George H. Badger, III
Environmental Engineer, Habitat Management

GHB/lrp
HM

Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

Re: Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Project

1 message

Pudvah, Lauren <lauren.pudvah@mrc.virginia.gov> Tue, Jan 15, 2019 at 4:15 PM
To: "Howard, Janine" <janine.howard@deq.virginia.gov>
Cc: George Badger <hank.badger@mrc.virginia.gov>

Hi Janine,

This language looks good. Thank you!

Best,

Lauren Pudvah

On Tue, Jan 15, 2019 at 12:02 PM Howard, Janine <janine.howard@deq.virginia.gov> wrote:

> Hi Lauren,
>
> Thanks for submitting VMRC's comments on this project. Below is the draft conditional concurrence language that I proposed to use in our response to NASA. Please take a look and let me know that you concur and that the citations are correct. Thanks for your help!
>
> **Condition of Concurrence with the FCD**
>
> The condition of the Commonwealth's concurrence includes the following authorization under the Virginia CZM Program:
>
> - a permit issued by VMRC for encroachments on or over state-owned subaqueous beds authorized under § 28.2-1200 to §28.2-1213 of the Virginia Code.
> - a permit issued by VMRC for encroachments on or over state-owned coastal primary sand dunes and beaches authorized under §28.2-1400 through §28.2-1420 of the Virginia Code.
>
> In accordance with the *Federal Consistency Regulations* 15 CFR Part 930, section 930.4, this conditional concurrence is based on NASA obtaining the necessary authorizations prior to initiating project activities. If the requirements of section 930.4, sub-paragraphs (a)(1) through (a)(3) are not met, this conditional concurrence becomes an objection under 15 CFR Part 930, section 930.63.
>
> Janine Howard
> Environmental Impact Review Coordinator
> Virginia Department of Environmental Quality
> 1111 East Main Street, Suite 1400
> Richmond, VA 23219
> 804-698-4299
>
> For program updates and public notices please subscribe to the OEIR News Feed
>
> On Wed, Jan 2, 2019 at 11:07 AM Pudvah, Lauren <lauren.pudvah@mrc.virginia.gov> wrote:
>
>> Ms. Howard,

Please find attached the VMRC's comments on the above referenced project. Thank you for the opportunity to comment.

Best,

Lauren Pudvah

--

Lauren Pudvah
Comments Coordinator
VA Sea Grant Fellow
Marine Resources Commission
2600 Washington Ave., 3rd Floor
Newport News, VA 23607
lauren.pudvah@mrc.virginia.gov

We're moving! **On January 28th, 2019 we will open our doors at our new location at **380 Fenwick Road, Bldg. 96, Fort Monroe, VA.** To prepare for the move, our current main office **will be closed January 24-25, 2019**. Should you have any communications, permits, reports, etc. that need to be attended to the week of January 21 – 25, we ask that you try and have them delivered no later than January 17, 2019. We will make every effort to avoid any interruptions in service and should you have any questions or concerns please call 757-247-2200.**

--

Lauren Pudvah
Comments Coordinator
VA Sea Grant Fellow
Marine Resources Commission
2600 Washington Ave., 3rd Floor
Newport News, VA 23607
lauren.pudvah@mrc.virginia.gov

We're moving! **On January 28th, 2019 we will open our doors at our new location at **380 Fenwick Road, Bldg. 96, Fort Monroe, VA.** To prepare for the move, our current main office **will be closed January 24-25, 2019**. Should you have any communications, permits, reports, etc. that need to be attended to the week of January 21 – 25, we ask that you try and have them delivered no later than January 17, 2019. We will make every effort to avoid any interruptions in service and should you have any questions or concerns please call 757-247-2200.**

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR PROGRAM COORDINATION

ENVIRONMENTAL REVIEW COMMENTS APPLICABLE TO AIR QUALITY

TO: Janine L. Howard **DEQ - OEIR PROJECT NUMBER: DEQ #18-171F**

PROJECT TYPE: ☐ STATE EA / EIR **X FEDERAL EA / EIS** ☐ SCC

X CONSISTENCY DETERMINATION

PROJECT TITLE: Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Project

PROJECT SPONSOR: National Aeronautics and Space Administration

PROJECT LOCATION: ☐ OZONE ATTAINMENT AREA

REGULATORY REQUIREMENTSMAY BE APPLICABLE TO: **X CONSTRUCTION**
☐ OPERATION

STATE AIR POLLUTION CONTROL BOARD REGULATIONS THAT MAY APPLY:

1. ☐ 9 VAC 5-40-5200 C & 9 VAC 5-40-5220 E – STAGE I
2. ☐ 9 VAC 5-45-760 et seq. – Asphalt Paving operations
3. **X 9 VAC 5-130 et seq. – Open Burning**
4. **X 9 VAC 5-50-60 et seq. Fugitive Dust Emissions**
5. ☐ 9 VAC 5-50-130 et seq. - Odorous Emissions; Applicable to____________________
6. ☐ 9 VAC 5-60-300 et seq. – Standards of Performance for Toxic Pollutants
7. ☐ 9 VAC 5-50-400 Subpart_____, Standards of Performance for New Stationary Sources, designates standards of performance for the______________________________
8. ☐ 9 VAC 5-80-1100 et seq. of the regulations – Permits for Stationary Sources
9. ☐ 9 VAC 5-80-1605 et seq. Of the regulations – Major or Modified Sources located in PSD areas. This rule may be applicable to the ______________________________
10. ☐ 9 VAC 5-80-2000 et seq. of the regulations – New and modified sources located in non-attainment areas
11. ☐ 9 VAC 5-80-800 et seq. Of the regulations – State Operating Permits. This rule may be applicable to ____

COMMENTS SPECIFIC TO THE PROJECT:

K. S. Narasimhan

(Kotur S. Narasimhan)
Office of Air Data Analysis **DATE: December 12, 2018**

Matthew J. Strickler
Secretary of Natural Resources

Clyde E. Cristman
Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

Rochelle Altholz
Deputy Director of Administration and Finance

Russell W. Baxter
Deputy Director of Dam Safety & Floodplain Management and Soil & Water Conservation

Thomas L. Smith
Deputy Director of Operations

MEMORANDUM

DATE: January 7, 2019

TO: Janine Howard, DEQ

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: DEQ 18-171F, WFF Shoreline Restoration and Infrastructure Protection Project Draft EA

Division of Natural Heritage

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in our files, the Wallops – Assawoman Islands Conservation Site is located within the project site. Conservation sites are tools for representing key areas of the landscape that warrant further review for possible conservation action because of the natural heritage resources and habitat they support. Conservation sites are polygons built around one or more rare plant, animal, or natural community designed to include the element and, where possible, its associated habitat, and buffer or other adjacent land thought necessary for the element's conservation. Conservation sites are given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain; on a scale of 1-5, 1 being most significant. Wallops – Assawoman Islands Conservation Site has been given a biodiversity significance ranking of B2, which represents a site of very high significance. The natural heritage resources of concern at this site are:

Eupatorium maritimum	A Eupatorium	G2?/S1/NL/NL
Charadrius melodus	Piping plover	G3/S2B,S1/LT/LT
Caretta caretta	Loggerhead (Sea Turtle)	G3/S1B,S1/LT/LT
Papaipema araliae	Aralia Shoot Borer Moth	G3G4/S2S3/NL/NL
Juncus megacephalus	Big-headed rush	G4G5/S2/NL/NL
Ammodramus caudacutus	Saltmarsh sparrow	G4/S2B,S3/NL/NL
Euphorbia bombensis	Southern seaside spurge	G4G5/S2/NL/NL
Falco peregrinus	Peregrine falcon	G4/S1B,S2/NL/LT
Papaipema duovata	Seaside Goldenrod Stem Borer	G4/S1S3/NL/NL
Sternula antillarum	Least tern	G4/S2B/NL/NL
Charadrius wilsonia	Wilson's plover	G5/S1B/NL/LE
Circus hudsonius	Northern harrier	G5/S1S2B,S3N/NL/NL
Rynchops niger	Black skimmer	G5/S2B,S1/NL/NL
Plantago maritima var. juncoides	Seaside plantain	G5T5/S1/NL/NL
Tidal Herbaceous Vegetation Low Salt Marsh (Salt Panne Type)		GNR/S3/NL/NL
Bird Nesting Colony		G5/SNR/NL/NL

600 East Main Street, 24th Floor | Richmond, Virginia 23219 | 804-786-6124

State Parks • Soil and Water Conservation • Outdoor Recreation Planning
Natural Heritage • Dam Safety and Floodplain Management • Land Conservation

Wax Myrtle Interdune Shrubland	G3G4/S2S3/NL/NL
Interdune Swale / Pond	G2/S2/NL/NL
Interdune Swale (Northern Mixed Grassland Type)	G1G2/S1? /NL/NL
Woodland Black Cherry Xeric Dune Woodland	G1G2/S1/NL/NL
Shrub Herbaceous Vegetation Xeric Backdune Grassland	G2/S2/NL/NL

Due to the legal status of some of the species listed above, DCR recommends continued coordination with the US Fish and Wildlife Service (USFWS) and the Virginia Department of Game and Inland Fisheries (VDGIF), Virginia's regulatory authority for the management and protection of these species to ensure compliance with protected species legislation. DCR supports the planned mitigation measures to reduce the probability and intensity of potential effects to protected species.

Please note according to DCR's species distribution model, Sea-beach amaranth (*Amaranthus pumilus*, G2/S1/LT/LT) may exist within the project site. Please coordinate with DCR if any occurrences of Sea-beach amaranth are documented.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please re-submit project information and map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

The VDGIF maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis/ or contact Ernie Aschenbach at 804-367-2733 or Ernie.Aschenbach@dgif.virginia.gov.

The remaining DCR divisions have no comments regarding the scope of this project. Thank you for the opportunity to comment.

CC: Troy Andersen, USFWS
Amy Ewing, VDGIF

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 1111 East Main Street, Suite 1400, Richmond, VA 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

MEMORANDUM

TO: Janine Howard, DEQ Office of Environmental Impact Review

FROM: Rachel Hamm, DEQ Principal Environmental Planner

DATE: December 18, 2018

SUBJECT: DEQ #18-171F: NASA Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Project– Accomack County

We have reviewed the Federal Consistency Determination submittal for the proposed project and offer the following comments regarding consistency with the provisions of the Chesapeake Bay Preservation Area Designation and Management Regulations.

The proposed project is located in the Atlantic Ocean watershed and is outside of the Chesapeake Bay watershed; thus there are no comments or requirements under the Chesapeake Bay Preservation Area Designation and Management Regulations or the *Chesapeake Bay Preservation Act*.

DEPARTMENT OF ENVIRONMENTAL QUALITY
TIDEWATER REGIONAL OFFICE
ENVIRONMENTAL IMPACT REVIEW COMMENTS

January 17, 2019

PROJECT NUMBER: 18-171F

PROJECT TITLE: Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Project

As Requested, TRO staff has reviewed the supplied information and has the following comments:

Petroleum Storage Tank Cleanups:
No comments.

Petroleum Storage Tank Compliance/Inspections:
No comments.

Virginia Water Protection Permit Program (VWPP):
On October 9, 2018, the VWP program received a joint permit application for the proposed activities and on December 12, 2018, we waived the requirement for a VWP permit pursuant to 9 VAC 25-210-220.B. Provided the applicant complies with the VWP waiver, the project will be consistent with the VWP program.

Air Permit Program :
The following air regulations of the Virginia Administrative Code may be applicable: 9VAC5-50-60 *et seq*. which addresses the abatement of visible emissions and fugitive dust emissions, and 9VAC5-130-10 et *seq*. which addresses open burning. For additional information, contact Laura Corl at (757) 518-2178.

Water Permit Program :
The Wallops Flight Facility is covered under a VPDES individual permit (VA0024457). If there are any industrially related activities that will discharge pollutants to surface waters or facility changes that may require map or permit revisions, please contact the permit writer, Deanna Austin, at (757) 518-2008 or deanna.austin@deq.virginia.gov.

Waste Permit Program :
No Comment.

Storm Water Program:
No comments.

The staff from the Tidewater Regional Office thanks you for the opportunity to provide comments.

DEPARTMENT OF ENVIRONMENTAL QUALITY
TIDEWATER REGIONAL OFFICE
ENVIRONMENTAL IMPACT REVIEW COMMENTS

January 17, 2019

PROJECT NUMBER: 18-171F

PROJECT TITLE: Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Project

Sincerely,

Cindy L. Robinson

Cindy Robinson
Environmental Specialist II
5636 Southern Blvd.
VA Beach, VA 23462
(757) 518-2167
Cindy.Robinson@deq.virginia.gov

2 of 2

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 1111 East Main Street, Suite 1400, Richmond, VA 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

Attachment 2

Advisory Policies for Geographic Areas of Particular Concern

a. Coastal Natural Resource Areas - These areas are vital to estuarine and marine ecosystems and/or are of great importance to areas immediately inland of the shoreline. Such areas receive special attention from the Commonwealth because of their conservation, recreational, ecological, and aesthetic values. These areas are worthy of special consideration in any planning or resources management process and include the following resources:

   a) Wetlands
   b) Aquatic Spawning, Nursery, and Feeding Grounds
   c) Coastal Primary Sand Dunes
   d) Barrier Islands
   e) Significant Wildlife Habitat Areas
   f) Public Recreation Areas
   g) Sand and Gravel Resources
   h) Underwater Historic Sites

b. Coastal Natural Hazard Areas - This policy covers areas vulnerable to continuing and severe erosion and areas susceptible to potential damage from wind, tidal, and storm related events including flooding. New buildings and other structures should be designed and sited to minimize the potential for property damage due to storms or shoreline erosion. The areas of concern are as follows:

   i) Highly Erodible Areas
   ii) Coastal High Hazard Areas, including flood plains.

c. Waterfront Development Areas - These areas are vital to the Commonwealth because of the limited number of areas suitable for waterfront activities. The areas of concern are as follows:

   i) Commercial Ports
   ii) Commercial Fishing Piers
   iii) Community Waterfronts

   Although the management of such areas is the responsibility of local government and some regional authorities, designation of these areas as Waterfront Development Areas of Particular Concern (APC) under the VCP is encouraged.

Designation will allow the use of federal CZMA funds to be used to assist planning for such areas and the implementation of such plans. The VCP recognizes two broad classes of priority uses for waterfront development APC:

i) water access dependent activities;
ii) activities significantly enhanced by the waterfront location and complementary to other existing and/or planned activities in a given waterfront area.

Advisory Policies for Shorefront Access Planning and Protection

a. Virginia Public Beaches - Approximately 25 miles of public beaches are located in the cities, counties, and towns of Virginia exclusive of public beaches on state and federal land. These public shoreline areas will be maintained to allow public access to recreational resources.

b. Virginia Outdoors Plan - Planning for coastal access is provided by the Department of Conservation and Recreation in cooperation with other state and local government agencies. The Virginia Outdoors Plan (VOP), which is published by the Department, identifies recreational facilities in the Commonwealth that provide recreational access. The VOP also serves to identify future needs of the Commonwealth in relation to the provision of recreational opportunities and shoreline access. Prior to initiating any project, consideration should be given to the proximity of the project site to recreational resources identified in the VOP.

c. Parks, Natural Areas, and Wildlife Management Areas - Parks, Wildlife Management Areas, and Natural Areas are provided for the recreational pleasure of the citizens of the Commonwealth and the nation by local, state, and federal agencies. The recreational values of these areas should be protected and maintained.

d. Waterfront Recreational Land Acquisition - It is the policy of the Commonwealth to protect areas, properties, lands, or any estate or interest therein, of scenic beauty, recreational utility, historical interest, or unusual features which may be acquired, preserved, and maintained for the citizens of the Commonwealth.

e. Waterfront Recreational Facilities - This policy applies to the provision of boat ramps, public landings, and bridges which provide water access to the citizens of the Commonwealth. These facilities shall be designed, constructed, and maintained to provide points of water access when and where practicable.

f. Waterfront Historic Properties - The Commonwealth has a long history of settlement and development, and much of that history has involved both shorelines and near-shore areas. The protection and preservation of historic shorefront properties is primarily the responsibility of the Department of Historic Resources. Buildings, structures, and sites of historical, architectural, and/or archaeological interest are significant resources for the citizens of the Commonwealth. It is the policy of the Commonwealth and the VCP to enhance the protection of buildings, structures, and sites of historical, architectural, and archaeological significance from damage or destruction when practicable.

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APPENDIX C
JOINT PERMIT APPLICATION

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National Aeronautics and Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337-5099

Reply to Attn of: 228 October 1, 2018

Hank Badger
Environmental Engineer, Habitat Management Division
Virginia Marine Resources Commission
2600 Washington Avenue,
Newport News, VA 23607

Re: NASA Wallops Flight Facility Shoreline Enhancement and Restoration Project Joint Permit Application

Dear Hank.

Attached please find the Joint Permit Application and supporting documentation for the above referenced project. We have included the following:

1. Joint Permit Application
2. Permit drawings
3. Attachment 1: Purpose and Need, Alternatives Considered and Description of Project
4. Department of Historic Resources Finding (DHR File No. 2018-3863)
5. Breakwater Design and Analysis Report
6. Periodic Surveying Evaluation Fall 2015
7. Periodic Surveying Evaluation Fall 2017
8. Plans Wallops Island 100% Submittal
9. Specifications Wallops Island 100% Submittal
10. September 24, 2018 Pre- Application Meeting Minutes

We are providing this by posting to the Cardno FTP site. Please see link in email. If there are problems downloading the information, please let us know and we will assist. We appreciate your time and attention to this project. Do not hesitate to contact us with questions or comments.

Sincerely.

Paul Bull, PE

Cc: Brian Denson, ACOE, with attachments
Shari Kattan, VDEQ, with attachments
Lyle Varnell, VIMS, with attachments
Dave O'Brien NOAA, with attachments
Chris Guvernator, Accomack County, with attachments
Shari Miller, NASA
John Saecker, NASA
John Lowenthal, Cardno
Elizabeth Burak, Cardno

FOR AGENCY USE ONLY	
	Notes:
JPA#	

APPLICANTS

PLEASE PRINT OR TYPE ALL ANSWERS. If a question does not apply to your project, please print N/A (not applicable) in the space provided. ***If additional space is needed, attach extra 8 ½ x 11 inch sheets of paper.***

Check all that apply			
Pre-Construction Notification (PCN) ☐ NWP # ____ (*For Nationwide Permits ONLY - No DEQ-VWP permit writer will be assigned*)	SPGP ☐	DEQ Reapplication ☐ Existing permit number: ____	Receiving federal funds ☐ Agency providing funding: ____

PREVIOUS ACTIONS RELATED TO THE PROPOSED WORK (Include all federal, state, and local pre-application coordination, site visits, previous permits, or applications whether issued, withdrawn, or denied)

Historical information for past permit submittals can be found online with VMRC - https://webapps.mrc.virginia.gov/public/habitat/ - or VIMS - http://ccrm.vims.edu/perms/newpermits.html

Agency	Action / Activity	Permit/Project number, including any non-reporting Nationwide permits previously used (e.g., NWP 13)	Date of Action	If denied, give reason for denial
Corps/VMRC	Inter-agency Pre-Appl. Meeting	NAO-1992-1455	9/24/18	
VIMS/NOAA				

1. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR INFORMATION
The applicant(s) is/are the legal entity to which the permit may be issued (see How to Apply at beginning of form). The applicant(s) can either be the property owner(s) or the person/people/company(ies) that intend(s) to undertake the activity. The agent is the person or company that is representing the applicant(s). If a company, please also provide the company name that is registered with the State Corporation Commission (SCC), or indicate no registration with the SCC.

Applicant			Agent		
Legal Name(s) of Applicant(s): NASA Wallops Flight Facility			Agent (if applicable)		
Mailing address: Wallops Island/Accomack County			Mailing address		
City: Wallops Island	State: VA	ZIP Code: 23337	City	State	ZIP Code
Phone number w/area code	Fax		Phone number w/area code	Fax	
Mobile	E-mail		Mobile	E-mail	
State Corporation Commission Name and ID number (if applicable)			State Corporation Commission Name and ID number (if applicable)		

Certain permits or permit authorizations may be provided via electronic mail. If the applicant wishes to receive their permit via electronic mail, please provide an e-mail address here: ____

7

Application Revised: May 2017

1. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR INFORMATION (Continued)

Property owner(s) legal name, if different from applicant			Contractor, if known		
Paul Bull, PE					
Mailing address: NASA Wallops Flight Facility, Building N-161, Code 228			Mailing address:		
City: Wallops Island	State: VA	ZIP code: 23337	City:	State:	ZIP code:
Phone number w/area code: 757-824-1168	Fax: 757-824-1831		Phone number w/area code:	Fax:	
Mobile:	E-mail: paul.c.bull@nasa.gov		Mobile:	E-mail:	
State Corporation Commission Name and ID number (if applicable)			State Corporation Commission Name ID number (if applicable)		

2. PROJECT LOCATION INFORMATION
(Attach a copy of a detailed map, such as a USGS topographic map or street map showing the site location and project boundary, so that it may be located for inspection. Include an arrow indicating the north direction. Include the drainage area if the SPGP box is checked on Page 7.)

Street Address (911 address if available)	City/County/ZIP Code
Wallops Island	Accomack County
Subdivision	Lot/Block/Parcel #

Name of water body(ies) within project boundaries and drainage area (acres or square miles).
Atlantic Ocean

Tributary(ies) to: NA
Basin: ______________ Sub-basin: ______________
(*Example: Basin: James River Sub-basin: Middle James River*)

Special Standards (based on DEQ Water Quality Standards 9VAC25-260 et seq.): NA

Project type (check one)
- ☐ Single user (private, non-commercial, residential)
- ☑ Multi-user (community, commercial, industrial, government)
- ☐ Surface water withdrawal

Latitude and longitude at center of project site (decimal degrees): 37-50-45 / -75-28-29
(Example: 37.33164/-77.68200)

USGS topographic map name: Wallops Island

8-digit USGS Hydrologic Unit Code (HUC) for your project site (See http://cfpub.epa.gov/surf/locate/index.cfm): 02040303
If known, indicate the 10-digit and 12-digit USGS HUCs (see *http://dswcapps.dcr.virginia.gov/htdocs/maps/HUExplorer.htm* :
______________ ______________

Name of your project (*Example: Water Creek driveway crossing*) Shoreline Enhancement Restoration Project

Is there an access road to the project? ☑ Yes ☐ No. If yes, check all that apply: ☐ public ☑ private ☐ improved ☐ unimproved

Total size of the project area (in acres): 405

Application Revised: May 2017

2. PROJECT LOCATION INFORMATION (Continued)

Provide driving directions to your site, giving distances from the best and nearest visible landmarks or major intersections:

Access to project site will require NASA security badging. The NASA security office/badging facility directions are as follows: From Route 13 North, turn right on Chincoteague Road/Rt. 175. Travel east for 3.5 miles toward Town of Chincoteague. At Wallops Island stoplight, turn left (north) on Atlantic Road/Rt. 798. Travel north for one mile: veer off to the right (east) to parking area for NASA badging facility. NASA project personnel shall provide escort to the site.

Does your project site cross boundaries of two or more localities (i.e., cities/counties/towns)? ☐ Yes ☑ No
If so, name those localities:

3. DESCRIPTION OF THE PROJECT, PROJECT PRIMARY AND SECONDARY *PURPOSES*, PROJECT *NEED*, INTENDED USE(S), AND ALTERNATIVES CONSIDERED (Attach additional sheets if necessary)

- The purpose and need must include any new development or expansion of an existing land use and/or proposed future use of residual land.
- Describe the physical alteration of surface waters, including the use of pilings (#, materials), vibratory hammers, explosives, and hydraulic dredging, when applicable, and *whether or not tree clearing will occur* (include the area in square feet and time of year).
- Include a description of alternatives considered and measures taken to avoid or minimize impacts to surface waters, including wetlands, to the maximum extent practicable. Include factors such as, but not limited to, alternative construction technologies, alternative project layout and design, alternative locations, local land use regulations, and existing infrastructure
- For utility crossings, include both alternative routes and alternative construction methodologies considered
- For surface water withdrawals, public surface water supply withdrawals, or projects that will alter in-stream flows, include the water supply issues that form the basis of the proposed project.

See Attachment 1

Date of proposed commencement of work (MM/DD/YYYY) 3/1/19	Date of proposed completion of work (MM/DD/YYYY) 3/1/19
Are you submitting this application at the direction of any state, local, or federal agency? ☐ Yes ☑ No	Has any work commenced or has any portion of the project for which you are seeking a permit been completed? ☐ Yes ☑ No

If you answered "yes" to either question above, give details stating when the work was completed and/or when it commenced, who performed the work, and which agency (if any) directed you to submit this application. In addition, you will need to clearly differentiate between completed work and proposed work on your project drawings.

Are you aware of any unresolved violations of environmental law or litigation involving the property? ☐ Yes ☑ No
(If yes, please explain)

4. PROJECT COSTS

Approximate cost of the entire project, including materials and labor: $ 24,400,000
Approximate cost of only the portion of the project affecting state waters (channelward of mean low water in tidal areas and below ordinary high water mark in nontidal areas): $ 24,400,000

5. PUBLIC NOTIFICATION (Attach additional sheets if necessary)

Complete information for all property owners adjacent to the project site and across the waterway, if the waterway is less than 500 feet in width. If your project is located within a cove, you will need to provide names and mailing addresses for all property owners within the cove. If you own the adjacent lot, provide the requested information for the first adjacent parcel beyond your property line.

Failure to provide this information may result in a delay in the processing of your application by VMRC.

Property owner's name	Mailing address	City	State	ZIP code
USFWS Chincoteague NWR, (Robert Leffel, interim refuge manager)	PO Box 62, 8231 Beach Road	Chincoteague	VA	23336

Name of newspaper having general circulation in the area of the project: Eastern Shore News
Address and phone number (including area code) of newspaper PO Box 288 Tasley VA23441 757-787-1200

Have adjacent property owners been notified with forms in Appendix A? ☐ Yes ☑ No (attach copies of distributed forms)

6. THREATENED AND ENDANGERED SPECIES INFORMATION

Please provide any information concerning the potential for your project to impact state and/or federally threatened and endangered species (listed or proposed). Attach correspondence from agencies and/or reference materials that address potential impacts, such as database search results or confirmed waters and wetlands delineation/jurisdictional determination. Include information when applicable regarding the location of the project in Endangered Species Act-designated or -critical habitats. Contact information for the U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, Virginia Dept. of Game and Inland Fisheries, and the Virginia Dept. of Conservation and Recreation-Division of Natural Heritage can be found on page 4 of this package.

7. HISTORIC RESOURCES INFORMATION

Note: Historic properties include but are not limited to archeological sites, battlefields, Civil War earthworks, graveyards, buildings, bridges, canals, etc. Prospective permittees should be aware that section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the USACE from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the USACE, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant.

Are any historic properties located within or adjacent to the project site? ☑ Yes ☐ No ☐ Uncertain
If Yes, please provide a map showing the location of the historic property within or adjacent to the project site.

Are there any buildings or structures 50 years old or older located on the project site? ☐ Yes ☑ No ☐ Uncertain
If Yes, please provide a map showing the location of these buildings or structures on the project site.

Is your project located within a historic district? ☐ Yes ☑ No ☐ Uncertain

If Yes, please indicate which district: ______

7. HISTORIC RESOURCES INFORMATION (Continued)

Has a survey to locate archeological sites and/or historic structures been carried out on the property?
☑ Yes ☐ No ☐ Uncertain

If Yes, please provide the following information: Date of Survey: November 2003 and June/July 2010

Name of firm: URS Group and EG&G Technical Services

Is there a report on file with the Virginia Department of Historic Resources? ☑ Yes ☐ No ☐ Uncertain

Title of Cultural Resources Management (CRM) report: Cultural Resources Assessment of Wallops Flight Facility

Was any historic property located? ☑ Yes ☐ No ☐ Uncertain

8. WETLANDS, WATERS, AND DUNES/BEACHES IMPACT INFORMATION

Report each impact site in a separate column. If needed, attach additional sheets using a similar table format. Please ensure that the associated project drawings clearly depict the location and footprint of each numbered impact site. For dredging, mining, and excavating projects, use Section 17.

	Impact site number 1	Impact site number 2	Impact site number 3	Impact site number 4	Impact site number 5
Impact description (use all that apply): F=fill EX=excavation S=Structure T=tidal NT=non-tidal TE=temporary PE=permanent PR=perennial IN=intermittent SB=subaqueous bottom DB=dune/beach IS=hydrologically isolated V=vegetated NV=non-vegetated MC=Mechanized Clearing of PFO (*Example: F, NT, PE, V*)	F, T, PE, SB, DB, NV	S, T, PE, SB, NV			
Latitude / Longitude (in decimal degrees)	37-50-45/75-28-29	37-50-45/75-28-29			
Wetland/waters impact area (square feet / acres)	6,073,039/139.42	71,820/1.64			
Dune/beach impact area (square feet)	3,941.296/90.48	0			
Stream dimensions at impact site (length and average width in linear feet, and area in square feet)	NA	NA			
Volume of fill below Mean High Water or Ordinary High Water (cubic yards)	858,426	23,940			

8. WETLANDS/WATERS IMPACT INFORMATION (Continued)					
Cowardin classification of impacted wetland/water or geomorphological classification of stream *Example wetland: PFO; Example stream: 'C' channel and if tidal, whether vegetated or non-vegetated wetlands per Section 28.2-1300 of the Code of Virginia*	Marine, Intertidal/ Subtidal,Rock	Marine, Intertidal/ Subtidal, Rock			
Average stream flow at site (flow rate under normal rainfall conditions in cubic feet per second) and method of deriving it (gage, estimate, etc.)	NA	NA			
Contributing drainage area in acres or square miles (*VMRC cannot complete review without this information*)	NA	NA			
DEQ classification of impacted resource(s): Estuarine Class II; Non-tidal waters Class III; Mountainous zone waters Class IV; Stockable trout waters Class V; Natural trout waters Class VI; Wetlands Class VII; http://leg1.state.va.us/cgi-bin/legp504.exe?000+reg+9VAC25-260-50	Class I Open Ocean	Class I Open Ocean			
For DEQ permitting purposes, also submit as part of this section a wetland and waters boundary delineation map – see (3) in the Footnotes section in the form instructions.					
For DEQ permitting purposes, also submit as part of this section a written disclosure of all wetlands, open water, or streams that are located within the proposed project or compensation areas that are also under a deed restriction, conservation easement, restrictive covenant, or other land-use protective instrument.					

9. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR CERTIFICATIONS

READ ALL OF THE FOLLOWING CAREFULLY BEFORE SIGNING

PRIVACY ACT STATEMENT: The Department of the Army permit program is authorized by Section 10 of the Rivers and Harbors Act of 1899, Section 404 of the Clean Water Act, and Section 103 of the Marine Protection Research and Sanctuaries Act of 1972. These laws require that individuals obtain permits that authorize structures and work in or affecting navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters prior to undertaking the activity. Information provided in the Joint Permit Application will be used in the permit review process and is a matter of public record once the application is filed. Disclosure of the requested information is voluntary, but it may not be possible to evaluate the permit application or to issue a permit if the information requested is not provided.

CERTIFICATION: I am hereby applying for permits typically issued by the DEQ, VMRC, USACE, and/or Local Wetlands Boards for the activities I have described herein. I agree to allow the duly authorized representatives of any regulatory or advisory agency to enter upon the premises of the project site at reasonable times to inspect and photograph site conditions, both in reviewing a proposal to issue a permit and after permit issuance to determine compliance with the permit.

In addition, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

9. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR CERTIFICATIONS (Continued)

Is/Are the Applicant(s) and Owner(s) the same? ☑ *Yes* ☐ *No*

Legal name & title of Applicant Paul Bull, PE NASA Project Manager	Second applicant's legal name & title, if applicable
Applicant's signature	Second applicant's signature
Date 10/04/18	Date
Property owner's legal name, if different from Applicant	Second property owner's legal name, if applicable
Property owner's signature, if different from Applicant	Second property owner's signature
Date	Date

CERTIFICATION OF AUTHORIZATION TO ALLOW AGENT(S) TO ACT ON APPLICANT'S(S') BEHALF (IF APPLICABLE)

I (we), ______________________ (and) ______________________ ,
APPLICANT'S LEGAL NAME(S) – *complete the second blank if more than one Applicant*

hereby certify that I (we) have authorized ______________________ (and) ______________________
AGENT'S NAME(S) – *complete the second blank if more than one Agent*
to act on my (our) behalf and take all actions necessary to the processing, issuance, and acceptance of this permit and any and all standard and special conditions attached. I (we) hereby certify that the information submitted in this application is true and accurate to the best of my (our) knowledge.

Applicant's signature	Second applicant's signature, if applicable
Date	Date
Agent's signature and title	Second agent's signature and title, if applicable
Date	Date

CONTRACTOR ACKNOWLEDGEMENT (IF APPLICABLE)

I (we), ______________________ (and) ______________________ ,
APPLICANT'S LEGAL NAME(S) – *complete the second blank if more than one Applicant*

have contracted ______________________ (and) ______________________
CONTRACTOR'S NAME(S) – *complete the second blank if more than one Contractor*

to perform the work described in this Joint Permit Application, signed and dated ______________________.

I (we) will read and abide by all conditions as set forth in all federal, state, and local permits as required for this project. I (we) understand that failure to follow the conditions of the permits may constitute a violation of applicable federal, state, and local statutes and that we will be liable for any civil and/or criminal penalties imposed by these statutes.
In addition, I (we) agree to make available a copy of any permit to any regulatory representative visiting the project site to ensure permit compliance. If I (we) fail to provide the applicable permit upon request, I (we) understand that the representative will have the option of stopping our operation until it has been determined that we have a properly signed and executed permit and are in full compliance with all of the terms and conditions.

Contractor's name or name of firm (printed/typed)	Contractor's or firm's mailing address	
Contractor's signature and title	Contractor's license number	Date
Applicant's signature	Second applicant's signature, if applicable	
Date	Date	

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Application Revised: May 2017

13. FREE STANDING MOORING PILES, OSPREY NESTING POLES, MOORING BUOYS, AND DOLPHINS (not associated with piers)

Number of vessels to be moored: ___________

Type and number of mooring(s) proposed: ___________

In the spaces provided below, give the type (e.g., sail, power, skiff, etc.), size, and registration number of the vessel(s) to be moored

TYPE	LENGTH	WIDTH	DRAFT	REGISTRATION #

Give the name and complete mailing address(es) of the owner(s) of the vessel(s) if not owned by applicant (attach extra sheets if needed):

Do you plan to reach the mooring from your own upland property? ☐ Yes ☐ No
If "no," explain how you intend to access the mooring.

14. BOAT RAMPS

Will excavation be required to construct the boat ramp? ☐ Yes ☐ No. If "yes," will any of the excavation occur below the plane of the ordinary high water mark/mean high water line or in wetlands? ☐ Yes ☐ No. If "yes," you will need to fill out Section 17 for this excavation.
Where will you dispose of the excavated material?

____

What type of design and materials will be used to construct the ramp (open pile design with salt treated lumber, concrete slab on gravel bedding, etc.)?

Location of nearest public boat ramp

Driving distance to that public ramp ______________ miles

Will other structures be constructed concurrent with the boat ramp installation? ☐ Yes ☐ No
If "yes," please fill out the appropriate sections of this application associated with those other activities.

15. TIDAL/NONTIDAL SHORELINE STABILIZATION STRUCTURES (INCLUDING BULKHEADS AND ASSOCIATED BACKFILL, RIPRAP REVETMENTS AND ASSOCIATED BACKFILL, MARSH TOE STABILIZATION, GROINS, JETTIES, AND BREAKWATERS, ETC.) Information on non-structural, vegetative alternatives (i.e., Living Shoreline) for shoreline stabilization is available at http://ccrm.vims.edu/coastal_zone/living_shorelines/index.html.

Is any portion of the project maintenance or replacement of an existing and currently serviceable structure? ☐ Yes ☑ No
If yes, give length of existing structure: __________ linear feet

If your maintenance project entails replacement of a bulkhead, is it possible to construct the replacement bulkhead within 2 feet channelward of the existing bulkhead? ☐ Yes ☑ No If not, please explain below:

Length of proposed structure, including returns: ______________ linear feet

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Application Revised: May 2017

15. TIDAL/NONTIDAL SHORELINE STABILIZATION STRUCTURES (Continued)

Average channelward encroachment of the structure from Mean high water/ordinary high water mark: 380 feet Mean low water: 334 feet	*Maximum* channelward encroachment of the structure from Mean high water/ordinary high water mark: 759 feet Mean low water: 668 feet
Maximum channelward encroachment form the back edge of the Dune NA feet	*Maximum* channelward encroachment from the back edge of the Beach 150 feet

Describe the type of construction including all materials to be used (including all fittings). Will filter cloth be used? ☐ Yes ☑ No

Cedar Mountain Stone

What is the source of the backfill material? Mitchells VA

What is the composition of the backfill material? rock

If rock is to be used, give the average volume of material to be used for every linear foot of construction: 21 cubic yards
What is the volume of material to be placed below the plane of ordinary high water mark/mean high water? 23,940 cubic yards

For projects involving stone:
Average weight of core material (bottom layers): 150-500 lbs pounds per stone (Class Type II)
Average weight of armor material (top layers): 1,500-4,000 lbs pounds per stone (Class Type I)

Are there similar shoreline stabilization structures in the vicinity of your project site? ☑ Yes ☐ No
If so, describe the type(s) and location(s) of the structure(s):
Existing seawalls onsite

If you are building a groin or jetty, will the channelward end of the structure be marked to show a hazard to navigation? ☐ Yes ☑ No	Has your project been reviewed by the Shoreline Erosion Advisory Service (SEAS)? ☐ Yes ☑ No If yes, please attach a copy of their comments.

16. BEACH NOURISHMENT

Source of material and composition (percentage sand, silt, clay): Wallops Island North End	Volume of material: 1.3 million cubic yards cubic yards

Area to be covered 4,845,675 square feet channelward of mean low water 5,187,130 square feet channelward of mean high water
4,824,482 square feet landward of mean low water 3,930,580 square feet ~~channelward~~ Landward of mean high water

Mode of transportation of material to the project site (truck, pipeline, etc.):
Truck

Describe the type(s) of vegetation proposed for stabilization and the proposed planting plan, including schedule, spacing, monitoring, etc. Attach additional sheets if necessary.
American Beach grass will be sprigged @ 18" on center each way(ocew) along the entire dune. The cultivar 'Cape' will be used. Plants will be installed between October 1 and March 31, during the appropriate time of year for dune planting. See permit drawings for a typical profile of the planing area.

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Application Revised: May 2017

17. DREDGING, MINING, AND EXCAVATING

FILL OUT THE FOLLOWING TABLE FOR DREDGING PROJECTS

	NEW dredging				MAINTENANCE dredging			
	Hydraulic		Mechanical (clamshell, dragline, etc.)		Hydraulic		Mechanical (clamshell, dragline, etc.)	
	Cubic yards	Square feet	Cubic yards	Square feet	Cubic yards	Square feet	Cubic yards	Square feet
Vegetated wetlands			0.0	0.0				
Non-vegetated wetlands			37,515	1,350,573				
Subaqueous land			0.0	0.0				
Totals			37,515	1,350,573				

Is this a one-time dredging event? [✓] Yes [ ] No If "no", how many dredging cycles are anticipated: ____________
(____ initial cycle in cu. yds.) (_____ subsequent cycles in cu. yds.)

Composition of material (percentage sand, silt, clay, rock):
Provide documentation (i.e., laboratory results or analytical reports) that *dredged* material from on-site areas is free of toxics. If not free of toxics, provide documentation of proper disposal (i.e., bill of lading from commercial supplier or disposal site).

sand

Please include a dredged material management plan that includes specifics on how the dredged material will be handled and retained to prevent its entry into surface waters or wetlands. If on-site dewatering is proposed, please include plan view and cross-sectional drawings of the dewatering area and associated outfall.

Will the dredged material be used for any commercial purpose or beneficial use? [✓] Yes [ ] No
If yes, please explain:
Beach renourishment

If this is a maintenance dredging project, what was the date that the dredging was last performed? ____________
Permit number of original permit: ____________ *(It is important that you attach a copy of the original permit.)*

For mining projects: On separate sheets of paper, explain the operation plans, including: 1) the frequency (e.g., every six weeks), duration (i.e., April through September), and volume (in cubic yards) to be removed per operation; 2) the temporary storage and handling methods of mined material, including the dimensions of the containment berm used for upland disposal of dredged material and the need (or no need) for a liner or impermeable material to prevent the leaching of any identified contaminants into ground water; 3) how equipment will access the mine site; and 4) verification that dredging: a) will not occur in water body segments that are currently on the effective Section 303(d) Total Maximum Daily Load (TMDL) priority list (available at http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment/TMDLProgramPriorities.aspx) or that have an approved TMDL; b) will not exacerbate any impairment; and c) will be consistent with any waste load allocation/limit/conditions imposed by an approved TMDL (see, "What's in my backyard" or subsequent spatial files at http://www.deq.virginia.gov/ConnectWithDEQ/VEGIS.aspx to determine the extent of TMDL watersheds and impairment segments).

Have you applied for a permit from the Virginia Department of Mines, Minerals and Energy? [ ] Yes [✓] No If Yes:
Existing permit number:____________ Date permit issued: ____________

Contributing drainage area: na square miles	Average stream flow at site (flow rate under normal rainfall conditions): na cfs

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Application Revised: May 2017

ATTACHMENT 1

PURPOSE AND NEED, ALTERNATIVES CONSIDERED AND DESCRIPTION OF PROJECT

The National Aeronautics and Space Administration (NASA) is proposing to enhance and restore the shoreline on Wallops Island. The Shoreline Enhancement and Restoration Project would reduce the potential for damage to, or loss of, NASA, United States (U.S.) Navy, and Virginia Commercial Spaceflight Authority's Mid-Atlantic Regional Spaceport (MARS) assets on Wallops Island from wave impacts associated with storm events.

Below is a summary of the purpose of and need for the project and the alternative considered for permitting in the project Environmental Assessment (EA). More detailed information is contained in the Final EA.

1.0 PURPOSE AND NEED FOR THE PROJECT

The purpose of the project is to restore the Wallops Island shoreline infrastructure protection area in order to reduce the potential for damage to, or loss of, NASA, U.S. Navy, and MARS assets on Wallops Island from wave impacts associated with storm events. The project is needed because the shoreline's beach berm and dune system, established to protect NASA's Wallops Island launch range infrastructure, has been eroded through storm wind and wave damage; therefore, the existing beach cannot provide the level of storm damage reduction for which it was originally designed. The constructed beach system has served its intended purpose of reducing damage to the range assets. However, a notable portion of subaerial (i.e., on land surface) sand has been relocated by storm winds and waves with a majority of this sand volume transported to the north end of Wallops Island. The effects of storms are most apparent within the southern half of Wallops Island, where many of the most critical launch assets are located. Within this area, referred to as the shoreline infrastructure protection area, the seaward half of the beach berm has been lowered by three feet or more. As such, the beach berm and dune system can no longer protect the area from storm damage reduction as it was originally intended and must be restored to regain full functionality.

2.0 BACKGROUND

Wallops Island has experienced shoreline changes throughout the six decades that NASA has occupied the site. Recent evaluations of the need to restore the Wallops shoreline and the possible impacts resulting therefrom include the Shoreline Restoration and Infrastructure Protection Program Programmatic Environmental Impact Statement (Shoreline Restoration and

Infrastructure Protection Program Programmatic Environmental Impact Statement, 2010) and the Post-Hurricane Sandy Shoreline Repair EA (Post-Hurricane Sandy Shoreline Repair EA, 2013). In 2012 and 2014, the infrastructure protection area was renourished using sand from offshore Unnamed Shoal A, located approximately seven miles east of Wallops Island.

Presently, the existing seawall in the shoreline infrastructure protection area 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 that extend from the southern end of the existing seawall south to camera stand Z-100.

The potential risks to infrastructure from wave impacts (that will only be exacerbated by sea-level rise) are two-fold: first is the interruption of NASA, U.S. Navy, and MARS missions supported from Wallops Island facilities due to temporary loss of facility functions; and second is the potential for physical damage to or loss of these unique facilities. If no protective measures are taken, the assets on Wallops Island will be increasingly at risk from even moderate storm events.

The U.S. Army Corps of Engineers (USACE) prepared a breakwater analysis, design and modeling report for NASA to assess possible hardscape solutions to address the erosion problems along the shoreline infrastructure protection area of Wallops Island (USACE 2018-attached). The analysis included numerical modeling to determine the appropriate size and placement of a detached offshore breakwater or a series of detached breakwaters. Seven alternatives were evaluated and the recommendation was to construct two, series of three detached breakwaters to reduce the effects of erosion of the Wallops Island beach nourishment effort.

3.0 PROJECT DESCRIPTION

NASA has prepared an EA, which considers a range of alternatives that meet the purpose and need of restoring and enhancing the shoreline in the infrastructure protection area. The following alternatives are being proposed in this permit application and details are provided below.

1. Restoring the beach using sand from the north Wallops Island beach, where sand eroded from the south has accreted. This would involve removing sand using a pan excavator and trucking it to the shoreline infrastructure protection area where it would be spread using heavy equipment.
2. Building a series of six parallel offshore breakwaters.

3.1 Excavation

NASA would place an estimated 1.3 million cubic yards of sand along approximately 19,850 feet of shoreline in the infrastructure protection area. The beachfill material would come from the north Wallops Island beach, an area where sand is accreting due to longshore transport from the south.

A pan excavator would be used to remove sand from approximately 200 acres north Wallops Island beach to the mean low water line. The average excavation depth is 2.35 feet. Sand would be stockpiled and then loaded onto dump trucks for transport on existing roads to the southern end of the island. Bulldozers would 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.

The beach fill would start approximately 1,500 feet north of the Wallops Island-Assawoman Island property boundary and extend north for approximately 3.7 miles. The initial fill would be placed so that there would be a 6-foot-high berm extending a minimum of 70 feet seaward of the existing seawall. The remainder of the fill would slope seaward; the amount of that distance would vary along the length of the beach fill.

3.2 Breakwaters

Six rubble mound breakwaters will be constructed in two sets of three each approximately 200 feet offshore from the mean high water line of the renourished beach in the shoreline infrastructure protection area. Each breakwater would be constructed of Virginia Department of Transportation Type I armor stone for the outer layer (which ranges from 0.75 to 2 tons) and Class II Stone for the core layer (which ranges from 150 to 499 pounds). All stone would be placed parallel to the shore and would measure approximately 130 feet long and 10 feet wide at top crest elevation. The breakwaters would be placed approximately 100 feet apart from each other. Water depths in these areas is approximately 4 to 8 feet. The southernmost set of three breakwaters will be constructed approximated 4000 feet north of the southern extent of beach nourishment. The second set of three breakwaters will be constructed approximately 10,000 feet north of the southern extent of beach nourishment. The rocks for constructing each breakwater would be transported to the Wallops Flight Facility area by rail, offloaded, and then trucked to the handling or placement site on Wallops Island. The stone would then be loaded onto barges and placed using heavy lifting equipment.

The tables below depict the areas impacted from various parts of the project. Table 3-1 provides a summary of impact types from placement of beachfill along the shoreline, Table 3-2 provides a summary of the impacts of the excavation of the sand north Wallops Island beach and Table 3-3 provides a summary of impact types from construction of the breakwaters.

Table 3-1. Areas affected by beach fill placement

Impact Location	Area (acres)	Volume (cubic yards)
Vegetated Wetland	0.0	0.0
Un-vegetated Wetland	0.0	0.0
MHW Seaward	139.4	858,426
MLW Seaward	111.2	742,815
MHW Landward	90.4	441,574
MLW Landward	118.6	557,185

Table 3-2. Areas affected by sand excavation on the north Wallops Island beach

Impact Location	Area (acres)	Volume (cubic yards)
Vegetated Wetland	0.0	0.0
Un-vegetated Wetland	0.0	0.0
MHW Seaward	31.0	37,515
MLW Seaward	0.0	0.0
MHW Landward	90.4	441,574
MLW Landward	405	1,300,000

Table 3-3. Areas affected by breakwater construction

Impact Location	Area (acres)	Volume (cubic yards)
Vegetated Wetland	0.0	0.0
Un-vegetated Wetland	0.0	0.0
MHW Seaward	1.64	23,940
MLW Seaward	1.64	23,940
MHW Landward	0.0	0.0
MLW Landward	0.0	0.0

4.0 SECTION 7 CONSULTATIONS

On March 20, 2013, U.S. Fish and Wildlife Service (USFWS) responded that the impacts resulting from the beach renourishment proposed by the *2013 Post-Hurricane Sandy EA* would be within that already considered in its July 30, 2010 Programmatic Biological Opinion (BO). USFWS also submitted a newer consolidated BO in June 2016 to replace and consolidate opinions and terms for ongoing operations at Wallops Flight Facility that included a 2-7 year cycle for beach renourishment.

In developing the BOs, National Marine Fisheries Service (NMFS) and USFWS provided mandatory terms and conditions that NASA must follow to reduce potential effects to listed species. As such, NASA and USACE would ensure that their contractors implemented these measures on their behalf. NASA re-initiated informal consultation with NMFS and USFWS in 2018. The results of this informal consultation will be provided, once complete.

5.0 MITIGATION AND MONITORING

Well before NASA's presence on Wallops Island in the mid-1940s, the project site has been in a state of constant change. Accordingly, much of the project site is now open ocean with the normal tidal range falling along the existing seawall. Construction of the project would restore the Wallops Island beach to pre-Hurricane Sandy condition.

NASA is adopting all mitigation and monitoring components identified in Chapter 5 of the Final EA, and additional detail can be found there. Consistent with the overall Shoreline Erosion Restoration Program, it is expected that the mitigation plan will be adjusted based on monitoring results and effectiveness of the measures.

5.1 Water Quality

Onshore, NASA will implement erosion and sediment control Best Management Practices (BMPs) to minimize adverse effects on adjacent water bodies. All BMPs will be designed and installed in accordance with the latest version of the Virginia Erosion and Sediment Control Handbook.

For both onshore and offshore operations, spill prevention BMPs will be implemented to reduce potential impacts on soils and sediments during seawall construction, and all work would be performed in accordance with the most current version of Wallops Flight Facility's Integrated Contingency Plan. Prior to starting work, the contractor will be required to submit an Environmental Protection Plan which will outline all measures that will be employed during onshore and offshore construction activities to minimize adverse environmental impacts.

5.2 Shoreline Change

As funding allows, NASA will initiate a shoreline monitoring program to evaluate the performance of performance of the breakwaters and beach fill and identify the need for future beach renourishment. The monitoring program will consist of subaerial beach cross-section surveys, subaqueous beach profile surveys, aerial photographs, and storm data summaries, beginning before construction. The program will compare the post-construction data with the pre-construction data and evaluate the performance of the project.

5.3 Revegetation

American beach grass (*Ammophila breviligulata*, cultivar "Cape") will be planted at 18 inches intervals over the re-established dune. Plants will be installed between October 1 and March 31. The planting area will be approximately 150 feet wide along the entire length of the newly created dune in the beach nourishment area. See permit drawings for a typical profile of the planting area (100% Design Plans and specifications, USACE 2018-attached).

5.4 Munitions and Explosives of Concern

NASA will provide all construction personnel a Munitions and Explosives of Concern (MEC) awareness briefing prior to beginning work. Additionally, informational signs would be posted conspicuously in areas of the jobsite most frequently visited by workers. If any MEC is identified along the Wallops shoreline, it would be reported to the Wallops Flight Facility Security Office and managed in accordance with Wallops Flight Facility's established program. Any MEC discovered offshore would be immediately reported to the U.S. Coast Guard and Wallops Flight Facility personnel.

To minimize the risk of adverse impacts from MEC in the north Wallops Island beach, MEC Awareness and Avoidance Plans that address the potential hazards will be prepared. Visual and geophysical surveys of the area to locate MEC will be completed, as appropriate, and potential hazards removed prior to excavation.

5.5 Protected Species

Onshore

NASA has initiated consultation with the USFWS regarding potential effects on Endangered Species Act-listed birds and sea turtles that could be affected by the project. NASA and USFWS developed a number of mitigation measures to reduce the probability and intensity of potential effects. These include:

1. No work will be conducted in the borrow area at the north end of the island during the plover or turtle nesting season April to September. NASA would employ a biological monitor to survey the project site on a daily basis should work occur between the months of April and September.

2. NASA will educate all personnel working in the construction area on recognizing protected species and their likely habitat so that appropriate avoidance and minimization measures can be incorporated into activities.
3. Wallops Flight Facility administers a Protected Species Monitoring Program for a number of protected species that are likely to occur at Wallops Island including: seabeach amaranth, red knot, piping plover, American oystercatcher, and sea turtles.
4. Annually between March and September, NASA regularly surveys the Wallops Island beach for piping plover, red knot, and sea turtle activity as a component of its Natural Resources Management Program. Any nests discovered are identified with signage. Program staff provide outreach to beach users, including security staff and recreational users.

Offshore

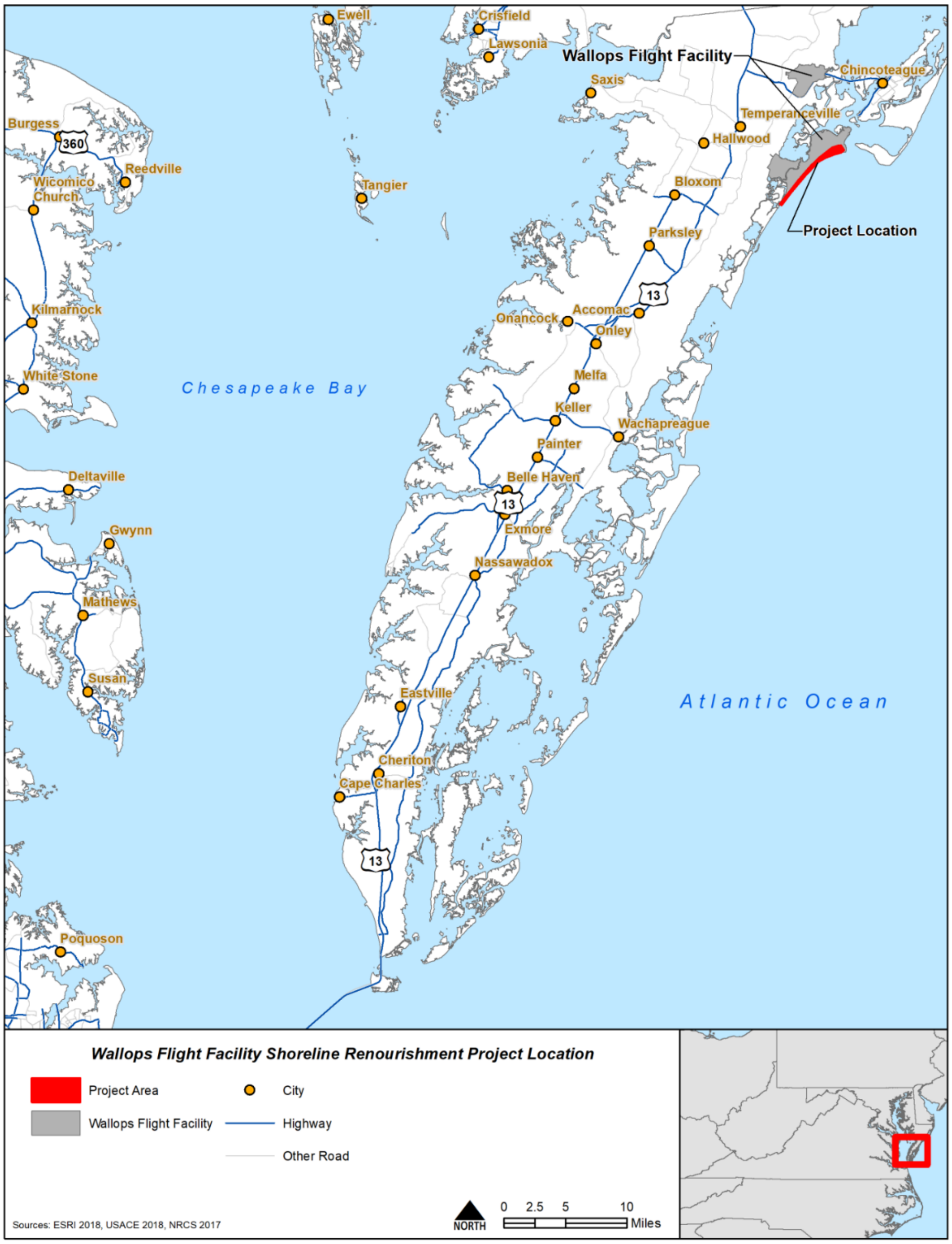
NASA has initiated consultation with NMFS regarding potential effects of the project on listed marine mammals, fish and in-water sea turtles. NASA will implement the any mitigation measures identified during the consultation to minimize impacts to protected species.

5.6 Essential Fish Habitat

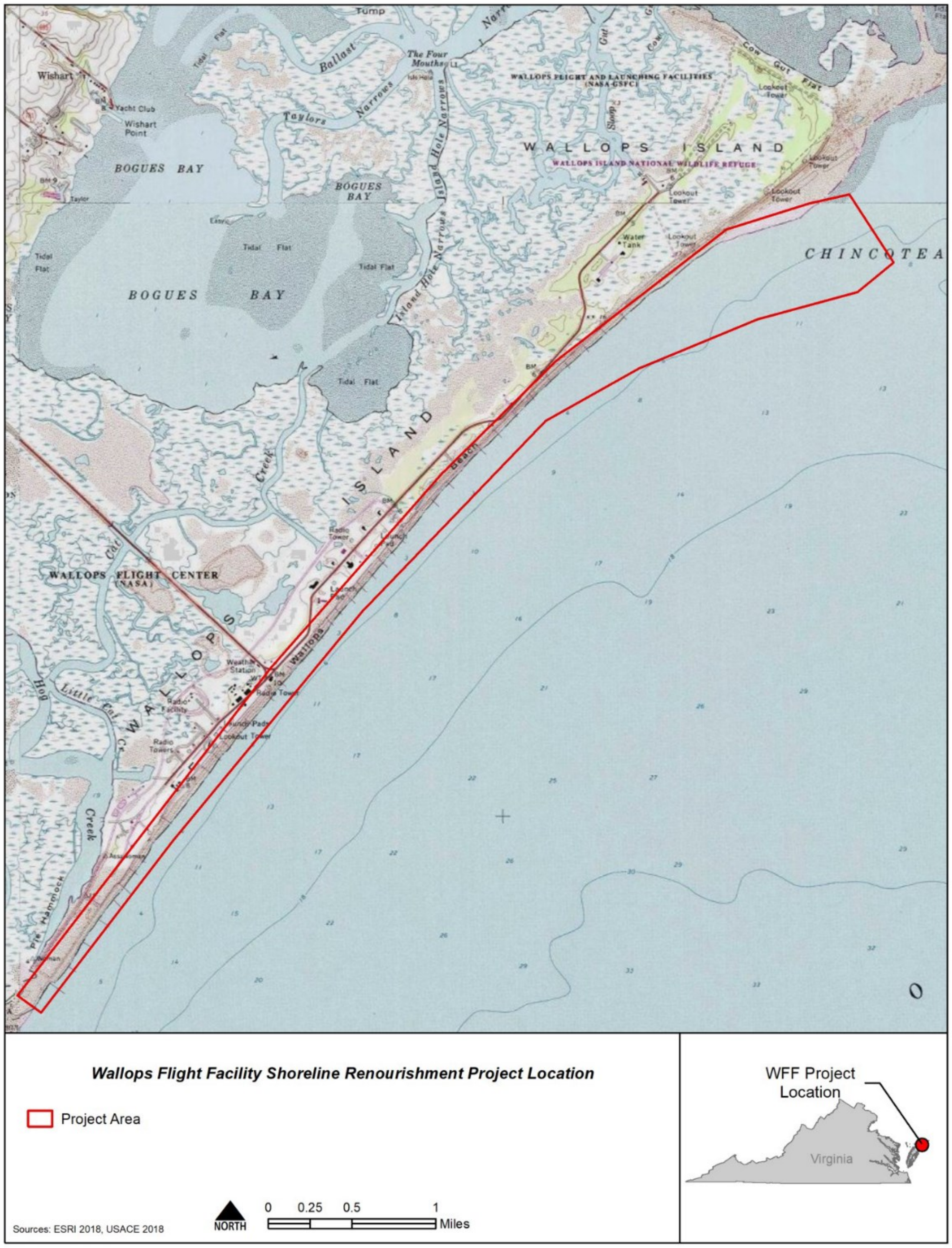
NASA has prepared an Essential Fish Habitat Assessment and is consulting with NMFS Habitat Conservation Division to identify any necessary mitigation measures. Any measures identified will be added as soon as the coordination with the agencies is concluded.

5.7 Cultural Resources

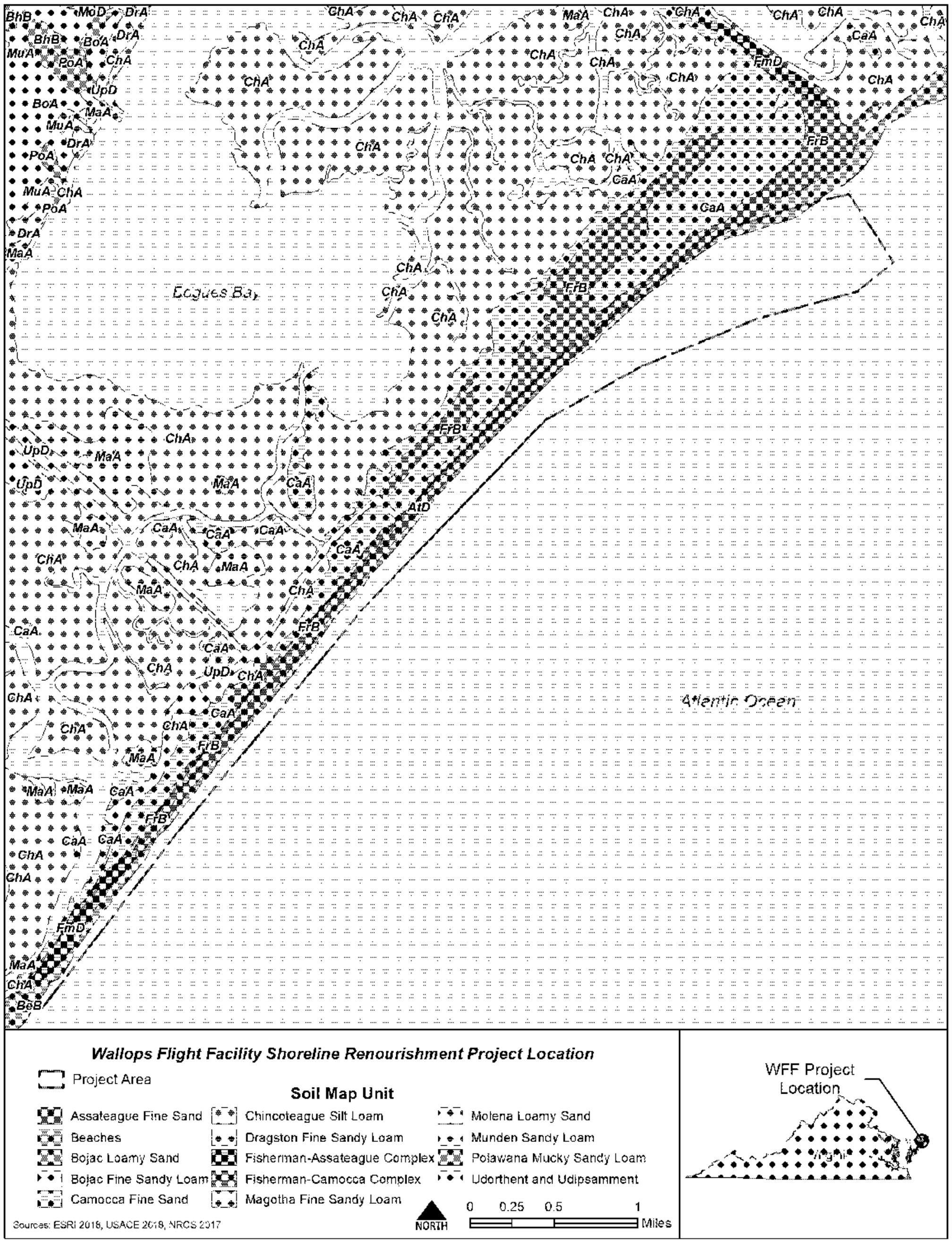
NASA has consulted with Virginia Department of Historic Resources (VDHR) regarding the beach nourishment and the breakwater construction and received a concurrence email dated August 14, 2018 (VDHR Concurrence 2018-attached). The inadvertent discovery of any previously unidentified archaeological resources would result in immediate cessation of work and notification of the Wallops Flight Facility Cultural Resources Manager.



NASA WFF Shoreline Enhancement & Restoration Project 1 of 18



NASA WFF Shoreline Enhancement & Restoration Project 2 of 18



NASA WFF Shoreline Enhancement & Restoration Project 3 of 18

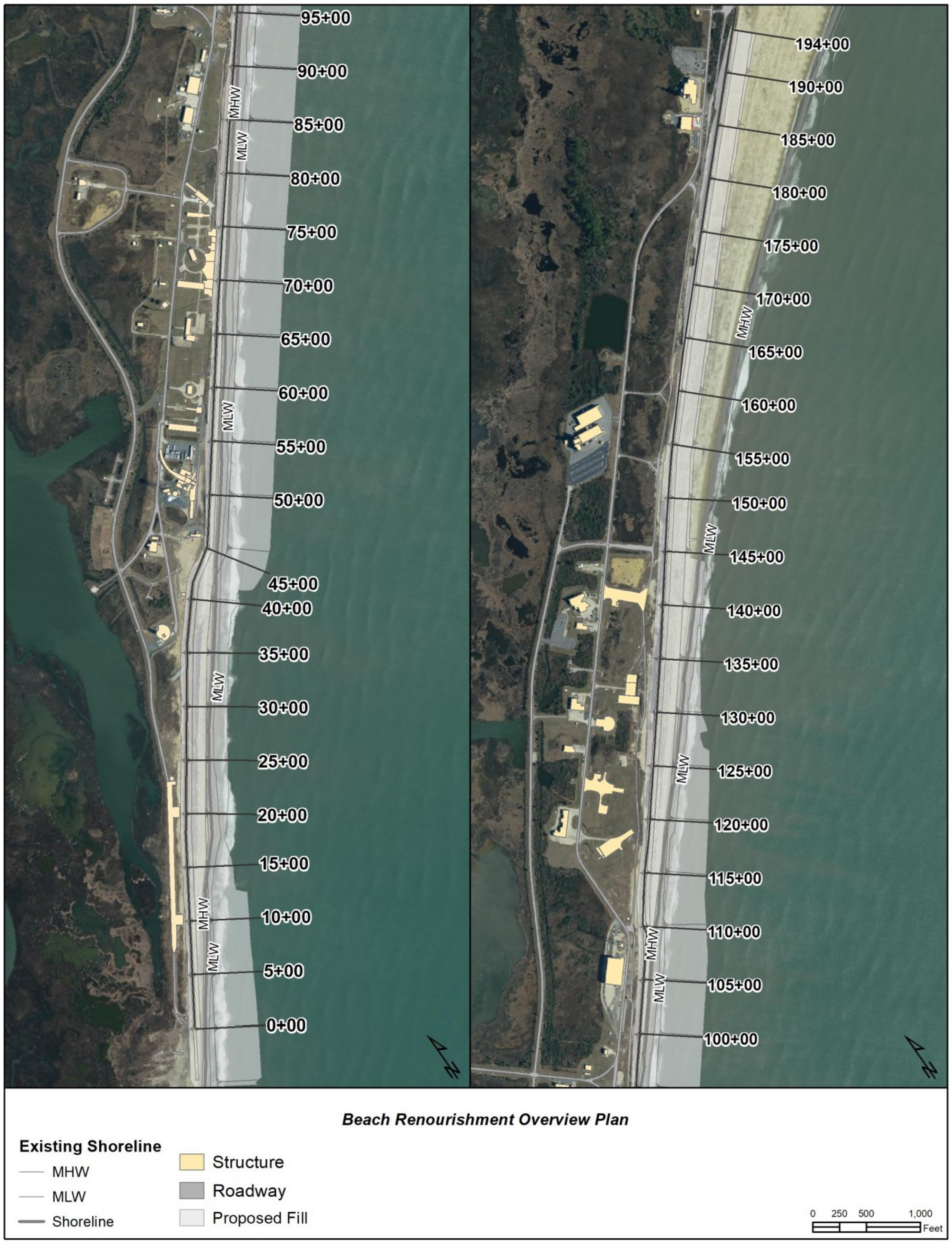
NASA WFF Shoreline Enhancement & Restoration Project 4 of 18

NASA WFF Shoreline Enhancement & Restoration Project 5 of 18

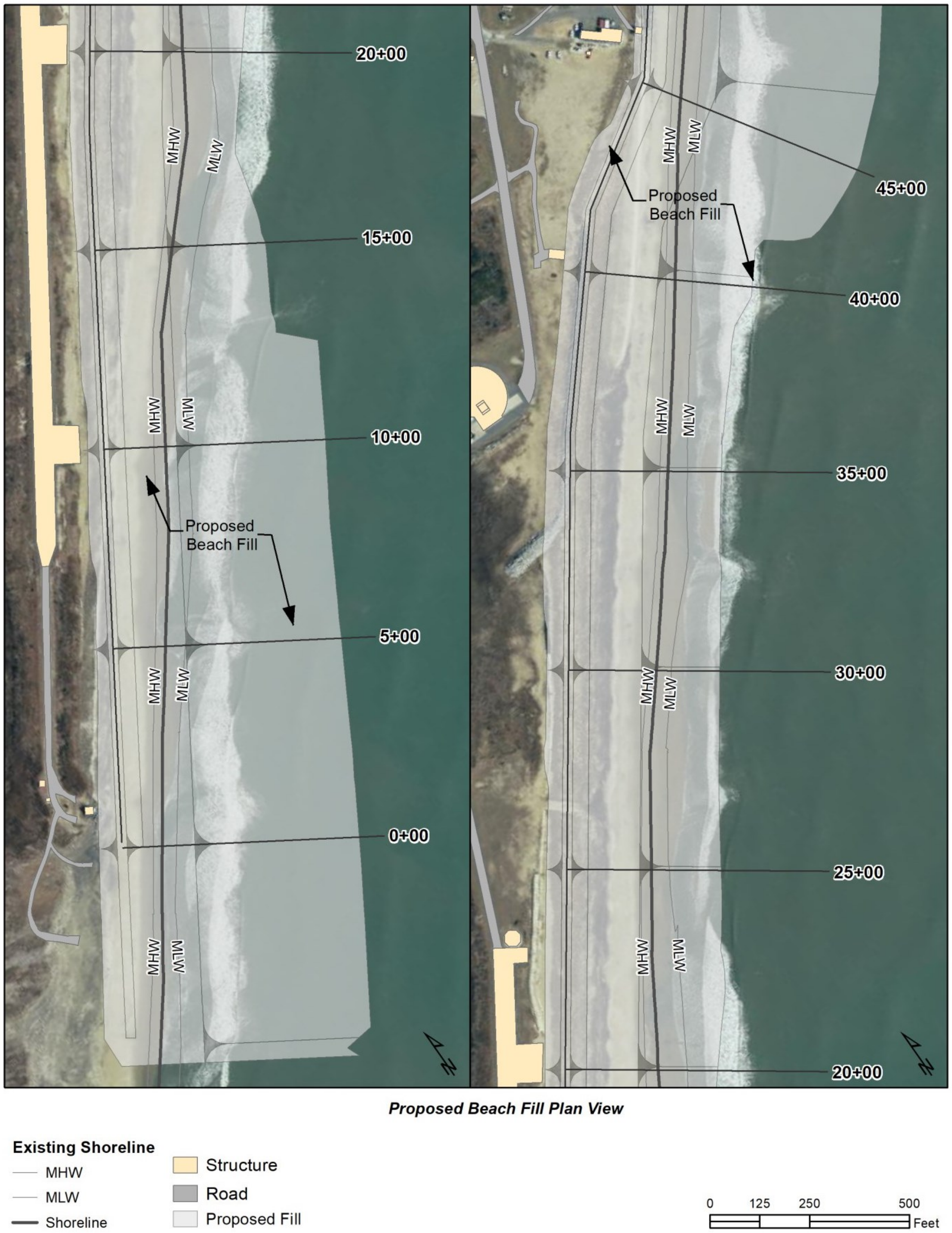
NASA WFF Shoreline Enhancement & Restoration Project 6 of 18

NASA WFF Shoreline Enhancement & Restoration Project 7 of 18

NASA WFF Shoreline Enhancement & Restoration Project 8 of 18

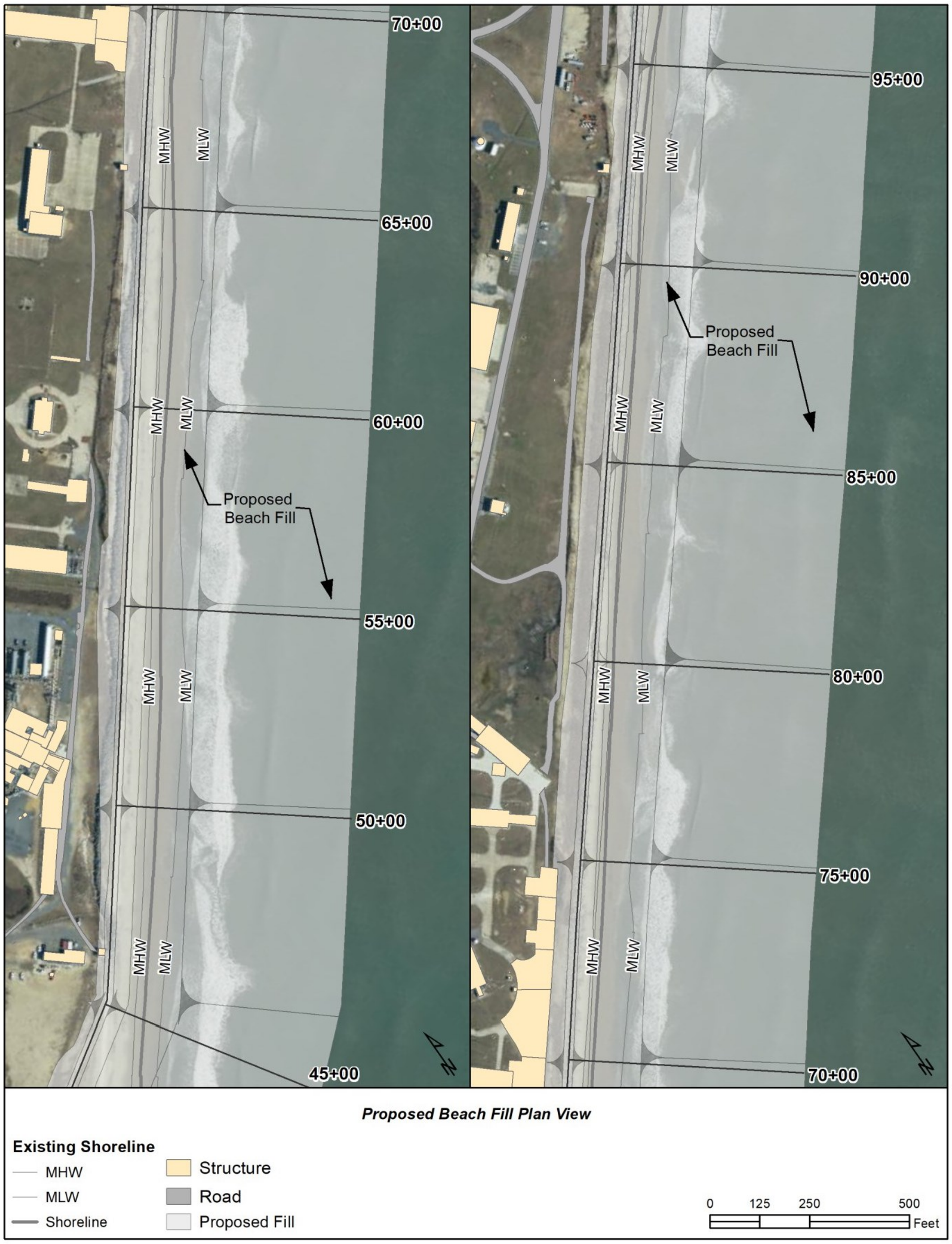


NASA WFF Shoreline Enhancement & Restoration Project 9 of 18

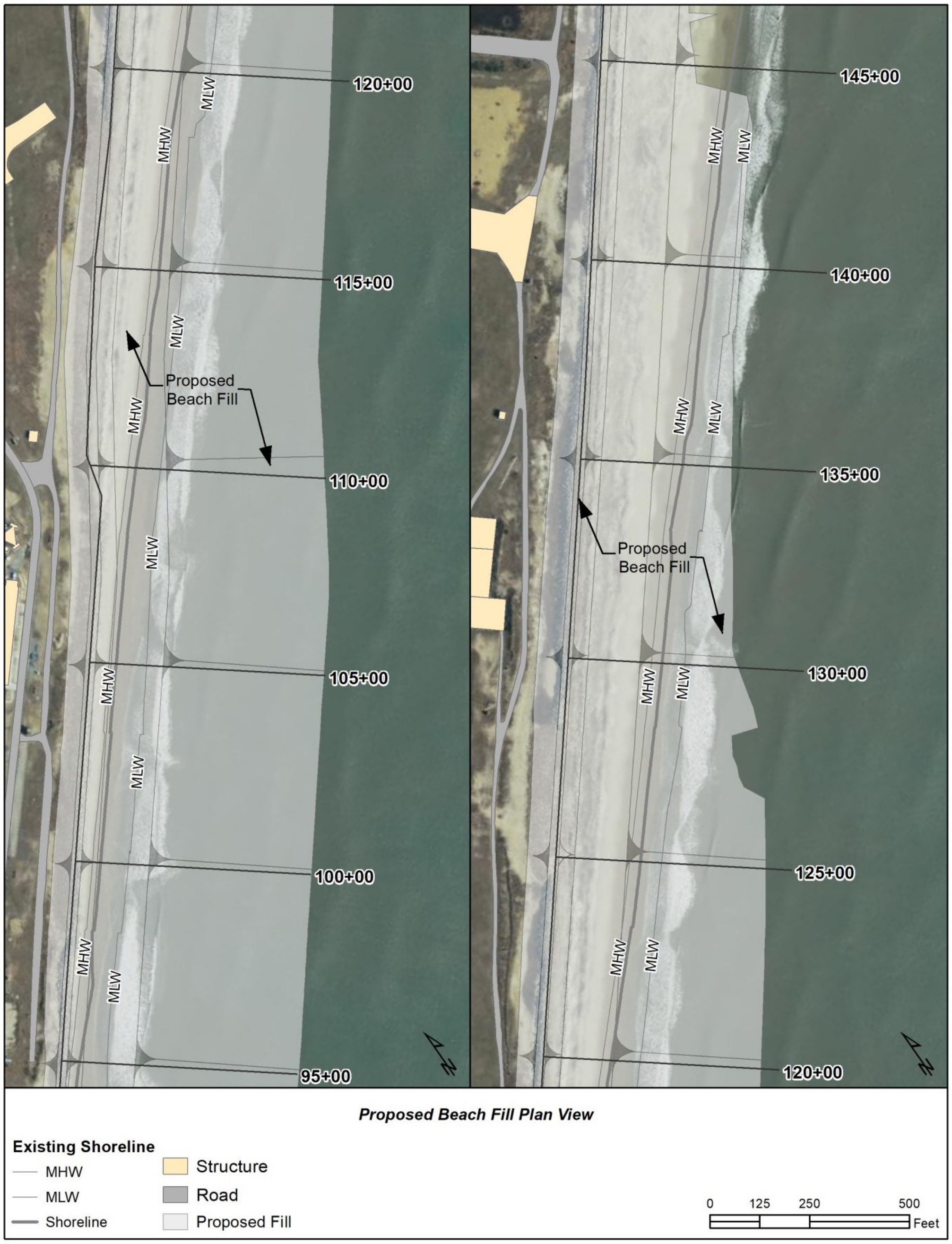


Proposed Beach Fill Plan View

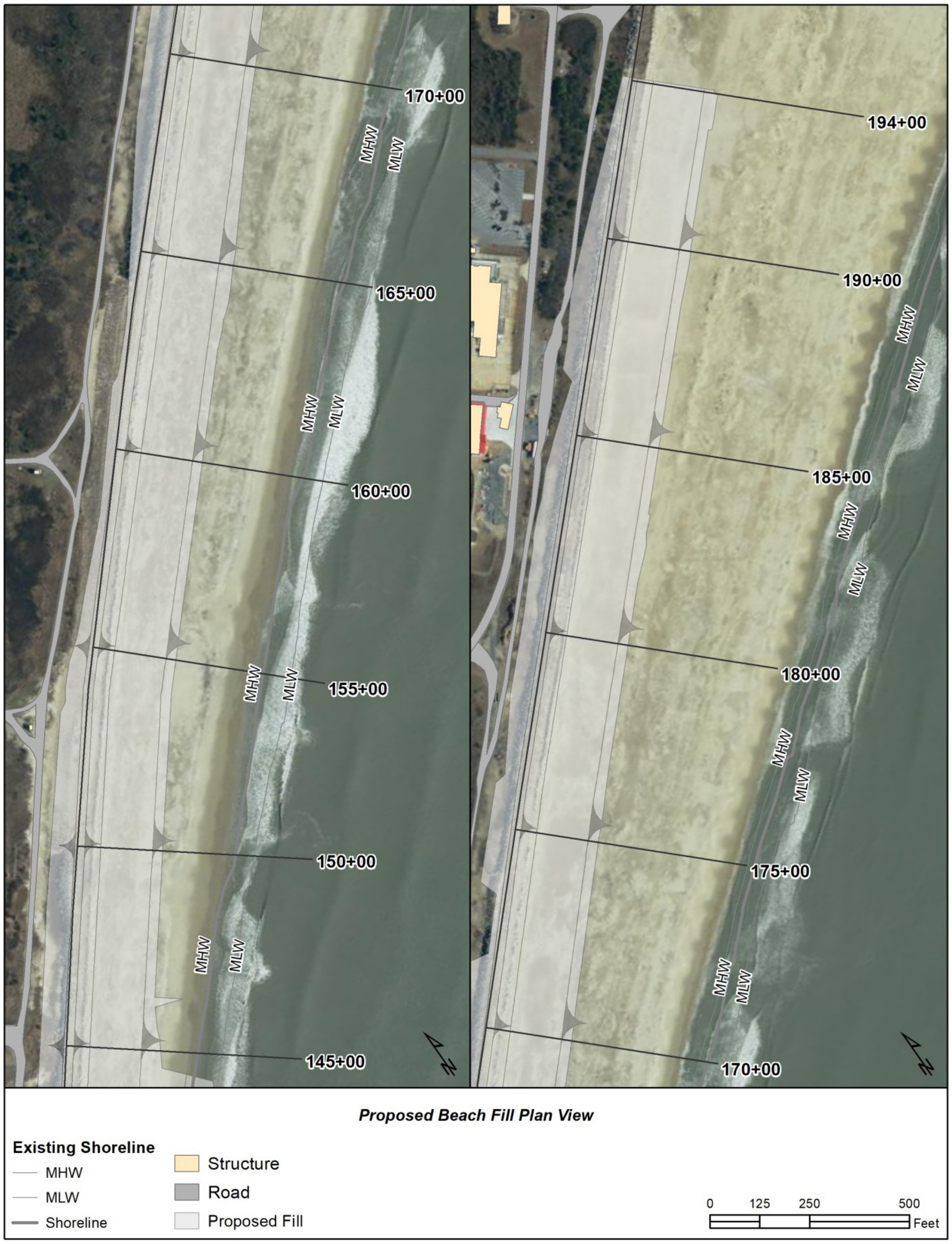
NASA WFF Shoreline Enhancement & Restoration Project 10 of 18



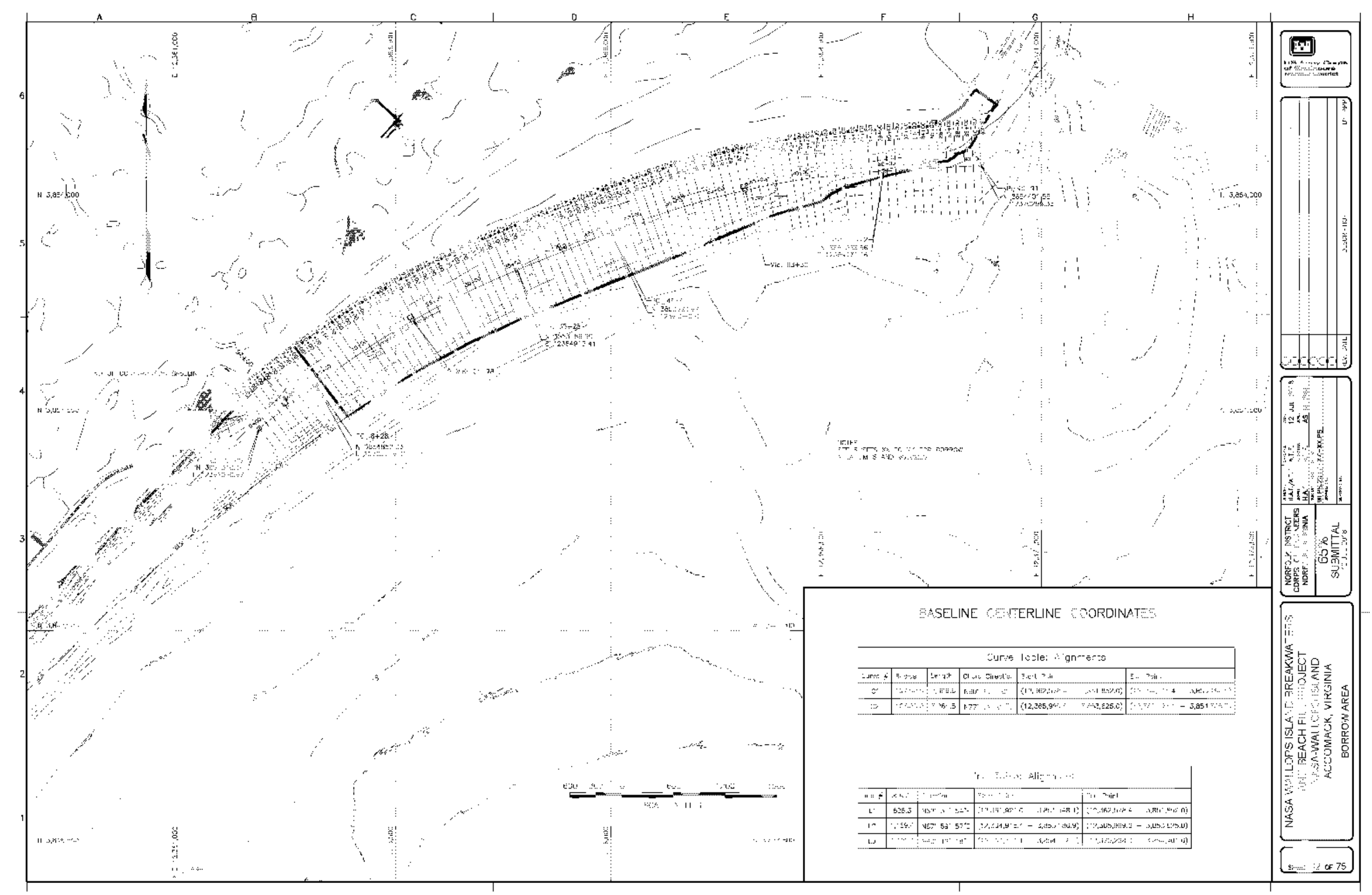
NASA WFF Shoreline Enhancement & Restoration Project 11 of 18



NASA WFF Shoreline Enhancement & Restoration Project 12 of 18



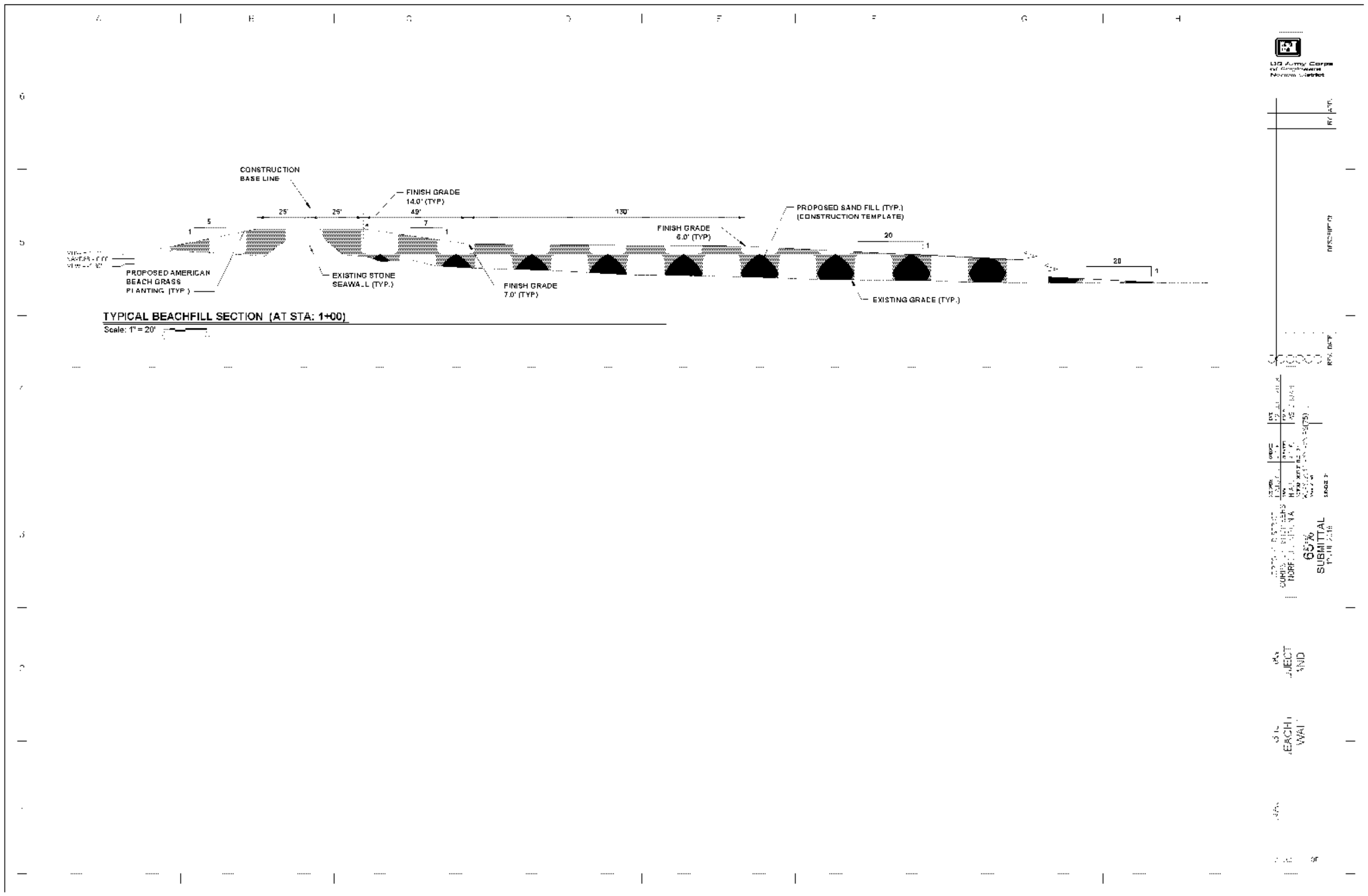
NASA WFF Shoreline Enhancement & Restoration Project 13 of 18

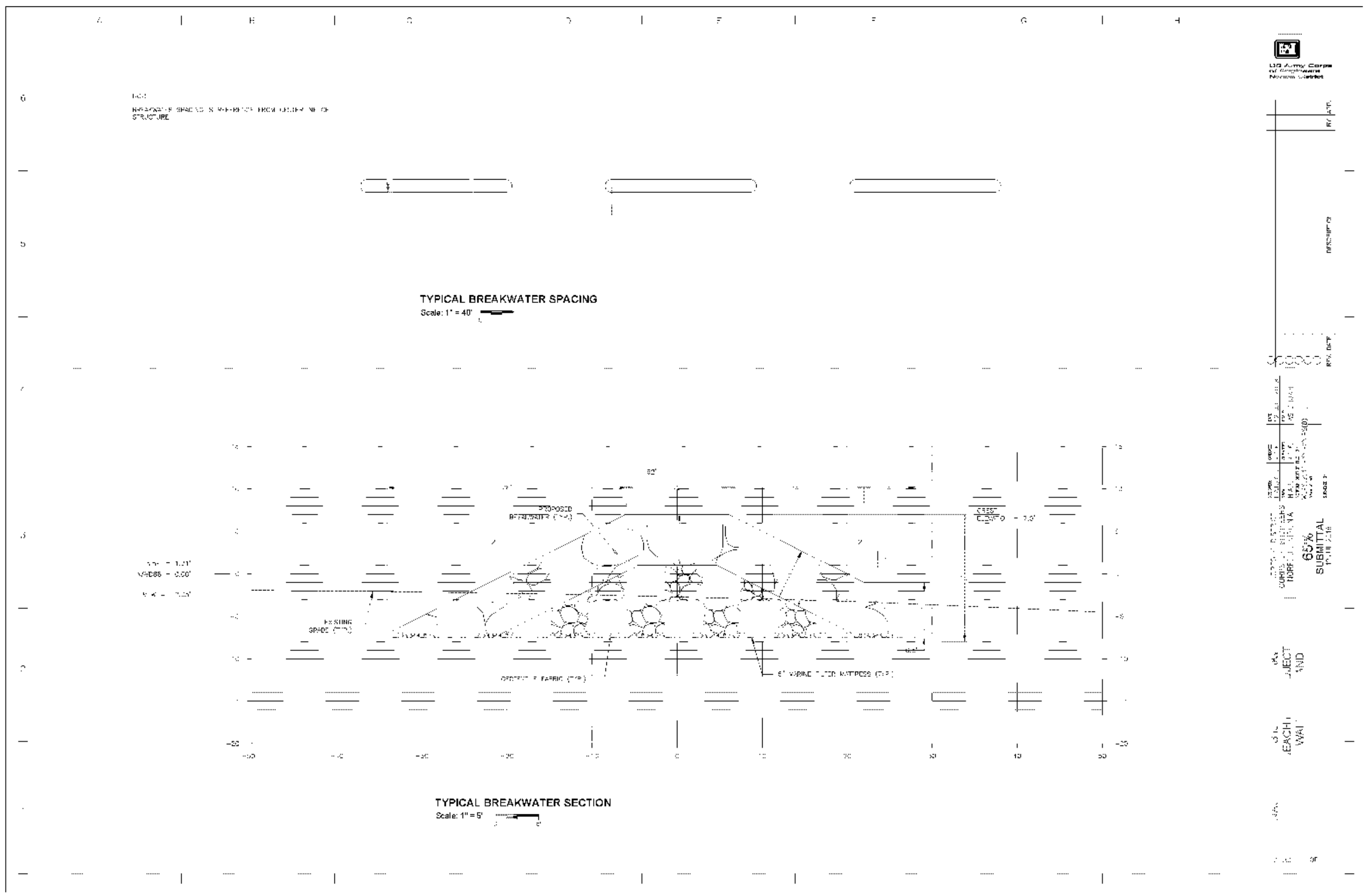


NASA WFF Shoreline Enhancement & Restoration Project 14 of 18

NASA WFF Shoreline Enhancement & Restoration Project 15 of 18

NASA WFF Shoreline Enhancement & Restoration Project 16 of 18


US Army Corps of Engineers Norfolk District
CONSTRUCTION BASE LINE
FINISH GRADE 14.0' (TYP)
25'
25'
49'
130'
5
1
7
1
PROPOSED SAND FILL (TYP.) (CONSTRUCTION TEMPLATE)
FINISH GRADE 6.0' (TYP)
20
1
20
1
PROPOSED AMERICAN BEACH GRASS PLANTING (TYP.)
EXISTING STONE SEAWALL (TYP.)
FINISH GRADE 7.0' (TYP)
EXISTING GRADE (TYP.)
TYPICAL BEACHFILL SECTION (AT STA: 1+00)
Scale: 1" = 20'
65% SUBMITTAL



NASA WFF Shoreline Enhancement & Restoration Project 18 of 18

Cardno Shaping the Future

NASA Wallops SERP Joint Permit Application Pre-Application Meeting Summary

1. Meeting Logistics and Materials

- Location: WFF Building F-160 Conference Room and via Telecon (1-844-467-6272; 109753#)
- Date: September 24, 2018
- Time: 10:00 am – 2:00 pm
- Materials: PDF slide presentation

2. Attendees

Shari Miller, NASA Wallops Flight Facility
Joe Mitchell, NASA WFF Environmental
John Saecker, NASA WFF
TJ Meyer, NASA WFF Medical and Environmental Division
Brian Denson, US Army Corps of Engineers, Regulatory (phone)
Alicia Farrow, USACE, Engineering (phone)
Megan Wood, USACE, NEPA (phone)
Doug Piatowski, BOEM (phone)
Hank Badger, VMRC
Dave O'Brien, NOAA
Lyle Varnell, VIMS
Chris Guvernater, Accomack County
John Lowenthal, Cardno
Liz Burak, Cardno

3. Meeting Discussion

USACE - Alicia and Brian had to leave the call at 10:30 so the presentation started with giving Brian some background providing input on permit type and processing schedule:Project exceeds the permit parameters (exceeding one acre of fill) for Regional Permit (RP19) and the project would require an individual permit.

- Noted that documentation of completed consultations with VDHR (SHPO), USFWS, NMFS would be required part of the package
- A public noitce would be issued 15 days after receipt of the JPA, and agree to issuing a final permit by February 2019.
- Dune grass planting as part of the project design, the project would be self-mitigating and that it's unlikely that additional mitigations would be required.
- Removal of sand below MHW would be considered dredging

VRMC - Hank then provided his comments and questions which included:

- Concerns/Questions: whether removal of the material at the north end would increase erosion at the north end; effect of removing sand from a functioning primary dune
- Project may be exempt from Coastal Zone permitting, depending on whetehr or not adjacent properties are affected. VIMS will provide advise VMRC.
- The next VMRC meeting where it is possible this project could be presented is in mid-December, next meeting is in January

NASA Wallops SERP Joint Permit Application
Pre-Application Meeting Summary

- If project is protested, it will have to go, to the commission, potentially as a “page 1” agenda item (requiring a presentation) or possibly as a “page 2” agenda item, which requires no formal presentation to the commission.

VIMS - Lyle provided comments and questions including:

- request any available data and reporting (NASA/Cardno provide Breakwater Modeling Report, Specifications/Plans, Spring and Fall Monitoring Reports and a summary of modeling on recover and erosion in/around borrow area.)
- Stated that he will not recommend not using breakwaters, his concern is the movement of sand

NOAA/NMFS - Dave asked for a copy of the EFH study and reiterated some of the concerns voiced by Hank and Lyle. Dave also asked for the planting plan to be included in the JPA.

4. Tour of Wallops Island

Shari Miller, John Saeker and Joe Mitchell provided the group a tour of the project area.

5. Action Items/After Action

1. Shari will provide Dave O’Brien the Essential Fish Habitat Assessment
2. Shari will request from Alicia: recovery time for the north Wallops Island beach, impacts downstream to Assawoman Island.
3. John Lowenthal - include planting information in the JPA.
4. The JPA will include:
   - the application and narrative description,
   - agency coordination and consultation documentation (VDHR, USFWS, NMFS),
   - 100% plans/specifications,
   - first and last USACE seasonal monitoring reports,
   - USACE Breakwater Modeling Report rovide the design plans,
5. VDEQ and Accomack County will be includeded in JPA distribution so that they can issue waivers.

COMMONWEALTH of VIRGINIA

Marine Resources Commission
Building 96
380 Fenwick Road
Fort Monroe, VA 23651

Matthew J. Strickler
Secretary of Natural Resources

Steven G. Bowman
Commissioner

May 15, 2019

National Aeronautics and Space Administration
Attn: Mr. Paul Bull
NASA Wallops Flight Facility
Building N-161, Code 228
Wallops Island, VA 23337

Re: VMRC #2018-1590

Dear Mr. Bull:

Enclosed is the Marine Resources Commission permit to install two (2) sets of three (3) approximately 130-foot long stone offshore breakwaters and place approximately 1.3 million cubic yards of sandy beach nourishment material landward of the breakwaters along approximately 19,850 feet of shoreline, situated along the Atlantic Ocean on and adjacent to Wallops Island. The sandy material will be mined from the north end of Wallops Island where the original nourishment has accreted due to longshore transport.

A yellow placard is also enclosed. This placard reflects the authorized activities for inspection purposes and <u>must</u> be conspicuously displayed at the work site throughout the construction phase. Failure to properly post the placard in a prominent location will be considered a violation of your permit conditions.

YOU ARE REMINDED THAT ANY DEVIATION FROM THE PERMIT OR ATTACHED DRAWINGS REQUIRES PRIOR AUTHORIZATION FROM THE MARINE RESOURCES COMMISSION. FAILURE TO OBTAIN THE NECESSARY MODIFICATION WILL BE CONSIDERED A VIOLATION AND COULD SUBJECT YOU TO CIVIL CHARGES IN AMOUNTS NOT TO EXCEED $10,000 PER VIOLATION.

The work authorized by this permit is to be completed by January 22, 2024. Please note that in conformance with Special Condition 17 of your permit you are to notify the Commission 15 days prior to commencement of your permitted project. The enclosed self-addressed, stamped, postcard is to be used for this purpose. All other conditions of the permit will remain in effect.

An Agency of the Natural Resources Secretariat
www.mrc.virginia.gov
Telephone (757) 247-2200 (757) 247-2292 V/TDD Information and Emergency Hotline 1-800-541-4646 V/TDD

National Aeronautics and Space Administration
Page Two

May 15, 2019
VMRC #2018-1590

Please be advised that you may also require issuance of a U. S. Army Corps of Engineers permit before you begin work on this project. You may wish to contact them directly to verify any permitting requirements.

Sincerely,

Tony Watkinson
Chief, Habitat Management

TW/ghb:lra
HM
Enclosure
cc: Applicant

MRC 30-317

VMRC# 2018-1590
Applicant: National Aeronautics and Space A(

COMMONWEALTH OF VIRGINIA
MARINE RESOURCES COMMISSION
PERMIT

The Commonwealth of Virginia, Marine Resources Commission, hereinafter referred to as the Commission, on this 22nd day of January 2019 hereby grants unto:

National Aeronautics and Space Administration
Bldg N-161, Code 228
Wallops Island, VA 23337

hereinafter referred to as the Permittee, permission to:

X Encroach in, on, or over State-owned subaqueous bottoms pursuant to Chapter 12, Subtitle III, of Title 28.2 of the Code of Virginia.

___ Use or develop tidal wetlands pursuant to Chapter 13, Subtitle III, of Title 28.2 of the Code of Virginia.

X Use or develop coastal primary sand dunes and beaches pursuant to Chapter 14, Subtitle III, of Title 28.2. of the Code of Virginia.

Permittee is hereby authorized to install two (2) sets of three (3) approximately 130-foot long stone offshore breakwaters and place approximately 1.3 million cubic yards of sandy beach nourishment material landward of the breakwaters along approximately 19,850 feet of shoreline, situated along the Atlantic Ocean on and adjacent to Wallops Island. The sandy material will be mined from the north end of Wallops Island where the original nourishment has accreted due to longshore transport. All activities authorized herein shall be accomplished in conformance with the plans and drawings dated received October 9, 2018, which are attached and made a part of this permit.

This permit is granted subject to the following conditions:

(1) The work authorized by this permit is to be completed by **January 22nd, 2024.** The Permittee shall notify the Commission when the project is completed. The completion date may be extended by the Commission in its discretion. Any such application for extension of time shall be in writing prior to the above completion date and shall specify the reason for such extension and the expected date of completion of construction. All other conditions remain in effect until revoked by the Commission or the General Assembly.

(2) This permit grants no authority to the Permittee to encroach upon the property rights, including riparian rights, of others.

(3) The duly authorized agents of the Commission shall have the right to enter upon the premises at reasonable times, for the purpose of inspecting the work being done pursuant to this permit.

(4) The Permittee shall comply with the water quality standards as established by the Department of Environmental Quality, Water Division, and all other applicable laws, ordinances, rules and regulations affecting the conduct of the project. The granting of this permit shall not relieve the Permittee of the responsibility of obtaining any and all other permits or authority for the projects.

(5) This permit shall not be transferred without written consent of the Commissioner.

(6) This permit shall not affect or interfere with the right vouchsafed to the people of Virginia concerning fishing, fowling and the catching of and taking of oysters and other shellfish in and from the bottom of acres and waters not included within the terms of this permit.

(7) The Permittee shall, to the greatest extent practicable, minimize the adverse effects of the project upon adjacent properties and wetlands and upon the natural resources of the Commonwealth.

(8) This permit may be revoked at any time by the Commission upon the failure of the Permittee to comply with any of the terms and conditions hereof or at the will of the General Assembly of Virginia.

(9) There is expressly excluded from the permit any portion of the waters within the boundaries of the Baylor Survey.

(10) This permit is subject to any lease of oyster planting ground in effect on the date of this permit. Nothing in this permit shall be construed as allowing the Permittee to encroach on any lease without the consent of the leaseholder. The Permittee shall be liable for any damages to such lease.

(11) The issuance of this permit does not confer upon the Permittee any interest or title to the beds of the waters.

(12) All structures authorized by this permit, which are not maintained in good repair, shall be completely removed from State-owned bottom within three (3) months after notification by the Commission.

(13) The Permittee agrees to comply with all of the terms and conditions as set forth in this permit and that the project will be accomplished within the boundaries as outlined in the plans attached hereto. Any encroachment beyond the limits of this permit shall constitute a Class 1 misdemeanor.

(14) This permit authorizes no claim to archaeological artifacts that may be encountered during the course of construction. If, however, archaeological remains are encountered, the Permittee agrees to notify the Commission, who will, in turn notify the Department of Historic Resources. The Permittee further agrees to cooperate with agencies of the Commonwealth in the recovery of archaeological remains if deemed necessary.

(15) If any loss or damage to the Commonwealth is caused by or contributed to, in whole or in part, by the Permittee arising from the establishment, operation, or maintenance of said project, the liability of the Permittee therefore shall be determined in accordance with the applicable provisions of the Federal Tort Claims Act of August 2, 1946, as amended.

VMRC# 2018-1590

MRC 30-317

VMRC# 2018-1590
Applicant: National Aeronautics and Space

The following special conditions are imposed on this permit:

(16) The yellow placard accompanying this permit document must be conspicuously displayed at the work site.

(17) Permittee agrees to notify the Commission a minimum of 15 days prior to the start of the activities authorized by this permit.

(18) Permittee agrees to notify the Commission of the commencement and conclusion of each phase of project activity and submittal of all post-construction beach profile monitoring surveys.

(19) Permittee agrees for sand mining and renourishment:
a. In any given year activities shall not begin until the last piping plover or American oystercatcher chicks have fledged or the last sea turtle nest has hatched or been deemed nonviable by DGIF staff, whichever is later.
b. Every effort shall be made to complete activities by March 15 of any year.
c. If work must continue past the March 15, deadline, daily monitoring for red knot migrants and nesting piping plovers and American oystercatchers shall begin on March 15 and continue until the last chicks of either species fledges. Daily sea turtle nest patrols shall begin on May 1, and continue until the last nest hatches or is deemed nonviable by VDGIF staff.
d. If a piping plover or sea turtle nest is found before sand mining and renourishment activities are completed, all activities must cease until the WFF staff has notified the USFWS and VDGIF and VDGIF has completed an on-site determination about whether or not construction activities may continue.
e. If an American oystercatcher nest is found before sand mining and renourishment activities are completed, all activities must cease until the VDGIF staff has completed an on-site determination about whether or not construction activities may continue.

(20) Permittee agrees predator screens will be placed over sea turtle nests and predator exclosures shall be erected around all piping plover nests.

(21) Permittee agrees equipment and materials shall be staged in upland areas westward of the beach and outside of sensitive habitats (e.g., marshes, mudflats, dunes).

(22) Permittee agrees VMRC, VDGIF and the USFWS shall be notified when sand mining and renourishment activities commence and cease.

(23) A biological monitoring report shall be submitted to the VMRC, VDGIF and the USFWS at the conclusion of the 2020 monitoring period.

VMRC# 2018-1590

-317

VMRC# 2018-1590
Applicant: National Aeronautics and Space

Description of Fees	Amount	Unit of Measure	Rate	Total	Frequency	After-The-Fact
Permit Fee				$100.00	One-Time	
Total Permit Fees				**$100.00**		

This permit consists of 28 Pages

PERMITTEE

Permittee's signature is affixed hereto as evidence of acceptance of all of the terms and conditions herein.

In cases where the Permittee is a corporation, agency or political jurisdiction, please assure that the individual who signs for the Permittee has proper authorization to bind the organization to the financial and performance obligations which result from activity authorized by this permit.

PERMITTEE
Accepted for National Aeronautics and Space Administration

1st day of May, 2019 By [signature] Deputy Division Chief, Facilities
(Name) (Title)

State of Virginia
City (or County) of Accomack, to-wit:

I, Valerie Paulette Justice a Notary Public in and for said City (or County) and State hereby certify that Paul C Bull, Permittee, whose name is signed to the foregoing, has acknowledged the same before me in my City (or County) and State aforesaid.

Given under my hand this 1st day of May, 2019
My Commission Expires: 2-28-2023

Notary Public Valerie Paulette Justice

VALERIE PAULETTE JUSTICE NOTARY PUBLIC REG # 7624235 MY COMMISSION EXPIRES 2/28/2023 COMMONWEALTH OF VIRGINIA

COMMISSION

IN WITNESS WHEREOF, the Commonwealth of Virginia, Marine Resources Commission has caused these presents to be executed in its behalf by Tony Watkinson, Chief, Habitat Management
(Name) (Title) Marine Resources Commission

15th day of May, 20 19 By [signature]

State of Virginia
City of Hampton, to-wit:

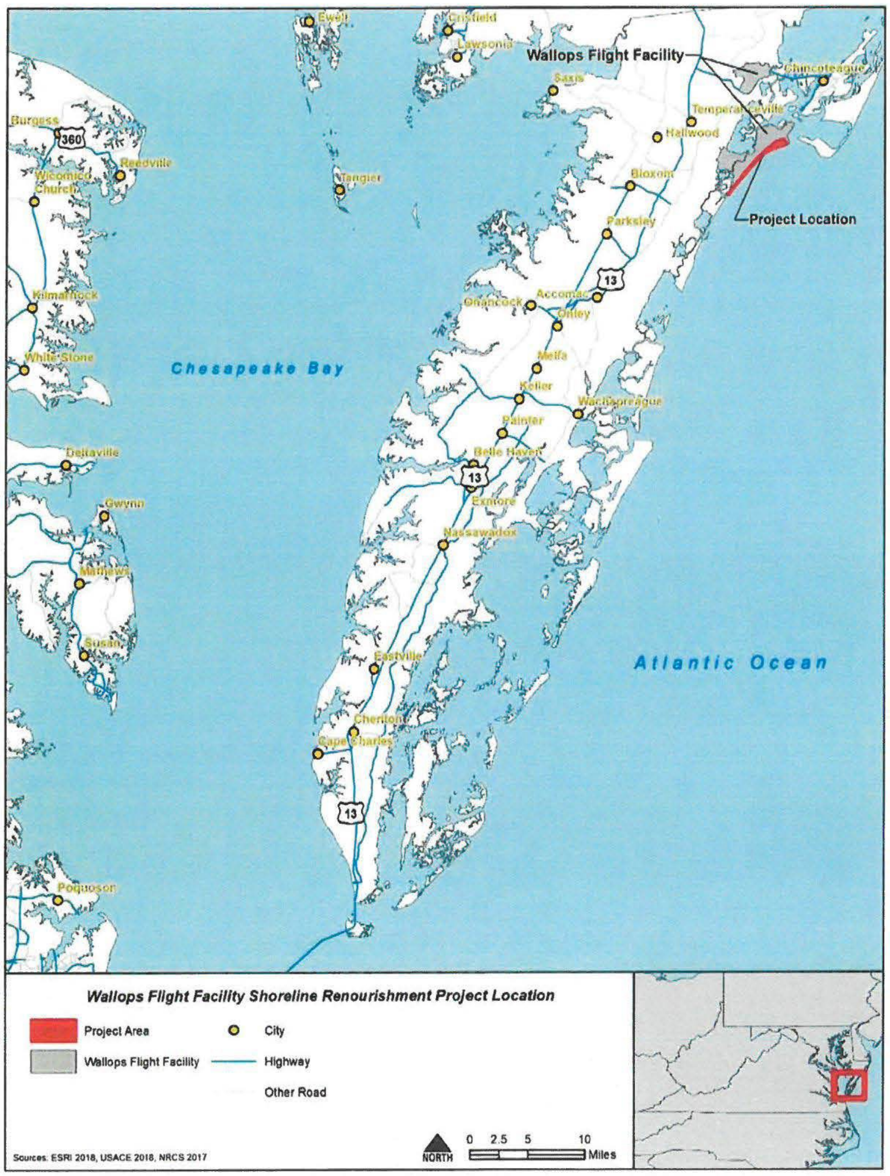
I, Louise R. Atkins, a Notary Public within and for said City, State of Virginia, hereby certify that Tony Watkinson, whose name is signed to the foregoing, bearing the 22nd day of January 2019, has acknowledged the same before me in City aforesaid.

Given under my hand this 15th day of May, 20 19
My Commission Expires: January 31, 2021

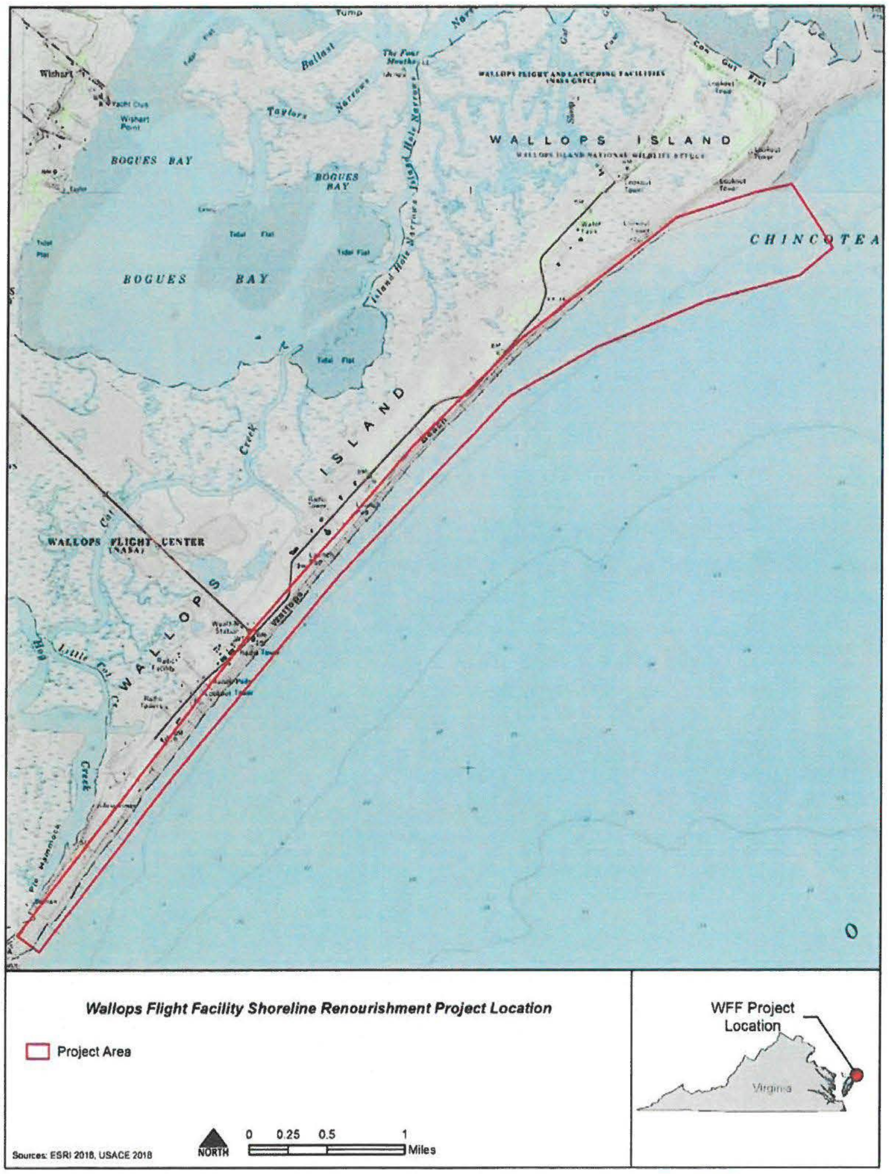
Notary Public [signature]

LOUISE R. ATKINS
Notary Public
Commonwealth of Virginia
355034

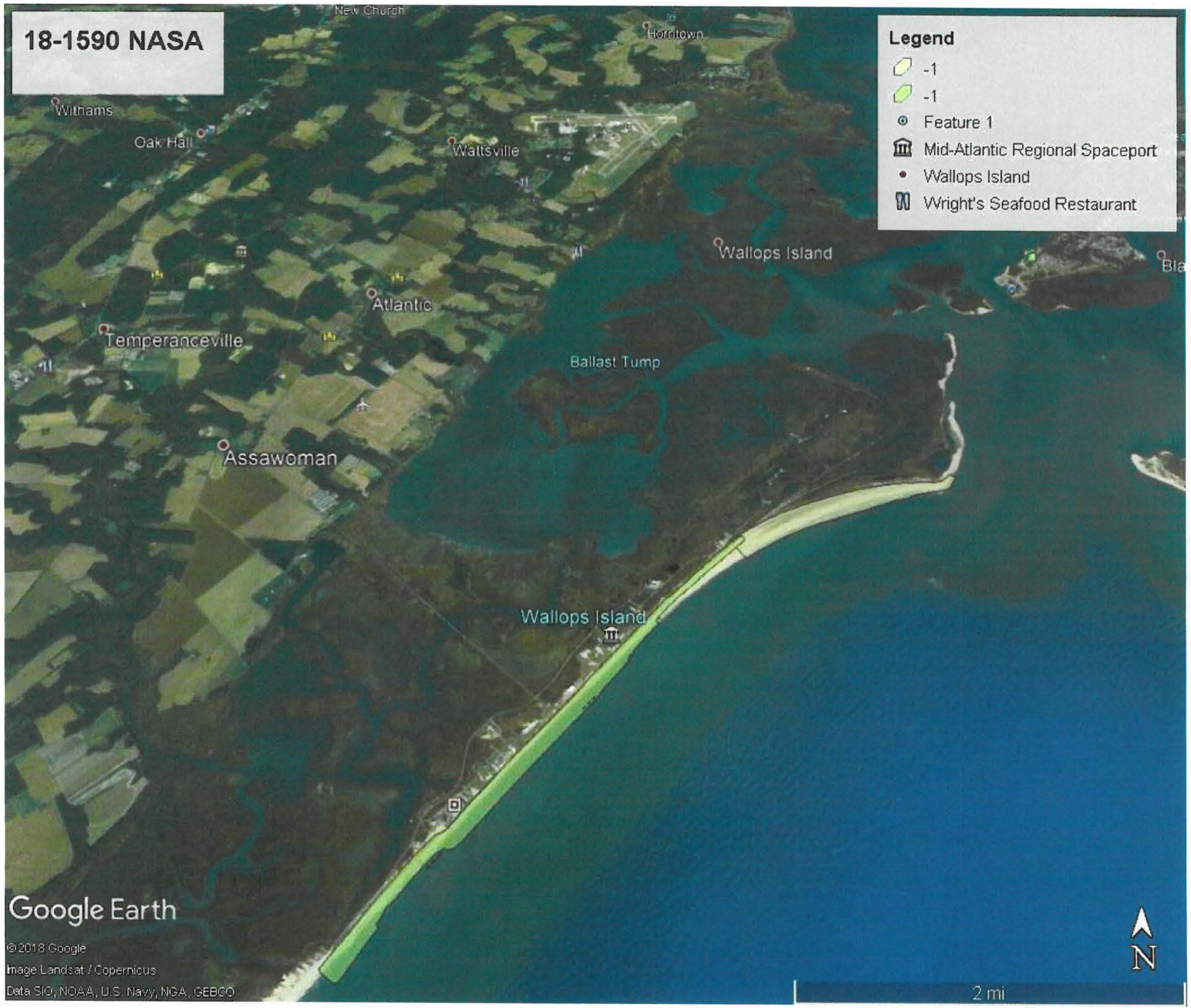
VMRC# 2018-1590



NASA WFF Shoreline Enhancement & Restoration Project 1 of 18



NASA WFF Shoreline Enhancement & Restoration Project 2 of 18


18-1590 NASA
Legend
-1
-1
Feature 1
Mid-Atlantic Regional Spaceport
Wallops Island
Wright's Seafood Restaurant
New Church
Horntown
Withams
Oak Hall
Wattsville
Wallops Island
Atlantic
Temperanceville
Ballast Tump
Assawoman
Wallops Island
Google Earth
©2018 Google
Image Landsat / Copernicus
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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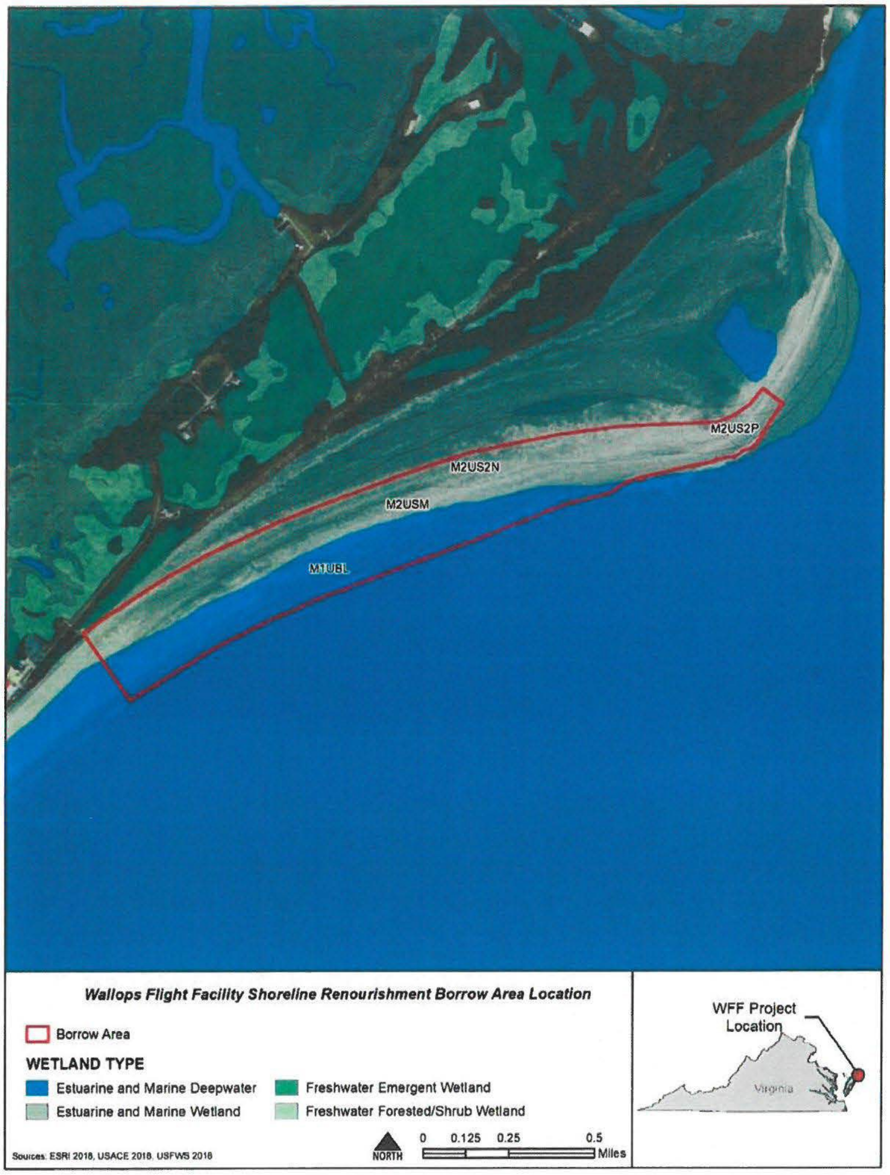
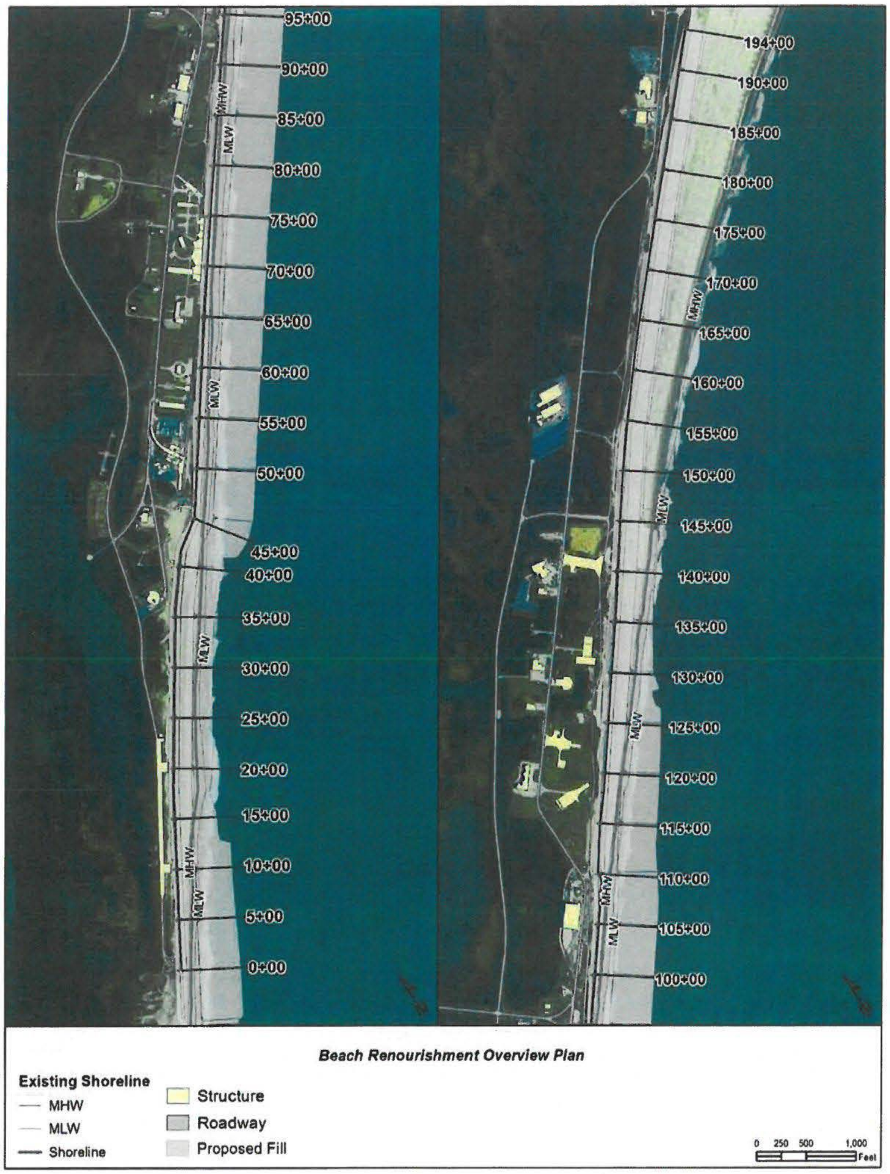


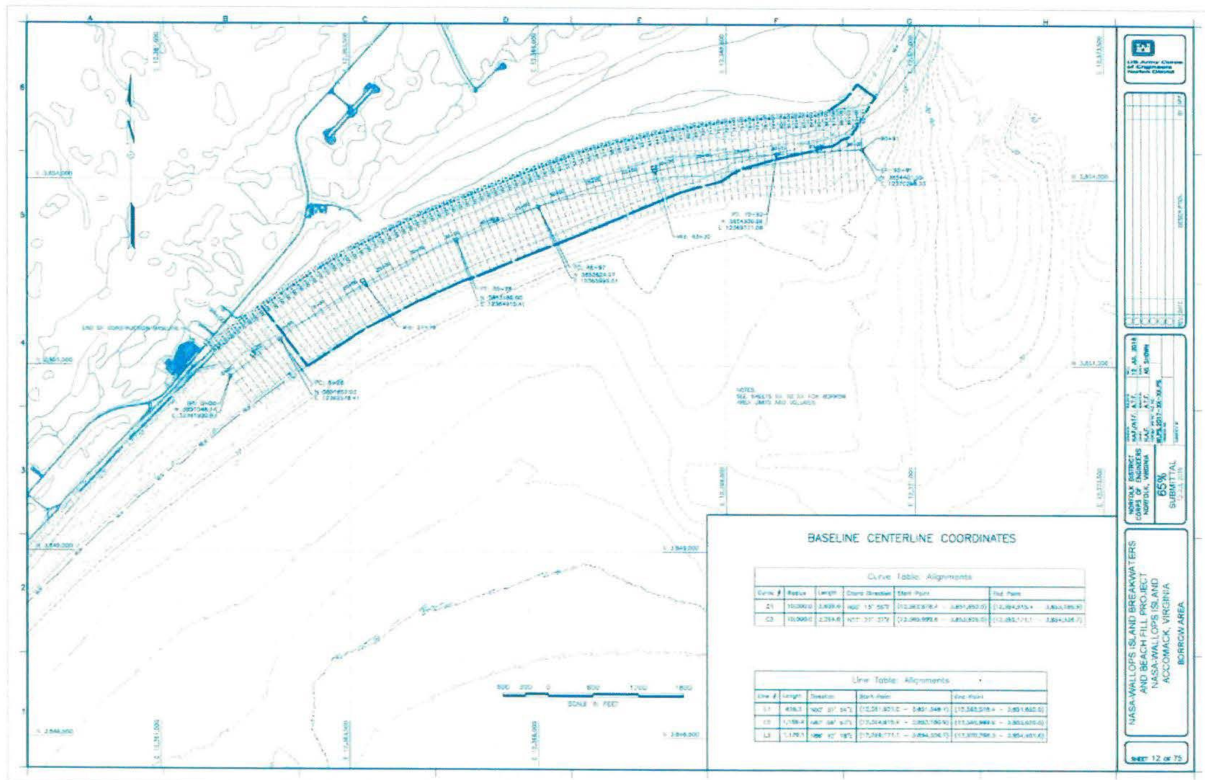
NASA WFF Shoreline Enhancement & Restoration Project 4 of 18

NASA WFF Shoreline Enhancement & Restoration Project 7 of 18

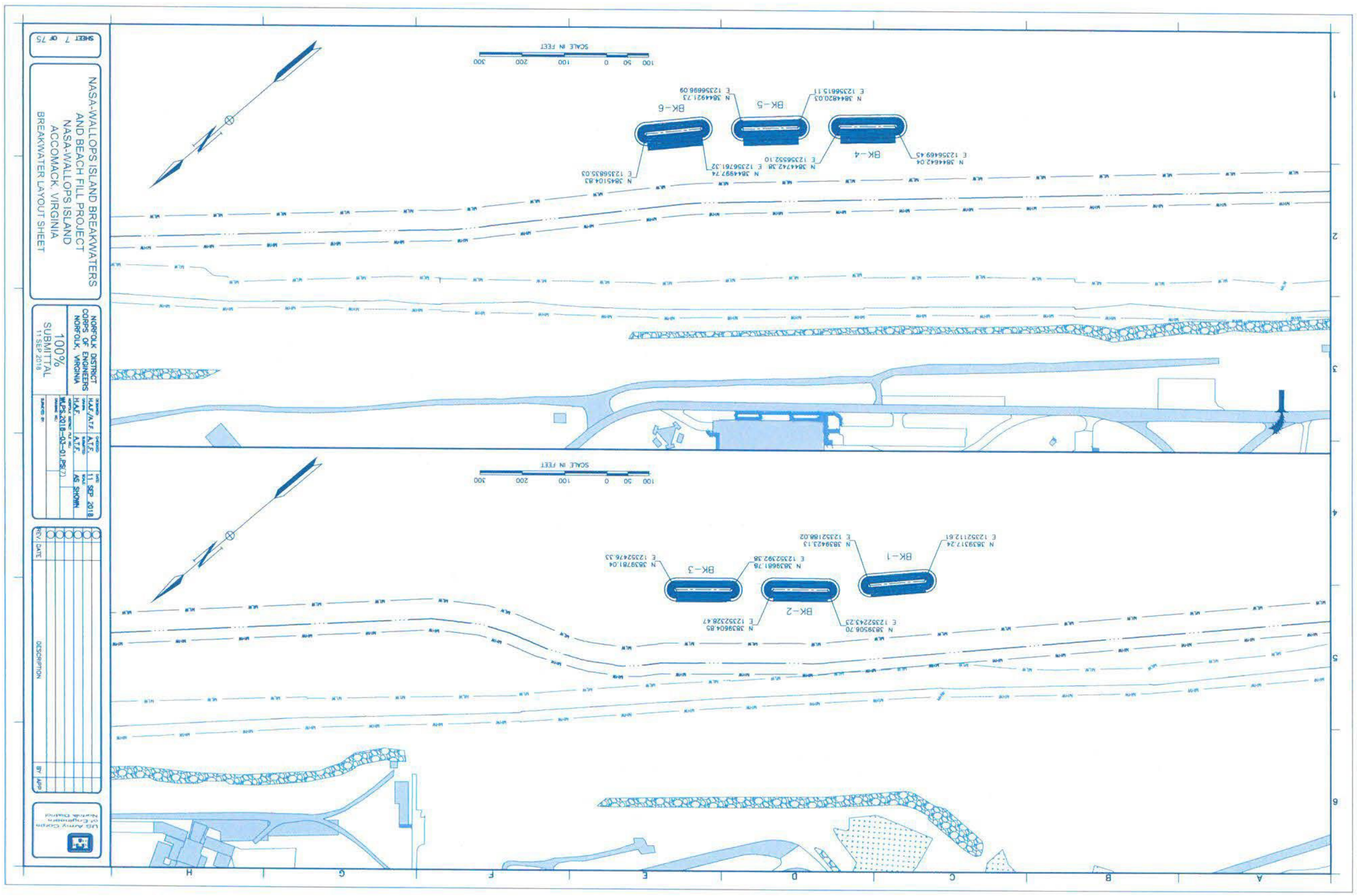
NASA WFF Shoreline Enhancement & Restoration Project 8 of 18

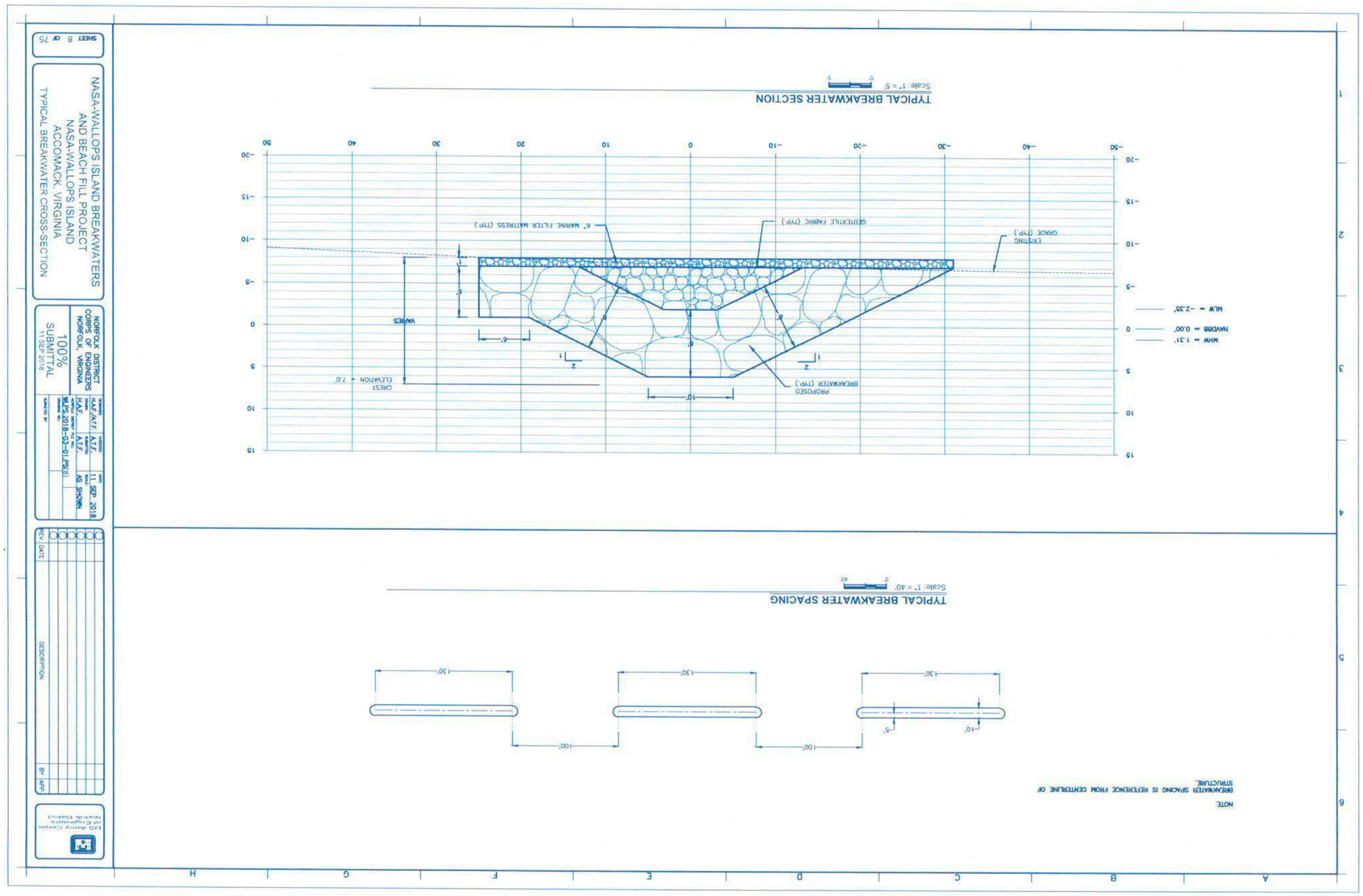


NASA WFF Shoreline Enhancement & Restoration Project 9 of 18

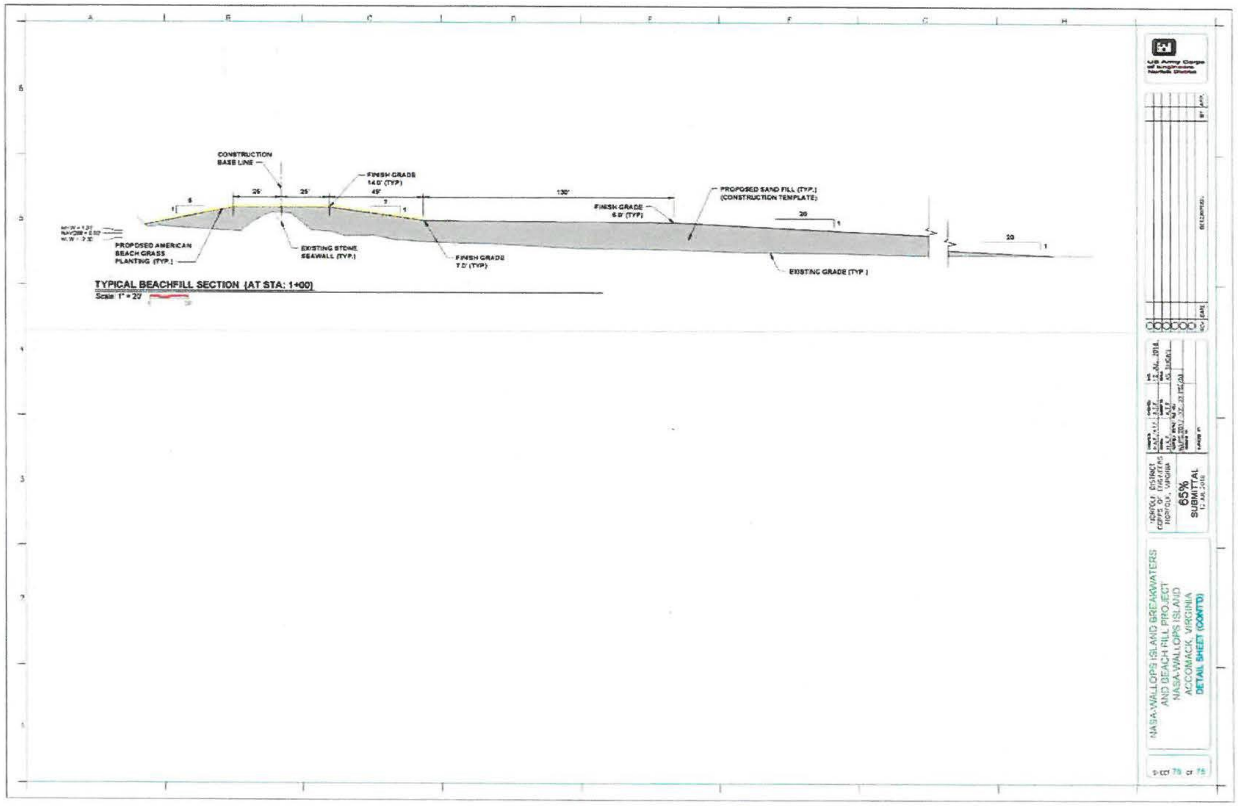


NASA WFF Shoreline Enhancement & Restoration Project 14 of 18


NASA-WALLOPS ISLAND BREAKWATERS
AND BEACH FILL PROJECT
NASA-WALLOPS ISLAND
ACCOMACK, VIRGINIA
BREAKWATER LAYOUT SHEET
NORFOLK DISTRICT
CORPS OF ENGINEERS
NORFOLK, VIRGINIA
100%
SUBMITTAL
SHEET 7 of 75
SCALE IN FEET
BK-1
BK-2
BK-3
BK-4
BK-5
BK-6



SHEET 8 OF 75
NASA-WALLOPS ISLAND BREAKWATERS AND BEACH FILL PROJECT
NASA-WALLOPS ISLAND
ACCOMACK, VIRGINIA
TYPICAL BREAKWATER CROSS-SECTION
NORFOLK DISTRICT CORPS OF ENGINEERS NORFOLK, VIRGINIA
100% SUBMITTAL
11 SEP 2018
TYPICAL BREAKWATER SECTION
Scale: 1" = 5'
6" MARINE FILTER MATTRESS (TYP.)
GEOTEXTILE FABRIC (TYP.)
EXISTING GRADE (TYP.)
PROPOSED BREAKWATER (TYP.)
CREST ELEVATION + 7.0'
MLW = -2.35'
NAVD88 = 0.00'
MHW = 1.31'
TYPICAL BREAKWATER SPACING
Scale: 1" = 40'
NOTE:
BREAKWATER SPACING IS REFERENCE FROM CENTERLINE OF STRUCTURE



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OCT 09 2018
MARINE RESOURCES COMMISSION

NASA WFF Shoreline Enhancement & Restoration Project 17 of 18

CHAPTER FIVE: MITIGATION AND MONITORING

Because the SRIPP Proposed Action would take place in a complex and dynamic environment over a 50-year period, NASA would implement and continuously evaluate mitigation measures to ensure they are effective and appropriate. Due to a certain degree of uncertainty inherent in predicting how the Proposed Action activities would affect physical and biological resources, NASA would implement an adaptive management strategy for the SRIPP comprised of the following three elements:

- Base planning on existing and adequate knowledge of the project area, well-defined project goals, and current technology;
- Implement the Proposed Action with the initially planned mitigation measures described below; and
- Monitor and evaluate results.

The cycle would then reinitiate, driven by the monitoring results and project performance. Results could validate existing practices or reveal the need for alterations in project implementation or mitigation techniques. By monitoring and evaluating how measures are working, NASA would ensure that mitigation measures are optimized.

The following sections discuss NASA's proposed mitigation measures and monitoring as they apply to the Proposed Action Alternatives and within the framework of adaptive management.

5.1 MITIGATION

CEQ regulations (40 CFR 1508.20) define mitigation to include: (1) avoiding the impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the lifetime of the action; and (5) compensating for the impact by replacing or providing substitute resources or environments.

Mitigation measures are either institutional in that they are inherent in project alternative selection, or they are incorporated into the construction, operation, and maintenance of the project.

Mitigation techniques can include operational measures or technology-based methods. They can be short- or long-term and may be designed to avoid, minimize, remediate, or compensate for environmental impact. The following sections describe the mitigation measures that would be implemented for the components of the alternatives: seawall extension, offshore dredging, sand placement, groin or breakwater construction, and north Wallops Island borrow site excavation.

5.1.1 Physical Environment

5.1.1.1 Seawall Extension

The main physical effects of seawall construction activities would be soil and sediment disturbance and potential pollution releases from construction equipment.

8-1

Mitigation and Monitoring

NASA would implement erosion and sediment control BMPs to minimize erosion. Spill prevention BMPs would be implemented to reduce potential impacts on soils and sediments during seawall construction, and all work would be performed in accordance with WFF's ICP.

5.1.1.2 Offshore Dredging

The main physical effects of dredging the proposed offshore shoals would be removal of sand from the shoal, suspended sediment/turbidity, redistribution of sediment outside the dredge footprint, and changes to bathymetry. The dredge contractor would be responsible for proper storage and disposal of any hazardous material such as oils and fuels used during the dredging and beach nourishment operations. The U.S. EPA and USCG regulations require the treatment of waste (e.g., sewage, gray water) from dredge plants and tender/service vessels and prohibit the disposal of debris into the marine environment. The dredge contractor would be required to implement a marine pollution control plan to minimize any direct impacts to water quality from construction activity.

Offshore dredging would result in changes to the bathymetry of the selected offshore borrow site. To minimize impacts on the bathymetry, dredging would be conducted so that a relatively shallow, uniform thickness of material is removed from the borrow area.

5.1.1.3 Beach Construction and Sand Placement

To minimize impacts on sediments, the beach would be restored to a comparable sediment type (a similar percentage of sand, silt and clay), grain size, and color as the existing beach material.

5.1.1.4 Groin and Breakwater Construction

During groin construction, there would be an accumulation of sediment on the updrift side of the groin, and some shoreline erosion would occur on the downdrift side. The extent of the erosion would depend on the direction and rate of longshore sediment transport in the groin area. NASA would renourish the beach to reduce the potential for downdrift erosion by placing sand all along the Wallops Island shoreline. Additionally, the groin would be located within the sediment transport nodal zone along the beach to ensure minimal potential downdrift.

5.1.1.5 North Wallops Island Sediment Removal

The main physical effects of excavation activities on north Wallops Island for beach fill material would be sediment disturbance and potential pollution releases from construction equipment.

NASA would implement erosion and sediment control BMPs to minimize erosion. Spill prevention BMPs would be implemented to reduce potential impacts on soils and sediments during excavation, construction, and beach fill work. All work would be performed in accordance with WFF's ICP.

5.1.1.6 MEC

To minimize the risk of adverse impacts from UXO in the North Wallops Island borrow area, an MEC Avoidance Plan that addresses the potential hazards would be prepared. A visual and magnetic survey of the area to locate MEC would be completed and potential hazards removed prior to excavation.

5.1.2 Threatened and Endangered Species

5.1.2.1 Onshore

The main biological effects of seawall construction activities would be disturbance of potential beach habitat for shorebirds and sea turtles in the southern portion of the project area. To limit negative impacts on shorebirds during construction activities, NASA would educate all personnel working in the construction area on recognizing protected species and their likely habitat so that appropriate avoidance and minimization measures can be incorporated into activities.

Piping plover and sea turtle nests have not been documented in this portion of the project area; however, they may nest immediately to the south. If a nest or crawl tracks are found, NASA would consult with USFWS to develop site-specific mitigation measures.

Consistent with the 2010 USFWS BO (Appendix D), NASA would implement the following measures to minimize impacts during the initial phase of the project:

1. NASA would conduct routine surveys and monitoring for listed species and implement measures to avoid potential impacts whenever possible;
2. NASA would conduct surveys and monitoring to determine the effects of the proposed action on listed species and their habitat; and
3. NASA would actively manage habitats and human activity on the beaches to avoid and minimize potential impact on listed species.

To fulfill these measures, NASA would also comply with the following terms and conditions.

1. NASA would fully implement the activities related to listed species in Chapter Five of the SRIPP Draft PEIS: Mitigation and Monitoring Plan (NASA, 2010d) for seawall extension, offshore dredging, and sand placement activities. NASA would produce an annual report summarizing the survey and monitoring efforts, the location and status of all occurrences of recorded protected species, and any additional relevant information. Reports would be submitted to USFWS's Virginia Field Office in digital format at the address provided in the SRIPP BO by December 31 of each year.
2. NASA would develop a training and familiarization program for all personnel conducting construction activities and NASA operations in areas where listed species may occur. This training program would include basic biological information about all listed species and be sufficient to allow personnel to tentatively identify the species and its likely habitat and incorporate appropriate avoidance and minimization measures into their activities.
3. Excavation of sand from the north Wallops Island borrow area for future renourishment would be conducted outside of plover and sea turtle nesting season (March 15 through November 30 or the last date of potential sea turtle hatchling emergence based on when the last eggs were laid). Sand would be stockpiled outside of the north Wallops Island borrow area and outside of potential nesting habitat for plovers and sea turtles prior to placement for renourishment.
4. Once the newly constructed beach is in place, NASA would conduct surveys for injured, dead, or impaired birds and wildlife after launches of rockets that produce an expected sound intensity greater than 150 dB seaward of the dune or seawall. These surveys would 8-3

be conducted as soon as possible following launches and within 2 hours of the launch or the first daylight following launch. If surveys cannot be conducted within this period, NASA would place remotely operated video cameras on the beach to document and record responses of plovers and similar birds and any sea turtles. Cameras would be placed a maximum of 100 m (330 ft) apart and extend to the limit of the project area where sound intensity is expected to exceed 150 dB. Surveys for dead, injured, or impaired wildlife would still be conducted as soon as possible following a launch, in addition to the use of cameras. Reports and DVDs would be provided to USFWS within 15 days of each launch event.

5. Concentrations of contaminants (hydrogen chloride, aluminum oxide, and other potentially toxic substances) normally present in rocket exhaust would be measured on the beach closest to the flame trench following launches involving use of solid propellants. Measurements would be taken daily until the levels reach background levels or conservative estimated non-toxic levels of these contaminants for birds, sea turtles, and other wildlife species. This information would be used to determine the typical exposure to contaminants on the beaches over time following a launch. Measurements would be taken, analyzed, and submitted to USFWS for at least the first five launches after the placement of beach and dune adjacent to NASA infrastructure. Reports would be submitted to USFWS's Virginia Field office in digital format within 30 days of each launch event.
6. NASA would report any evidence of potential nesting activity of green sea turtles or leatherback sea turtles on Wallops Island to USFWS's Virginia Field Office within one business day of observing the activity.
7. Care would be taken to preserve biological material of any dead specimens of proposed or listed species found in the best possible state. NASA would also ensure that evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. Upon locating a dead specimen, NASA would immediately notify USFWS.

Additionally, the sand fencing that would be installed at the toe of the dune would be perpendicular to the shoreline with regular spacing between sections to allow wildlife passage between the dune area and the ocean.

5.1.2.2 Offshore

As a requirement of the 2010 NMFS BO (Appendix E), NASA would implement the following measures to minimize impacts of incidental take of sea turtles:

1. NASA would contact NMFS within 3 days before dredging and again within 3 days after completion of dredging. NASA would report to NMFS whether:
   a. During April 1 through November 30, when sea turtles are known to be present in the project area, hopper dredges are outfitted with state-of-the-art sea turtle deflectors on the drag head and operated in a manner that will reduce the risk of interactions with sea turtles;
   b. An NMFS-approved observer is on board the vessel for any dredging occurring in the April 1 – November 30 time frame;

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c. All dredges are equipped and operated in a manner that provides endangered/threatened species observers with a reasonable opportunity for detecting interactions with listed species and that provides for handling, collection, and resuscitation of turtles injured during project activities; and

d. Measures are taken to protect any turtles that survive entrainment in the dredge.

2. All interactions with listed species would be properly documented and promptly reported to NMFS.

NASA would also ensure that the following terms and conditions are met to minimize and monitor the impact of incidental take:

1. NASA would contact NMFS' Section 7 Coordinator to alert NMFS to the commencement and cessation of dredging activities, to give NMFS an opportunity to provide NASA with any updated contact information or reporting forms, and to provide NMFS with information of any incidents with listed species.
2. If a sea turtle or its parts are taken in dredging operations, the take would be documented on the form included as Appendix H of the BO and submitted to NMFS along with the final report.
3. NASA would contact NMFS within 24 hours of any interactions with sea turtles, including non-lethal and lethal takes. Until alerted otherwise, NASA would contact the Section 7 Coordinator.
4. NASA would ensure that any sea turtles observed during project operations are measured and photographed (including sea turtles or body parts observed at the dredge location or on board the dredge, hopper, or scow) and the corresponding form completed and submitted to NMFS within 24 hours by fax.
5. In the event of any lethal takes of sea turtles, any dead specimens or body parts would be measured, photographed, and preserved (refrigerated or frozen) until disposal procedures are discussed with NMFS.
6. If a dead sea turtle or sea turtle part is taken in dredging operations, a genetic sample would be taken following the procedure outlined in the 2010 NMFS BO.
7. If a decomposed turtle or turtle part is entrained during dredging operations, an incident report would be completed and the specimen would be photographed. Any turtle parts that are considered "not fresh" (i.e., obviously dead prior to the dredge take) would be frozen and transported to a nearby stranding or rehabilitation facility for review. NASA would submit an incident report for the decomposed turtle part, as well as photographs, to NMFS within 24 hours of the take and request concurrence that this take should not be attributed to the Incidental Take Statement. NMFS would have the final authority in determining whether the take should count toward the Incidental Take Statement.
8. Any time that a take occurs, NASA would immediately contact NMFS to review the situation. At that time, NASA would inform NMFS of the amount of material dredged so far and the amount remaining to be dredged during that cycle. Also at that time, NASA and USACE would discuss with NMFS whether any new management measures could be implemented to prevent the total incidental take level from being exceeded.

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Mitigation and Monitoring

9. NASA would submit a final report summarizing the results of dredging and any takes of listed species to NMFS within 30 working days of the completion of each dredging contract.
10. If the take estimate for any contract is exceeded, NASA and the USACE would work with NMFS to determine whether the additional take represents new information revealing effects of project activities that may not have been previously considered.

In addition to the above measures required by NMFS, NASA would employ the following:

1. As the NMFS-approved observer would be on board the dredge only from April 1 through November 30, a lookout/bridge watch would be present on the dredge at all times from December 1 through March 31 to alert the captain when a listed whale is spotted within 1 kilometer (km) (0.62 mi) of the dredge. The lookout will be knowledgeable in listed species identification. From April 1 through November 30, the NMFS-approved observer would assume this responsibility.
2. If a NMFS-approved observer or the lookout/bridge watch observes a whale within 1 km (0.62 mi) of the dredge, all pumps would be turned off (i.e., dredging will stop) until the whale leaves the area (i.e., is farther than 1 km [0.62 mi] from the dredge).
3. All dredge operators would be required to monitor the right whale sighting reports (i.e., sighting advisory system, dynamic management areas, seasonal management areas) to remain informed on the whereabouts of right whales in the vicinity of the action area.
4. All dredge operators would conform to the regulations prohibiting the approach of right whales closer than 500 yds (1,500 ft) (50 CFR 224.103 (c)). If a dredge vessel comes within the 500-yd (1,500-ft) buffer zone created by a surfacing whale, it would depart the area immediately at a safe, slow speed.
5. For dredging operations at night, the work area would be lit well enough to ensure that the observer/lookout can perform his/her work safely and effectively and that all mitigation measures can be performed to the extent practicable.
6. NASA would require its dredging contractor to provide information regarding whale sightings. This information would be reported to NMFS' Protected Resources Division Section 7 Coordinator.

In accordance with the ESA, NASA would reinitiate formal consultation with USFWS or NMFS when: 1) the amount of extent of incidental take is exceeded; 2) new information reveals that the agency action may affect listed species or critical habitat in a manner or to an extent not considered in the BO; 3) the action is subsequently modified in a manner that has an effect on the listed species or critical habitat not considered in the BO; or 4) a new species is listed or critical habitat designated that may be affected by the SRIPP. Additionally, in its 2010 BO, USFWS clearly states that any incidental take authorization is only applicable to the initial beach construction and seawall extension. As such, NASA would reinitiate consultation with USFWS for subsequent renourishment cycles. Although the NMFS BO addresses the SRIPP in its 50-year entirety, NASA would continue to coordinate with the agency prior to each renourishment cycle to ensure the BO's validity.

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5.1.3 Essential Fish Habitat

Dredging at the proposed borrow sites would be conducted in a manner generally consistent with the recommendations made in two recent MMS publications examining the dredging of offshore shoals in the mid-Atlantic (CSA International, Inc. et al., 2009 and Dibajnia and Nairn, 2010). These recommendations include targeting depocenters for extraction, avoiding active erosional areas, shallow dredging over large areas rather than deep pits, dredging shoals in less than 30 m (98 ft) of water, and avoiding longitudinal dredging over the entire length of shoal.

More specifically, for initial fill:

- NASA would target Shoal A sub-area A-1 (an accretional area) for initial fill. Shoal A sub-area A-2 would only be used during off-nominal conditions;
- Dredging would be uniform over a large area and would not create deep pits;
- Cut depth would not be excessive at approximately 2-3 m (6.6-9.8 ft); and
- Dredging would not occur over the entire length of the shoal.

To stabilize the dune area and reduce borrow requirements (and potential effects on offshore shoals), NASA would plant the dunes with native vegetation and install sand fencing to trap windblown sand.

More detail on NASA's dredging plan is included in Appendix J. NASA would follow the same general dredging guidelines for planning renourishment fill cycles as for initial fill and would consider use of either Shoal A or Shoal B for offshore borrow material. Because specific details on the use of either offshore shoal would be developed in the future once actual renourishment volume requirements are known, NASA would continue to coordinate and consult with NMFS throughout the 50-year life of the SRIPP to avoid and minimize impacts on EFH.

5.1.4 Cultural Resources

It is unknown at this time what methods and exact locations a contractor may use to pump sand from dredge barges to Wallops Island. Because these methods may affect unidentified cultural resources, NASA would consult with VDHR prior to pump-out operations. NASA's contractor would supply NASA with a dredge plan prior to implementation, which NASA would review with VDHR and jointly decide whether further investigation is required and, if warranted, agree on a survey method. If underwater resources are discovered during the survey, they would be reported to VDHR along with a proposed avoidance buffer. VDHR's concurrence with the survey report would conclude the Section 106 process. In the event that previously unrecorded historic properties are discovered during project activities, NASA would stop work in the area and contact VDHR immediately.

If an unanticipated discovery of archaeological resources would occur at either of the offshore shoals within BOEMRE's jurisdiction, the dredge would immediately halt operations within 305 m (1,000 ft) of the area of the discovery. NASA would report the discovery to the Regional Supervisor, Leasing and Environment, Gulf of Mexico Region within 72 hours of discovery. The Regional Supervisor would then inform NASA as to how to proceed.

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5.2 MONITORING

NASA would implement a monitoring program that focuses on three areas of the SRIPP; threatened and endangered species, the beach profile, and offshore shoals. The purpose of the monitoring program is to; (1) determine potential impacts to threatened and endangered species from the various components of the program, (2) evaluate the post-construction performance of the seawall extension and beach fill, (3) identify the need for beach renourishment and the quantity of material needed, and (4) assess the bathymetric changes to the sand shoal(s) after dredging.

NASA would ensure that the monitoring program is implemented by appropriately qualified, experienced personnel.

5.2.1 Threatened and Endangered Species

5.2.1.1 Seawall Extension and Sand Placement

In addition to complying with USFWS' required mitigation measures, NASA would employ a trained observer to monitor the area daily during when sand placement activities are within Piping Plover or sea turtle nesting season to ensure that impacts are avoided or minimized. When work on the beach overlaps sea turtle or Piping Plover nesting season, daily monitoring would be conducted within the first several hours of sunrise by an observer trained in accordance with NASA's Protected Species Monitoring Plan (NASA, 2010c). Monitoring would occur at least within a 300 m (984 ft) buffer of construction activities during Piping Plover and sea turtle nesting season to ensure Piping Plovers and sea turtles are not directly affected by construction activities. If any Piping Plover or sea turtle nests are detected within the proposed work area, NASA would avoid the area until it has coordinated with USFWS to employ site-specific measures to minimize potential effects.

Potential habitat areas for seabeach amaranth would be surveyed immediately prior to renourishment or sand removal activities at the north end of Wallops Island to ensure that the species is not present. In the event that the seabeach amaranth is encountered during project activities, NASA would work with USFWS to ensure appropriate measures are taken to protect the species and its habitat.

5.2.1.2 Dredging Operations

An NMFS-approved observer would be on board the dredging vessel for any dredging occurring between April 1 and November 30. This experienced endangered species observer would monitor dredging operations for evidence of sea turtle takes and would advise the vessel operator to slow the vessel or maneuver safely when sea turtles or marine mammals are spotted to further reduce the potential for interaction with vessels. A lookout/bridge watch would be present on the dredge at all times from December 1 through March 31 to alert the captain when a listed whale is spotted within 1 kilometer (km) (0.62 mi) of the dredge.

5.2.1.3 North Wallops Island Excavation

As there is currently a bald eagle nest on north Wallops Island, NASA would survey an area 200 m (660 ft) around the proposed work site to determine the presence of additional nests. If nests are identified, NASA would consult with USFWS and VDGIF to minimize effects. Additionally, when more specific plans for excavation at the north end of Wallops Island are

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known in the future (based on monitoring of the shoreline as described in Chapter 5 of this PEIS), NASA would conduct surveys for other protected species, consult with NMFS, USFWS, and VDGIF, and prepare the appropriate level of NEPA documentation prior to excavation.

5.2.2 Beach Profile

As funding allows, NASA would conduct pre- and semi-annual post-construction monitoring in the designated shoreline monitoring area following the initial beach fill. NASA would conduct combined subaerial (above water) and subaqueous (below water) monitoring surveys along the Wallops Island shoreline.

The objective of the annual beach profile post-construction monitoring program would be to evaluate the post-construction performance of the seawall extension and beach fill project. This evaluation would also be used to identify the need for beach renourishment.

The monitoring program would consist of data collection, including subaerial beach cross-section surveys, subaqueous beach profile surveys, aerial photographs, and storm data summaries. The monitoring program would also compare the post-construction data with the pre-construction data and evaluate the performance of the project.

The horizontal and vertical survey datums would adhere to Virginia State Plane Coordinate System, South Zone, North American Datum 1983/1993 (High Accuracy Reference Network) U.S. Survey Feet and North American Vertical Datum 1988, U.S. Survey Feet, respectively. The vertical accuracy for the survey would be International Hydrographic Organization Order 1 (standards of accuracy recommended for coastal areas with depths up to 100 m [330 ft] and sand or silt bottoms).

Consistent with the SRIPP adaptive management framework, beach profile monitoring protocol could be modified in the future based upon such factors as project performance or changes in technology. Additionally, more specific details regarding the monitoring protocol outlined in this section would be developed by the survey team prior to commencing work.

5.2.2.1 Pre-Construction

NASA would conduct a survey of the pre-construction profile baseline of the expanded project monitoring area. The expanded project monitoring area would be along the lengths of Wallops and Assawoman Islands, starting 0.8 km (0.5 mi) north of Chincoteague Inlet at the north to Gargathy Inlet at the south, a distance of approximately 29 km (18 mi). In the cross-shore direction, the survey elevation data would extend from behind the proposed dune line to seaward of the depth of closure (estimated to be at approximately -4.5 to -6 m (-15 to -20 ft) MLW). Near Chincoteague Inlet the ebb shoal complex creates a large shallow offshore area; therefore, surveys in this area would extend a maximum of 3.2 km (2 mi) offshore if the depth of closure is not reached.

Sufficient control points would be established to cover the entire expanded monitoring area and be able to support future long-term post-construction monitoring program needs. The control points would consist of 72 pipe benchmarks at intervals of 457 m (1,500 ft) along the monitoring baseline. The baseline would be located to maximize the survival of the pipe benchmarks during severe storm events. The benchmarks would be 3.8 cm (1.5 in) galvanized pipes driven into the beach to a depth of about 1.8 m (6 ft) and extending upward above the sand level approximately 0.6 m (2 ft) with a threaded cap on top. Vertical elevation of the tops of the pipes and horizontal 8-9

Mitigation and Monitoring

coordinates would be required for the pipe benchmarks. Control point number, elevation data, and horizontal coordinates would be engraved on the threaded cap.

NASA would perform beach cross-section surveys along new and/or previously established baselines on set stations every 152 m (500 ft) from Chincoteague Inlet to Assawoman Inlet and every 305 m (1,000 ft) from Assawoman Inlet to Gargathy Inlet and from Chincoteague Inlet to 0.8 km (0.5 mi) north of Chincoteague Inlet. The beach survey would extend from the baseline, offshore to a depth of -1.5 m (-5 ft) MLW, except in the seawall area where the beach survey would extend from the baseline to the seaward edge of the existing seawall crest. The profile surveys would locate the Mean High Water Level (MHWL) at each profile. Additional "spot shots" would be taken between profiles to locate the MHWL between profiles.

Beach survey data would be processed in Computer-Assisted Design (CAD), Beach Morphology Analysis Package (BMAP), and xyz formats.

To compare the accuracy of LiDAR data to that collected by the more traditional survey methods, NASA would obtain pre-construction LiDAR topographic survey data (subaerial only) provided by a qualified LiDAR survey contractor over the full extended monitoring area. The LiDAR topographic survey would be conducted concurrently with the pre-construction beach profile survey and would encompass the land area from the profile baseline and seaward to include the beach and the seawall. The vertical accuracy for the survey would be International Hydrographic Organization Order 1. The LiDAR survey data would be processed in CAD and xyz formats such that profiles and MHWL location could be established and compared with those established by the land-based survey. Decisions regarding the need for additional LIDAR surveys would be based on this evaluation.

NASA would obtain an initial set of digital geographically referenced color orthophotographs over the full extended monitoring area (29 km [18 mi] +/-). The intent of the orthophotographs would be to supplement the shoreline location between the beach profile survey points and to visually identify changes in the shoreline and beach area. The photographs would be taken at the same time of year that beach profile data would be collected. Aerial targets would be set by NASA at each baseline point prior to the aerial photography flight. The aerial photography flight and data collection would be conducted during mean lower low water as determined by the tidal gauge located at the Chincoteague USCG Station. The scale of the digital photographs would be 1:24,000. Rectified orthophotograph files would be combined with the beach profile files and the hydrographic survey files to create a single survey data file and shoreline change analysis of the entire area. Monitoring program shorelines and shoreline data available from other sources (e.g., NPS, NOAA, and USACE) would be directly imported into a shoreline change program (e.g., U.S. Geological Survey's Digital Shoreline Analysis System, BMAP, and others) for analysis of patterns and trends.

Profile Comparisons

The USACE's BMAP within Coastal Engineering and Design Analysis System (CEDAS) would be used for initial profile comparisons and analyses. Once the surveying data are compiled, the new survey profiles developed by combining the beach cross-sections, the offshore hydrographic survey, and the new profiles developed from the LiDAR survey would be overlaid on previous survey profiles, and the proposed authorized template profile to evaluate relative differences. Using BMAP, the following shoreline position and volumetric calculations would be performed:

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- Shoreline change at mean high water;
- Shoreline change at the design berm elevation;
- Volume change between overlapping extents of new and previous survey profiles; and
- Volume surplus/deficit between the new survey profiles and the proposed authorized beach fill template.

5.2.2.2 Post-Construction

NASA would perform a combined subaerial and subaqueous monitoring survey in the project monitoring area along the lengths of Wallops and Assawoman Islands, starting 0.8 km (0.5 mi) north of Chincoteague Inlet at the north to Gargathy Inlet at the south, a distance of approximately 29 km (18 mi). In the cross-shore direction, the survey elevation data would extend from behind the dune line to seaward of the depth of closure, estimated to be at approximately -4.5 to -6 m (-15 to -20 ft) MLW. Near Chincoteague Inlet, the ebb shoal complex creates a large, shallow, offshore area; therefore, surveys in this area would extend a maximum of 3.2 km (2 mi) offshore if the depth of closure is not reached.

NASA would perform two beach cross-section surveys each year of the post-construction monitoring program. The first survey would likely be a Pre-Winter Survey (i.e., October) and would include beach cross-sections along the previously established baseline on set stations every 152 m (500 ft) from Chincoteague Inlet to Assawoman Inlet and every 305 m (1,000 ft) from Assawoman Inlet to Gargathy Inlet, and from Chincoteague Inlet to 0.8 km (0.5 mi) north of Chincoteague Inlet. This survey would be completed as soon as practicable following completion of the initial beach fill. The second survey would be a Post-Winter Survey (i.e., April) and would include beach cross-sections along the previously established baseline on set stations every 152 m (500 ft) from 0.8 km (0.5 mi) south of the south end of the beach fill placement to 0.8 km (0.5 mi) north of the north end of the beach fill placement. The profile surveys would locate the MHWL at each profile. Additional "spot shots" would be taken between profiles to locate the MHWL between profiles. The beach cross-section surveys would extend from the baseline and offshore to a depth of -1.5 m (-5 ft) MLW. Beach survey data would be processed in CAD, BMAP, and xyz formats.

NASA would perform two offshore hydrographic surveys each year of the monitoring program. The first survey would be a Pre-Winter Survey (i.e., October) and would include hydrographic survey profiles along the previously established baseline on set stations every 152 m (500 ft) from Chincoteague Inlet to Assawoman Inlet and every 305 m (1,000 ft) from Assawoman Inlet to Gargathy Inlet, and from Chincoteague Inlet to 0.8 km (0.5 mi) north of Chincoteague Inlet. The survey would be conducted as soon as practicable following completion of the initial beach fill. The second survey would be a Post-Winter Survey (i.e., April) and would include hydrographic survey profiles along the previously established baseline on set stations every 152 m (500 ft) from 0.8 km (0.5 mi) south of the south end of the beach fill placement to 0.8 km (0.5 mi) north of the north end of the beach fill placement. The hydrographic survey would be conducted using a single-beam echosounder collecting data along transect lines as described above. The offshore survey would extend from -1.2 m (-4 ft) MLW to the depth of closure -4.5 to -6 m (-15 to -20 ft) MLW. If possible (weather permitting), the hydrographic survey would be conducted within 2 weeks of the beach survey. Bathymetric survey data would be processed in CAD, BMAP, and xyz formats.

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NASA would obtain two sets of geographically referenced digital color orthophotographs each year of the monitoring program. The first set of photographs would be Pre-Winter photographs (i.e., October) over the full extended monitoring area (0.8 km [0.5 mi] north of Chincoteague Inlet and south to Gargathy Inlet). The second set of photographs obtained would be Post-Winter photographs (i.e., April) over the full extended monitoring area. The photographs would be taken at the same time of year that beach profile data would be collected. Aerial targets would be set at selected baseline points prior to the aerial photography flight. The aerial photography flight and data collection would be conducted during MLW as determined by the tidal gauge located at the Chincoteague USCG Station. The scale of the digital photographs would be 1:24,000. The rectified orthophotograph files would be combined with the beach profile files and the hydrographic survey files to create a single survey data file and shoreline change analysis of the entire area. Monitoring program shorelines and shoreline data available from other sources (e.g., NPS, NOAA, and USACE) would be directly imported into a shoreline change program (e.g., U.S. Geological Survey's Digital Shoreline Analysis System, BMAP, and others) for analysis of patterns and trends.

Profile Comparisons

The BMAP tool of USACE's CEDAS would be used for initial profile comparisons and analyses. Once the surveying data are compiled, the new survey profiles would be overlaid on previous survey profiles and the authorized template profile to show relative differences. Using BMAP, the following shoreline position and volumetric calculations would be performed:

- Shoreline change at mean high water;
- Shoreline change at the design berm elevation;
- Volume change between overlapping extents of new and post-fill survey profiles; and
- Volume surplus/deficit between the new survey profile and the assumed authorized beach fill template.

Storm Data Collection

NASA would collect storm data for each moderate to severe storm event affecting the project. The data would include type of storm, date and duration, wind data from the National Climatic Data Center, tide and surge data, wave data, air temperature and pressure, wind speed and direction, wind gust, and sea surface temperature from the National Data Buoy Center. This data would be collected for all monitoring years and included in an annual summary report and related mapping. Field visits to the project area would also be conducted to evaluate the storm impacts on the project area. Formal subaerial and subaqueous post-storm surveys (comparable to those described above under pre-and post-construction monitoring) would be conducted as practicable.

Shoreline and Volumetric Change

In addition to relative profile comparisons, the shoreline and volumetric change based on three-dimensional surfaces of the study area within a GIS environment would be evaluated. These types of analyses expand on the two-dimensional profile comparisons and are recommended for identifying areas of concern along the shoreline and evaluating sediment transport trends. New

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survey data would be incorporated into GIS to allow mapping and further analysis of shoreline and volumetric change. This includes developing a digital terrain model from the new survey data. Shoreline positions would be extracted from the digital terrain model and plotted in GIS for comparison with historical shoreline positions. Additionally, volume change grids would be calculated to plot the morphologic changes in relative survey periods. Color-shaded grids showing areas of erosion and accretion within the nearshore study area would be developed from the three-dimensional comparisons. The pre-construction LiDAR data would be processed and included as part of the analysis.

5.2.2.3 Project Design Life Analysis

Based on results of shoreline change and volume analyses, areas of concern in the study area would be identified. The results of the analyses would be used to evaluate performance of the beach nourishment project and to determine maintenance areas for future renourishment.

5.2.2.4 Monitoring Summary and Mapping

A report summarizing the data collection, coastal engineering analyses, observed trends from the shoreline change and volumetric change analyses, project design life estimates, identified areas of concern, statement of overall quantity needed to bring the entire beach up to the template, and recommended future work would be prepared semi-annually. The following items would also be included in the summary report:

- Profile comparison plots with summarized results (e.g., shoreline change, volume change)
- Large-scale map(s) showing relative shoreline positions and corresponding shoreline change rates for the reporting period
- Large-scale map(s) showing volumetric change over the study area extent

NASA would share all monitoring results and reporting with resource agencies and any other interested parties. This report would be used to assess the project performance with respect to storm damage protection and sand loss. Replenishment of the sand fill would be needed at intervals that would be determined by the monitoring measurements. When the trends in the volume changes indicate that a minimum fill volume is being approached it would be necessary to plan for such a renourishment operation.

It is expected that the sand placed on the beach would disperse over time to the south, to the north, and offshore. The relative rates of these losses would also be determined from interpretation of the monitoring data. These results would be reviewed in each of the monitoring reports to determine whether project modifications could be developed to reduce the rates of loss or to likewise lower maintenance costs. For example, it may be shown that the dominant net sand transport accounting for the overall fill volume loss is in a longshore direction. Based on the present understanding of the coastal system, once the fill is placed, this net direction could be to either the north or the south. It may be shown that a sand retention structure could be located adjacent to, or nearby, the placement area to help retain the sand or to capture the escaping sand so that it could be episodically returned with appropriate equipment. The monitoring would be used to determine whether such a structure would be effective to the north or south of the fill. If a comparison with the existing project maintenance practice shows that such a structure would be cost-effective in reducing the need for renourishment sand from the offshore shoals then a modification to the preferred option may be considered. Such a development would require additional NEPA analysis, agency consultation, and permitting.

5.2.3 Offshore Shoals

NASA would provide NMFS pre- and post-borrow bathymetric maps of the dredged areas. The post-borrow survey would be performed soon after dredging was completed, likely not more than 2 weeks after completion of the initial fill phase of the project. NASA would follow standard USACE bathymetric survey procedures as stated in USACE survey manual publication number EM 1110-2-1003 (USACE, 2002). Survey data would be provided to interested resource agencies as soon as practicable thereafter. Future plans for dredging would be based on an assessment of bathymetric changes of the shoals between dredging cycles.

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Permit # 18-1590

Commonwealth of Virginia
Marine Resources Commission
Authorization

A Permit has been issued to:

NASA - Wallops Flight Facility
Attn: Mr. Paul Bull
Building N-161, Code 228
Wallops Island, VA 23337

The Permittee is hereby authorized to:

install two (2) sets of three (3) approximately 130-foot long stone offshore breakwaters and place approximately 1.3 million cubic yards of sandy beach nourishment material landward of the breakwaters along approximately 19,850 feet of shoreline, situated along the Atlantic Ocean on and adjacent to Wallops Island. The sandy material will be mined from the north end of Wallops Island where the original nourishment has accreted due to longshore transport.

Issuance Date: April 25,0 2019

Expiration Date: January 22, 2024

Commissioner or Designee

This Notice Must Be Conspicuously Displayed At Site Of Work

APPENDIX D
FEDERAL CONSISTENCY DETERMINATION

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FEDERAL CONSISTENCY DETERMINATION FOR THE SHORELINE ENHANCEMENT AND RESTORATION PROJECT ENVIRONMENTAL ASSESSMENT

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION GODDARD SPACE FLIGHT CENTER

WALLOPS FLIGHT FACILITY WALLOPS ISLAND, VA 23337

INTRODUCTION

The National Aeronautics and Space Administration (NASA) has prepared an Environmental Assessment (EA) to evaluate the potential environmental impacts from proposed enhancement and restoration of the Wallops Island shoreline at NASA's Goddard Space Flight Center Wallops Flight Facility (WFF), Wallops Island, Virginia. The Shoreline Enhancement and Restoration Project EA evaluates the Proposed Action to renourish the beach along the Wallops Island shoreline infrastructure protection area. Before the renourishment, NASA may construct a series of parallel nearshore breakwater structures that would reduce the intensity of wave action and slow sediment transport. The Shoreline Enhancement and Restoration Project EA was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S. Code 4321-4347), the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508), NASA's regulations for implementing NEPA (14 CFR Subpart 1216.3), and the NASA Procedural Requirements (NPR) for Implementing NEPA and Executive Order (EO) 12114 (NPR 8580.1).

This document provides the Commonwealth of Virginia with NASA's Consistency Determination under Coastal Zone Management Act Section 307(c)(1) and Title 15 CFR Part 930, Subpart C, for enhancing and restoring the Wallops Island shoreline analyzed in the NASA WFF Shoreline Enhancement and Restoration Project EA. The information in this Consistency Determination is provided pursuant to 15 CFR Section 930.39.

NASA requested the cooperation of Bureau of Ocean Energy Management (BOEM) and the United States Army Corps of Engineers (USACE), Norfolk District in preparing the Shoreline Enhancement and Restoration Project EA and this Consistency Determination, because they possess regulatory authority or specialized expertise pertaining to the Proposed Action. The EA is being developed to fulfill each Federal agency's obligations under NEPA and the Coastal Zone Management Act (CZMA). NASA, as the WFF property owner and project proponent, is the lead agency and responsible for ensuring overall compliance with applicable environmental statutes, including NEPA and the CZMA.

BACKGROUND

Some of NASA's and the Commonwealth of Virginia's most critical launch assets, including Mid-Atlantic Regional Spaceport Launch Complex 0 and multiple sounding rocket pads are located along the Wallops Island shoreline infrastructure protection area.

On December 13, 2010, NASA issued a Record of Decision (ROD) for its *Final Programmatic Environmental Impact Statement Wallops Flight Facility Shoreline Restoration and Infrastructure*

Protection Program[3]. In its ROD, NASA selected for implementation Alternative 1: Full Beach Fill, Seawall Extension and adopted a suite of mitigation and monitoring protocols to both reduce potential environmental impacts and track project performance. Implementing the initial phase of Alternative 1 entailed: 1) the placement along the Wallops Island shoreline of approximately 3.2 million cubic yards of sand dredged from Unnamed Shoal A, located on the Outer Continental Shelf (OCS) under BOEM jurisdiction, located in the Atlantic Ocean; and 2) an initial 1,430-foot southerly extension of the Wallops Island rock seawall with future extensions completed on a funds-available basis to a maximum length of 4,600 feet. The ROD stated that fill material for future renourishment cycles could be taken from either Unnamed Shoal A, Unnamed Shoal B, or north Wallops Island beach and left the specifics of how and when the fill material was obtained to be addressed in future action-specific NEPA documentation. After issuing its ROD and securing necessary permits, NASA and its technical partner, the U.S. Army Corps of Engineers (USACE), Norfolk District, oversaw the construction of the project between April and August 2012.

In October 2012, Hurricane Sandy made landfall. Monitoring surveys following the storm event identified the need to repair a section of the seawall and the southern two-thirds of the recently nourished beach. Public Law 113-2, *Disaster Relief Appropriations Act, 2013*, was signed into law on January 29, 2013. The bill included a provision for NASA to repair facilities that sustained damage during the Hurricane. NASA signed a Finding of No Significant Impact (FONSI) on June 6, 2013, for the *Wallops Island Post-Hurricane Sandy Shoreline Repair Final Environmental Assessment*[4]. Repairs to the seawall and beach renourishment were completed in September 2014. Subsequent storms including Hurricane Joaquin in 2015 and Winter Storm Jonas in 2016 reduced the sand volume in the southern portion of the project area by an average of 1,014,337 cubic yards as compared to volumes present after 2014 shoreline repair (USACE 2018a). Additional sand volume reduction occurred most recently in 2018 with Winter Storm Riley.

NASA and USACE have sponsored biannual (spring and fall) topographic and hydrographic monitoring surveys of the Wallops Island shoreline. The most recent survey was completed in fall of 2017. Data indicate that a notable portion of the land surface sand relocated by storm winds and waves has been transported to the north end of Wallops Island. The effects of storms are most apparent within the southern half of the Wallops Island beach, where many of the most critical launch assets are located. Within this area, the seaward half of the beach berm has been lowered by up to 3 feet or more. As such, the beach berm and dune system can no longer provide the level of storm damage reduction to which it was originally intended and must be restored to regain full functionality.

DESCRIPTION OF THE PROPOSED ACTION

Approximately 1.3 million cubic yards of sand would be needed to renourish the shoreline infrastructure protection area. Upon receipt of all necessary authorizations, NASA would contract for the placement of the sand material that would be taken from either 1) north Wallops Island beach (i.e., backpassed), an area that has been accreting due to transport of material from the south or 2) Unnamed Shoal A, an offshore sand ridge located in the OCS at the southern end of the Assateague ridge field which was used as a sand

[3] The *Final SRIPP PEIS* is available online at: https://code200-external.gsfc.nasa.gov/250-wff/programmatic-environmental-impact-statement-shoreline-restoration-and-infrastructure-protection

[4] The *Final Post-Sandy EA* is available online at: https://code200-external.gsfc.nasa.gov/250-wff/wallops-island-post-hurricane-sandy-shoreline-repair-final-environmental-assessment-fea-and-finding.

source for previous renourishment projects. Under either of the sand placement alternatives, a series of nearshore detached parallel breakwaters may be constructed prior to renourishment of the Wallops Island shoreline.

Sand Backpassed from North Wallops Island Beach

An estimated 1.7 million cubic yards of sand is available at the north Wallops Island beach, toward the 1.3 million cubic yards required. Based on vegetation and wildlife habitat constraints (such as avoiding areas of most dense vegetation and bird and sea turtle nesting season), the total potential area for sand removal is approximately 200 acres. Excavation depth would be to an average of -2.35 feet above mean sea level.

A pan excavator would likely be used to remove the sand from the north Wallops Island beach borrow area. The pan excavator 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. Other onshore equipment may include all-terrain vehicles (ATV), an office trailer, mobile generators, construction site lighting, and mobile fuel tanks. 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. Prior to excavation, a pre-project topographic and hydrographic survey would be conducted. Multiple survey crews would employ ATVs and light trucks to conduct pre-project surveys of the project site.

It is expected that the sand backpassing and spreading work would take **3** months to complete. When completed, NASA would replant the dunes.

Sand Dredged from Unnamed Shoal A

In 2010, up to 515 acres of the shoal (sub-area A-1) were dredged for the initial beach fill cycle and an additional 800,000 cubic yards were dredged from the same area (sub-area A-1) for the post-Hurricane Sandy repairs.

Given the distance of the borrow area (Unnamed Shoal A) from Wallops Island, it is expected that the contractor would again use one or more trailing suction hopper dredges to obtain the sand material. Because of overflow from the hopper dredge at the offshore borrow area 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. Assuming a conservative 25 percent loss of the 1.3 million cubic yards required, the dredged volume for the proposed renourishment would be approximately 1.625 million cubic yards.

Nearshore, it is expected that the contractor would require one or more anchored pumpout stations approximately 2 miles east of Wallops Island in 25 to 30 feet of water. Up to several miles of submerged steel pipeline would be temporarily placed on the seafloor and would be the conduit by which the sand/water slurry would be pumped from the dredge to the beach. Once discharged onto the beach, bulldozers would grade the material to the design template which is proposed to include an additional foot of berm elevation as compared to the initial beach fill. The time in the tidal cycle would factor into the location on the beach within which the equipment would work for a given dredge load. During low tide, the equipment would likely concentrate on the intertidal and subtidal zones, whereas during high tide, work would be focused on the upper beach berm and dune. After each section of beach is confirmed to meet design criteria, the process would continue in the longshore direction, with sections of discharge pipe added as it progresses.

It is expected that the dredging and beach fill work would take 3 months to complete. When completed, NASA would replant the dunes with vegetation.

Nearshore Detached Parallel Breakwaters

A series of rubble mound breakwaters would be constructed approximately 200 feet offshore from the renourished shoreline mean high water line. Each breakwater would be constructed of Virginia Department of Transportation (VDOT) Type I stone for the outer layer which ranges from 0.75 to 2 tons and VDOT Class II Stone for the core layer which range from 150 to 500 pounds. All stone would be placed parallel to the shore on top of approximately 130 feet long of prefabricated geotextile marine mattresses, placed approximately 100 feet apart from each other. The breakwaters would measure approximately 10 feet wide at top crest elevation. Water depths in these areas is approximately 4 to 8 feet. The breakwaters would be placed offshore of Launch Pad 0-B and continue north to the Horizontal Integration Facility (HIF); Building X-079. Depending upon economic, engineering, and environmental factors, the initial series may be broken into smaller series (e.g., three breakwaters offshore of Launch Pad 0-A and another three offshore of the HIF). The rocks for constructing each breakwater would be transported to the WFF area by rail, offloaded, and then trucked to the handling or placement site on Wallops Island. The breakwater construction would take place in the water using a barge and heavy lifting equipment.

It is expected that breakwater construction would take approximately 6 to 9 months to complete. Breakwater construction would be completed prior to renourishment of the shoreline infrastructure protection area.

Effects to Resources

NASA has determined that implementing the Shoreline Enhancement and Restoration Project EA would affect resources of Virginia in the following manner:

Coastal Geology and Processes

Nearshore - Renourishment of the beach at the southern end of the Wallops Island would result in a new shoreline extending several hundred feet offshore from the current shoreline. The new beach profile would provide increased wave dissipation and added protection for the onshore infrastructure from storm events. Over time, the new beach would be reshaped; the profile would shift with seasonal differences in wave action. Higher wave energy during the winter would likely steepen the beach profile with some of the sand moved offshore into a bar system. Lower wave energy during the summer months would tend to flatten out as sand from the offshore bar system is moved back onto the beach face. The onshore-offshore beach dynamics would also be influenced by the littoral transport of the sand both to the north and to the south depending upon the direction of incident wave action. Transport to the north should be recaptured at the north end as wave action is diminished in the lee of Assateague Island. Transport to the south would eventually provide additional sand resources to the barrier islands south of Wallops Island. Parallel breakwaters in conjunction with beach renourishment would help provide an increased level of shoreline protection with the minimum possible impact on shoreline processes.

Offshore - The removal of material from Unnamed Shoal A would be done in a uniform manner across the areal extent of sub-area A-1. As such, approximately two-thirds of the southern half of the shoal's elevation would be lowered by an additional 1.5 to 3 feet, with some areas approaching an additional 10 feet below the current profile. As proposed, the elevation of the northern portion of the shoal (sub-area A-2) would remain the same. The conservative model-based analysis performed for the *2010 Final SRIPP PEIS* indicated that even when a 2 square mile area of the shoal was "planed" to an elevation necessary to obtain up to 10 million cubic yards 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 additional lowering of the shoal would cause any measurable reduction in wave sheltering effects on properties to the west of the borrow area.

Water Quality

Nearshore - The beach fill material from the north Wallops Island beach has a grain size appropriate for use for renourishment. It is expected that the turbidity plume generated at the placement site would be comparable to those reported in similar projects: concentrated within the swash zone, dissipating between 1,000 to 2,000 feet alongshore; and short term, only lasting several hours. Offshore impacts to water quality could result from breakwater construction. Localized turbidity would be expected from placement of stone onto the sandy bottom during breakwater construction; the impact would be of short duration and not adverse.

Offshore - Dredging operations would cause sediment to be suspended in the water column. Studies of past projects indicate that the extent of the sediment plume is generally limited to between 1,640 to 4,000 feet from the dredge. The length and shape of the plume depends on the hydrodynamics of the water column and the sediment grain size. Given that the dominant substrate material at the borrow site is sand, it is expected to settle rapidly and cause less turbidity and oxygen demand than finer-grained sediments would cause. No appreciable effects on dissolved oxygen, pH, or temperature are anticipated because the dredged material has low levels of organics and low biological oxygen demand. Additionally, dredging activities would occur within the open ocean where the water column is subject to constant mixing and exchange with oxygen rich surface waters. Turbidity resulting from the dredging 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.

Air Quality

Emissions from earthmoving equipment used during sand excavation from north Wallops Island beach and placement along the shoreline infrastructure protection area, barge activities (dredging and transport), and equipment used in the transport and construction of nearshore breakwaters are not anticipated to cause significant impacts to air quality. GHG emissions generated alone would not be enough to cause global warming, in combination with past and future emissions from all other sources, they would contribute incrementally to the global warming that produces the adverse effects of climate change.

Noise

The operation of heavy equipment would be the primary source of project related noise. Wind and surf conditions would play a major role in dictating the distances at which the construction-related sounds could be heard by nearby receivers. Localized impacts would occur during sand excavation, movement and placement and construction of the breakwaters, but they would not be expected to be substantial.

Localized impacts on marine mammals from noise associated with vessel activities (dredging) and construction of breakwaters would be anticipated but any impacts would be temporary and not adverse.

Benthos

Benthos living in the sandy beach area of north Wallops Island beach would experience direct mortality from sand removal and relocation. The physical oceanographic conditions would be essentially unchanged, and after the renourishment reaches equilibrium, there would be no net change in the physical environment available for benthos. It is expected that organisms from adjacent areas would recolonize the new beach in 6 to 12 months after project completion. Minimal impacts to benthos during breakwater construction; minimal benefits post-construction as the breakwaters could provide attachment points as well as refuge and cover.

Bottom dwelling benthic organisms (most commonly the horseshoe crab, whelk, and blue crabs) would become entrained in the dredge. Because of the dynamic nature of nearshore benthic communities and their variability over time, the recovery of benthos at offshore borrow areas varies. Given that Unnamed Shoal A consists of fine to medium sand, benthos recovery would be approximately several months to two years.

Wildlife

Temporary noise and visual disturbances could adversely affect beach foraging and nesting birds and sea turtles during sand excavation and placement and breakwater construction. Due to the nesting cycle of potentially affected species, the possibility of adverse effects would be greatest should the work occur between the months of April and September. If work were to be conducted between the months of April and September, NASA would ensure that the work site and adjacent areas are surveyed for nesting birds and sea turtles by a biological monitor on a daily basis.

Topography of Unnamed Shoal A would not substantially change though the additional dredging would increase the water depths at the borrow area. Diving bird species could still effectively forage on the shoal; however, forage sources would be suppressed for several seasons post-dredging. Both adjacent undisturbed areas on Unnamed Shoal A and neighboring shoals would provide adequate forage should seabirds avoid the directly affected area. Impacts from disturbance would be limited to the anticipated 3-month active dredging phase.

Fisheries and Essential Fish Habitat

Turbidity and water quality stressors imposed on intertidal and subtidal fishery species and EFH would be moderate and episodic for the duration of the project. Construction equipment and materials would displace water column EFH, fish species, and their prey. The adverse impact would be concentrated within the swash zone, projected to dissipate approximately 1,000 to 2,000 feet alongshore, and projected to last only several hours after cessation of work. Physical strike and disturbance stressors would be limited to vehicles operating in the surf zone.

Approximately 206 acres of offshore shoal habitat would be affected. Absolute mortality of sessile species (organisms attached to substrate) in the project area; potential mortality to motile species from entrainment into the sand excavation equipment. Most motile fishery species would be displaced. Displacement would range from temporary to long term, and most consequences would be temporary or short term.

Marine Mammals

Potential adverse impacts to marine mammals would be associated with physical disturbance to habitats during dredging and fill, temporary increases in-water turbidity, a reduction in prey availability, vessel strike, and increased noise from vessel activities. However, given the relatively slow speed of the dredge, the limited extent of habitat affected, and with the implementation of mitigation measures described below, effects are expected to be minimal. Adverse impacts to marine mammals during breakwater construction would not be anticipated as large marine mammals would likely not be found in the shallow waters and bottlenose dolphins would avoid the noise and construction activity.

During the development of the *2013 Post-Hurricane Sandy EA*, NASA participated in a study that found in-water sounds levels associated with dredging would not reach the 190 and 180 dB root mean square (RMS) thresholds; 160 dB_{RMS} would only be reached several meters from the dredge; and 120 dB_{RMS} would be reached at between 0.1 and 1.2 miles from the dredge, depending on the specific activity within the dredging cycle. As with previous projects that involved dredging, NASA would ensure that an NMFS-approved bridge watch is stationed on each dredge at all times of year to scan the horizon for up to 1.2 miles for marine mammals. At this distance, marine mammals could be readily detected with the aid of binoculars. Should an individual be detected, the vessel would be required to turn off its pumps until the animal has left the immediate vicinity, upon which the dredging activity could resume.

Special Status Species

Potential impacts on piping plovers and red knots would include the potential for startle or disruption of foraging, reduction in prey availability, and, for piping plovers, the potential for disruption of courtship and nesting activities. Nesting sea turtles could potentially be impacted during nighttime construction activity (particularly artificial lighting) on the beach, unintentional burial of a newly dug nest if it were to go undetected, disorientation of hatchlings (due to project related light sources), or obstruction to hatchlings during their emergence and subsequent trip to the ocean. NASA would employ a biological monitor to survey the project site on a daily basis should renourishment work occur between the months of April and September to ensure and would not harvest (i.e., backpass) sand from north Wallops Island during those months, to ensure the species are not directly impacted during construction activities. Potential impacts on in-water sea turtles, Atlantic sturgeon, and the giant manta ray, and cetaceans could include entrainment in the dredge, interaction with the sediment plume, reduction in available forage, and elevate sounds levels. NASA would implement a number of measures to minimize impacts to listed species including approved observers that would be present on the dredging vessels.

Cultural Resources

All dredging, sand placement, and breakwater construction would be conducted within areas previously surveyed for cultural resources. Only the Wallops Beach Life Saving Station (DHR ID #001-0027-0100; WFF #V-065) and the Coast Guard Observation Tower (DHR ID #001-0027-0101) are considered eligible for listing in the National Register of Historic Places. Potential effects are likely to be minimal since the resources are located approximately 3,000 feet north of the area of potential effect. Previous surveys did not identify any archaeological resources. The inadvertent discovery of any previously unidentified archaeological resources would result in immediate stoppage of work and notification of the WFF Cultural Resources Manager, who would contact the Virginia Department of Historic Resources and Native American Tribes as appropriate.

Recreation Resources

Closure of the north Wallops Island beach during sand excavation would temporarily reduce recreational opportunities. Increased boat and barge traffic during excavation of material from Unnamed Shoal A and breakwater construction could limit recreational boating. A Notice to Mariners would be issued when necessary to notify boaters in advance so that they can select alternate destinations without substantially affecting their activities or experience.

Consistency Determination

The Virginia Coastal Resources Management Program contains the following applicable enforceable policies:

- **Fisheries Management**. Administered by Virginia Marine Resources Commission (VMRC) and the Virginia Department of Game and Inland Fisheries (VDGIF), this program stresses the conservation and enhancement of shellfish and finfish resources and the promotion of commercial and recreational fisheries. The State Tributyltin (TBT) Regulatory Program is also part of the Fisheries Management program. The TBT program monitors boating activities and boat painting activities to ensure compliance with TBT regulations promulgated pursuant to the amendment. The VMRC, VDGIF, and Virginia Department of Agriculture and Consumer Services share enforcement responsibilities.
- **Subaqueous Lands Management.** Administered by VMRC, this program establishes conditions for granting permits to use state-owned bottomlands.
- **Wetlands Management.** Administered by VMRC, Virginia Department of Environmental Quality (VDEQ), and the Accomack County Wetland Board, the wetlands management program preserves and protects both tidal and non-tidal wetlands.
- **Dunes and Beaches Management.** Administered by VMRC and the Accomack County Wetland Board, the purpose of this program is to prevent the destruction and/or alteration of primary dunes.
- **Non-point Source Water Pollution Control.** Administered by the Virginia Department of Environmental Quality, the Virginia Erosion and Sediment Control Law is intended to minimize soil erosion and to decrease inputs of chemical nutrients and sediments to the Chesapeake Bay, its tributaries, and other rivers and waters of the Commonwealth.
- **Point Source Water Pollution Control.** Administered by the State Water Control Board, the Virginia Pollution Discharge Elimination System and Virginia Pollution Abatement permit programs regulate point source discharges to Virginia's waterways.
- **Shoreline Sanitation.** Administered by the Virginia Department of Health, this program regulates the installation of septic tanks to protect public health and the environment.
- **Point Source Air Pollution Control.** Administered by the State Air Pollution Control Board, this program implements the Federal Clean Air Act through a legally enforceable State Implementation Plan.
- **Coastal Lands Management.** Administered by VDEQ's Office of Ecology and the Chesapeake Bay Local Assistance Department, the Chesapeake Bay Preservation Act guides land development in coastal areas to protect the Chesapeake Bay and its tributaries.

Based upon the following information, data, and analysis, NASA finds that the project activities proposed and evaluated under the Shoreline Enhancement and Restoration Project EA are consistent to the maximum extent practicable with the enforceable policies of the Virginia Coastal Resources Management Program. The following table below summarizes NASA's analysis supporting this determination.

Virginia Policy	Consistent?	Analysis
Fisheries Management	Yes	There would be short term site specific adverse effects on fish habitat within the fill placement backpassing, and breakwater construction areas due to temporary burial of existing benthic habitat and increased levels of turbidity during and immediately after sand placement. Benthic habitats would recover post-project.
Subaqueous Lands Management	Yes	The proposed renourishment would affect existing subaqueous areas in the nearshore ocean environment. Elevated turbidity in marine waters would occur during and immediately after beach fill, backpassing, and breakwater construction. Recent correspondence with VMRC indicated they would issue new permits for beach renourishment.
Wetlands Management	Yes	Project activities would not impact vegetated wetlands.
Dunes and Beaches Management	Yes	The project would restore the previously constructed dune system. As discussed above under Subaqueous Lands Management, VMRC indicated they would issue new permits for beach renourishment.
Non-point Source Water Pollution Control	Yes	Project activities have the potential to increase non-point source runoff to the Atlantic Ocean. NASA would implement appropriate best management practices to avoid these impacts.
Point Source Water Pollution Control	Yes	The project would not involve a new point source discharge to Virginia waters.
Shoreline Sanitation	Yes	The project would not involve the construction of septic tanks.
Point Source Air Pollution Control	Yes	Use of fossil fuel-burning equipment for construction of the nearshore breakwaters and the movement of sand would generate emissions of both criteria pollutants and greenhouse gases. However, the project activities would not violate Federal or Virginia air quality standards.
Coastal Lands Management	Yes	The project would not include land development activities that would impact the Chesapeake Bay or its tributaries. Moreover, although Accomack County has adopted the Chesapeake Bay Preservation Act restrictions for its seaside riparian areas, NASA's Wallops Island is specifically excluded from this overlay area.

Pursuant to 15 CFR section 930.41, the Virginia Coastal Resources Management Program has 60 days from the receipt of this letter in which to concur with or object to this Consistency Determination, or to request an extension under 15 CFR Section 930.41(b). Virginia's concurrence will be presumed if its response is not received by NASA on the 60th day from receipt of this determination. The Commonwealth's response should be sent to:

Shari A. Miller
Environmental Planning Lead
NASA Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov

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January 17, 2019

Shari Miller
ATTN: Code 250 W
National Aeronautics and Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337-5099

RE: Comments on the Draft Environmental Assessment and Federal Consistency Determination for the Wallops Flight Facility Shoreline Enhancement and Restoration Project proposed by the National Aeronautics and Space Administration, Accomack County, VA (DEQ 18-171F)

Dear Ms. Miller:

The Commonwealth of Virginia has completed its review of the above-referenced documents. The Department of Environmental Quality (DEQ) is responsible for coordinating Virginia's review of federal environmental documents submitted under the National Environmental Policy Act (NEPA) and responding to appropriate federal officials on behalf of the Commonwealth. DEQ is also responsible for coordinating Virginia's review of federal consistency documents submitted pursuant to the Coastal Zone Management Act (CZMA) and providing the state's response. This is in response to the December 2018 Draft Environmental Assessment (DEA) and Federal Consistency Determination (FCD) submitted by the National Aeronautics and Space Administration (NASA) for the above referenced project. The following agencies participated in the review of this proposal:

Department of Environmental Quality
Department of Game and Inland Fisheries (DGIF)
Department of Conservation and Recreation (DCR)
Department of Health (VDH)
Marine Resources Commission (MRC)
Virginia Institute of Marine Sciences (VIMS)

In addition, the Department of Historic Resources (DHR), Accomack-Northampton Planning District Commission and Accomack County were invited to comment on the proposal.

PROJECT DESCRIPTION

NASA proposes to conduct the Wallops Flight Facility (WFF) Shoreline Enhancement and Restoration Project on Wallops Island which fronts the Atlantic Ocean in Accomack County. The project involves the re-nourishment of the beach along the Wallops Island shoreline infrastructure protection area, utilizing approximately 1.3 million cubic yards of sand. The sand material would be taken from either the north Wallops Island beach (Alternative 1), which is an area that has been accreting due to transport of material from the south, or from Unnamed Shoal A (Alternative 2) which is an offshore sand ridge located seven miles east of Wallops Island in the outer continental shelf in the Atlantic Ocean, at the southern end of the Assateague ridge field. Unnamed Shoal A has been used as a sand source for prior re-nourishment projects (in 2012 and 2014). In addition, a series of six nearshore, detached, parallel breakwaters with a total length of 780 feet are proposed for construction approximately 200 feet offshore prior to the re-nourishment being completed (Alternative 3). Alternative 3 would be combined with Alternative 1 or 2, depending which is chosen, for the complete project scope. The DEA does not identify a preferred alternative. However, based on the information included in the Joint Permit Application (JPA) (#18-1590) that has been filed for this project and that is included as Appendix B of the DEA, a combination of Alternative 1 and 3 appears to be the de facto Preferred Alternative. Two state agencies that participated in the review of the DEA have expressed a strong preference for Alternative 2 (refer to the Preferred Alternative Recommendation section on page 19).

In addition, the DEA includes a Federal Consistency Determination (Appendix C) which finds the proposed action consistent to the maximum extent practicable with the enforceable policies of the Virginia Coastal Zone Management Program.

BACKGROUND

DEQ previously reviewed a Final Programmatic Environmental Impact Statement (PEIS) for the Shoreline Restoration and Infrastructure Protection Program (SRIPP) at Wallops Island (DEQ 10-156F) in November 2010. The purpose of the SRIPP was to reduce the potential for damage to, or loss of, existing NASA, U.S. Navy, and Mid-Atlantic Regional Spaceport assets on Wallops Island from wave impacts associated with storm events. The project involved extending the existing rock seawall a maximum of 4,600 feet south of its southernmost point and placing sand dredged from Unnamed Shoal A on the Wallops Island shoreline. The SRIPP also planned for re-nourishment cycles every five years, with a total of nine re-nourishment cycles over the 50-year lifecycle of the SRIPP. A Record of Decision (ROD) for this project was issued on December 13, 2010. In October 2012 Hurricane Sandy caused damage to the seawall and losses to the recently nourished beach. Repairs were made in September 2014, however the sand volume has been reduced by an average of 1,014,337 cubic yards compared to the 2014 sand volumes following storms in 2015 (Hurricane Joaquin), 2016 (Winter Storm Jonas) and 2018 (Winter Storm Riley). The constructed beach system has successfully reduced storm damage to the NASA Wallops Island launch range infrastructure but the seaward half of the beach berm has been lowered by more than three feet, thus reducing its effectiveness for future storm protection. The currently proposed action will address storm damage and sand loss that has occurred since the September 2014 repairs.

ENVIRONMENTAL IMPACTS AND MITIGATION

1. Surface Waters and Non-tidal Wetlands. According to the DEA (page 3-7), Alternative 1 (North Wallops Island beach borrow area) could have short-term near-shore water quality impacts related to construction activities and the potential for the accidental release of contaminants or petroleum products from construction vehicles. A turbidity plume would also be generated at the placement site. Impacts from Alternative 2 (Unnamed Shoal A borrow area) would be similar as sediment would become suspended in the water column during dredging and pump out operations. The impacts to offshore water quality are expected to be temporary. Offshore turbidity would similarly result from Alternative 3 during the breakwater construction. The DEA notes that DEQ is expected to waive the requirement for a permit in lieu of receipt of a permit from the U.S. Army Corps of Engineers (Corps) and VMRC. The FCD (Appendix C, C-11) states that vegetated wetlands will not be impacted by the project.

1(a) Agency Jurisdiction. The State Water Control Board promulgates Virginia's water regulations covering a variety of permits to include the Virginia Pollutant Discharge Elimination System Permit (VPDES) regulating point source discharges to surface waters, Virginia Pollution Abatement Permit regulating sewage sludge, storage and land application of biosolids, industrial wastes (sludge and wastewater), municipal wastewater, and animal wastes, the Surface and Groundwater Withdrawal Permit, and the Virginia Water Protection (VWP) Permit regulating impacts to streams, wetlands, and other surface waters. The VWP permit is a state permit which governs wetlands, surface water, and surface water withdrawals and impoundments. It also serves as §401 certification of the federal Clean Water Act §404 permits for dredge and fill activities in waters of the U.S. The VWP Permit Program is under the Office of Wetlands and Stream Protection, within the DEQ Division of Water Permitting. In addition to central office staff that review and issue VWP permits for transportation and water withdrawal projects, the six DEQ regional offices perform permit application reviews and issue permits for the covered activities:

- Clean Water Act, §401;
- Section 404(b)(i) Guidelines Mitigation Memorandum of Agreement (2/90);
- State Water Control Law, Virginia Code section 62.1-44.15:20 *et seq*.; and
- State Water Control *Regulations*, 9 VAC 25-210-10.

1(b) Agency Findings. The VWP program at the DEQ Tidewater Regional Office (TRO) notes that the JPA for this project was received on October 9, 2018 (#18-1590). On December 12, 2018, DEQ waived the requirement for a VWP permit pursuant to 9 VAC 25-210-220.B.

1(c) Requirement. Adhere to the VWP Waiver that has been issued for this project.

1(d) CZMA Federal Consistency. Provided the required VWP Permit Waiver is adhered to, this project would be consistent to the maximum extent practicable with the wetlands management enforceable policy of the CZM Program and the VWP Permit Program (see Federal Consistency under the CZMA section below for additional information).

2. Subaqueous Lands and Tidal Wetlands. The DEA (page 3-6) indicates that VMRC issued an extension to the existing permit 10-2003 which expires in 2021 and authorized the 2014 rehabilitation of the seawall and beach re-nourishment. Following submittal of an updated Joint Permit Application, VMRC determined that a new permit will be required for subaqueous lands impacts to include the current design for beach re-nourishment, and dredging at the north end of the Island.

The FCD (Appendix C, page C-11) indicates that nearshore subaqueous lands would be impacted by the proposal to nourish the beach and construct the breakwaters.

2(a) Agency Jurisdiction. The Virginia Marine Resources Commission regulates encroachments in, on or over state-owned subaqueous beds as well as tidal wetlands pursuant to Virginia Code §28.2-1200 through 1400. For nontidal waterways, VMRC states that it has been the policy of the Habitat Management Division to exert jurisdiction only over the beds of perennial streams where the upstream drainage area is 5 square miles or greater. The beds of such waterways are considered public below the ordinary high water line.

2(b) Agency Finding. VMRC stated that a JPA was received for this project on October 9, 2018 (JPA# 18-1590). The JPA is currently under review and any permit issued by the VMRC would specify the necessary special conditions for the project. VRMC did not indicate that tidal wetlands will be impacted.

2(c) Requirement. A VMRC permit for the submerged land encroachments is required. The applicant must adhere to any necessary special conditions included in the permit.

2(d) VIMS Finding. VIMS submitted comments to VMRC in response to NASA's JPA and provided a copy (attached) to DEQ in response to the DEA and FCD. VIMS notes that the project has the potential to alter local land and marine resources differently than would occur via natural processes. VIMS finds that the placement of the six stone breakwaters with sand nourishment landward of each structure will have a minimal direct impact on state-owned subaqueous resources. The proposed shoreline nourishment will result in temporary and minimal impacts to the littoral marine environment. VIMS concludes that minimal adverse impacts will result within the footprint of the shoreline stabilization features.

Chincoteague Inlet may be affected by the proposed sand borrowing from North Wallops Island. The mining will likely widen the inlet and result in subsequent shoaling to an unknown degree. If the sand borrowing does not occur from North Wallops Island, VIMS predicts an unknown degree of effect on Chincoteague Inlet if sand continues migrating north towards the inlet.

Refer to the attached letter dated January 8, 2019 for greater detail.

2(e) CZMA Federal Consistency. On the condition that a VMRC permit is approved for this project, this project would be consistent to the maximum extent practicable with the subaqueous lands management enforceable policy of the CZM Program (see Federal Consistency under the CZMA section below for additional information).

3. Dunes Management. The DEA (page 3-6) indicates that VMRC issued an extension to an existing permit 10-2003 (expires 2021) on February 2, 2016 for rehabilitation of the seawall and beach re-nourishment. Following submittal of an updated Joint Permit Application, VMRC determined that a new permit will be required for dune and beach impacts from the currently proposed scope of work for beach re-nourishment and dredging at the north end of the Island.

The FCD (Appendix C, page C-11) indicates that the project will restore the previously constructed dune system. A new permit will be required for the beach re-nourishment which will impact dunes.

3(a) Agency Jurisdiction. Dune protection is carried out pursuant to the Coastal Primary Sand Dune Protection Act and is intended to prevent destruction or alteration of primary dunes. This program is administered by the Marine Resources Commission (Virginia Code §28.2-1400 through §28.2-1420).

3(b) Agency Finding. VMRC stated that a JPA was received for this project on October 9, 2018 (JPA# 18-1590). The JPA is currently under review and any permit issued by the VMRC would specify the necessary special conditions for the project.

3(c) Requirement. A VMRC permit for the dune impacts from this project is required. The applicant must adhere to any necessary special conditions included in the permit.

3(d) VIMS Findings. VIMS submitted comments to VMRC in response to NASA's JPA and provided a copy (attached) to DEQ in response to the DEA and FCD. If North Wallops Island (Alternative 1) is used for the sand collection, beach and dunes resources will be removed within the footprint of the mining area. Adjacent beaches and dunes are expected to be destabilized as a result of the mining activity.

Indirect and remote impacts to marine resources may occur depending on the sand source and the altered long-term sand transport patterns that result from the proposed breakwaters. The proposed North Wallops Island mining site accreted very rapidly compared with expected natural accretion due to large volumes of additional sand that was placed to nourish Wallops Island migrating northward as a result of significant storm events. VIMS is confident that the area in question will not retain its post-mining form nor naturally fill again to its current profile from wave and tidal action. If the sand mining occurs at North Wallops Island, secondary erosional impacts to dunes and beaches adjacent to the mining area should be expected, but VIMS does not have near-term concerns for significant dune erosion.

The breakwater placement is expected to have an impact on the natural sediment transport to the north around Fishing Point and across Chincoteague inlet. The breakwaters will affect the rate and volume of sand transport in the vicinity of the structures, thus contributing to long-term effects to Northern Wallops Island as a result of disruption of northward sediment transport. However, once maximum sand capacity is reached at the breakwaters, longshore transport by wind and waves has the potential to occur at rates and volumes similar to natural processes.

Refer to the attached letter dated January 8, 2019 for greater detail.

3(e) VIMS Recommendations. Utilize an offshore source for the sand nourishment material, to eliminate direct impacts to beaches and dunes on northern Wallops Island. This site could be any approved offshore source, including Unnamed Shoal A (Alternative 2). If offshore sand is used, consider management strategies and structures that semi-contain the sand within and around the beach mining location at North Wallops Island to prevent an abnormally large volume of sand moving into Chincoteague inlet.

Continue the shoreline monitoring program to continue providing data to form the basis for future adaptive management.

Consider applying addition breakwaters, designed to contain all sand nourishment and nourish to the maximum capacity. This would stabilize the shoreline to the maximum extent possible while providing added protection to the Wallops Island shoreline and NASA infrastructure.

3(f) CZMA Federal Consistency. On the condition that a VMRC permit is approved for this project, this project would be consistent to the maximum extent practicable with the dunes management enforceable policy of the CZM Program (see Federal Consistency under the CZMA section below for additional information).

4. Erosion and Sediment Control and Stormwater Management. The DEA (page 1-3) notes that the purpose of the project is to reduce the rate of shoreline erosion along Wallops Island and re-nourish areas that have been depleted as a result of wind and wave action from storm activity.

The FCD (Appendix C, C-11) states that the construction period has the potential to increase non-point source runoff to the Atlantic Ocean and that Best Management Practices (BMPs) will be in place to mitigate these impacts.

4(a) Agency Jurisdiction. The DEQ Office of Stormwater Management administers the following laws and regulations governing construction activities:

- Virginia Erosion and Sediment Control (ECS) Law (§ 62.1-44.15:51 *et seq*.) and Regulations (9VAC25-840) (*VESCL&R*);
- Virginia Stormwater Management Act (§ 62.1-44.15:24 *et seq*.) (*VSWML)*;
- Virginia Stormwater Management Program (VSMP) regulation (9VAC25-870) (*VSWMR*); and
- 2014 General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Construction Activities (9VAC25-880).

In addition, DEQ is responsible for the Virginia Stormwater Management Program (VSMP) General Permit for Stormwater Discharges from Construction Activities related to Municipal Separate Storm Sewer Systems (MS4s) and construction activities for the control of stormwater discharges from MS4s and land disturbing activities under the Virginia Stormwater Management Program (9VAC25-890-40).

4(b) Requirements.

4(b)(i) Erosion and Sediment Control and Stormwater Management. NASA and its authorized agents conducting regulated land-disturbing activities on private and public lands in the state must comply with *VESCL&R* and Virginia Stormwater Management Laws and Regulations *(VSWML&R)*, including coverage under the general permit for stormwater discharges from construction activities, and other applicable federal non-point source pollution mandates (e.g. Clean Water Act-Section 313, federal consistency under the Coastal Zone Management Act). Clearing and grading activities, installation of staging areas, parking lots, roads, buildings, utilities, borrow areas, soil stockpiles, and related land-disturbing activities that result in the total land disturbance of equal to or greater than 10,000 square feet would be regulated by *VESCL&R*. Accordingly, NASA must prepare and implement an erosion and sediment control (ESC) plan to ensure compliance with state law and regulations. The ESC plan should be submitted to the DEQ for review for compliance. NASA is ultimately responsible for achieving project compliance through oversight of on-site contractors, regular field inspection, prompt action against non-compliant sites, and other mechanisms consistent with agency policy. A stormwater management plan may also be required.

4(b)(ii) Virginia Stormwater Management Program General Permit for Stormwater Discharges from Construction Activities (VAR10). The operator or owner of a construction activity involving land disturbance of equal to or greater than 1 acre is required to register for coverage under the General VPDES Permit for Discharges of Stormwater from Construction Activities and develop a project specific stormwater pollution prevention plan (SWPPP). The SWPPP must be prepared prior to submission of the registration statement for coverage under the General Permit, and it must address water quality and quantity in accordance with the *Virginia Stormwater Management Program (VSMP) Regulations*. General information and registration forms for the General Permit are available on DEQ's website at www.deq.virginia.gov/Programs/Water/StormwaterManagement/VSMPPermits/ConstructionGeneralPermit.aspx.

4(c) CZMA Federal Consistency. The project would be consistent to the maximum extent practicable with the nonpoint source pollution control enforceable policy of the Virginia CZM Program, provided the activities comply with the above requirements, and applicable permits are obtained as necessary (see Federal Consistency under the CZMA section below for additional information).

5. Point Source Pollution Control. The FCD (Appendix, page C-11) states that the project will not create a new point source discharge.

5(a) Agency Jurisdiction. The point source program is administered by the State Water Control Board pursuant to Virginia Code §62.1-44.15. Point source pollution control is accomplished through the implementation of the National Pollutant Discharge Elimination System (NPDES) permit program established pursuant to §402 of the federal Clean Water Act and administered in Virginia as the VPDES permit program. The Water Quality Certification requirements of §401 of the Clean Water Act of 1972 are administered under the Virginia Water Protection Permit program.

5(b) Agency Finding. TRO stated that the Wallops Flight Facility is covered under VPDES Individual Permit (VA0024457).

5(c) Agency Requirement. Adhere to the existing VPDES permit for this facility. Coordinate with DEQ TRO regarding any necessary permit modifications or map updates if there are any industrial-related activities that will discharge pollutants to surface waters or facility changes that may require map or permit revisions.

5(d) CZMA Federal Consistency. Provided adherence to the existing VPDES permit, and proper updates as necessary, the project would be consistent to the maximum extent practicable with the point source pollution control enforceable policy of the Virginia CZM Program (see Federal Consistency under the CZMA section below for additional information).

6. Chesapeake Bay Preservation Areas. The DEA (page 3-12) notes that Wallops Island is one of 12 barrier islands in Virginia that fronts the Atlantic Ocean. The FCD (Appendix C, page C-11) states that the project does not include land-disturbing activities that will impact the Chesapeake Bay or its tributaries.

6(a) Agency Jurisdiction. The DEQ Office of Local Government Programs (OLGP) administers the Chesapeake Bay Preservation Act (Virginia Code §62.1-44.15:67 *et seq*.) and Chesapeake Bay Preservation Area Designation and Management Regulations (9 VAC 25-830-10 *et seq*.). Each Tidewater locality must adopt a program based on the Chesapeake Bay Preservation Act and the Chesapeake Bay Preservation Area Designation and Management Regulations. The Act and regulations recognize local government responsibility for land use decisions and are designed to establish a framework for compliance without dictating precisely what local programs must look like. Local governments have flexibility to develop water quality preservation programs that reflect unique local characteristics and embody other community goals. Such flexibility also facilitates innovative and creative approaches in achieving program objectives. The regulations address nonpoint source pollution by identifying and protecting certain lands called Chesapeake Bay Preservation Areas. The regulations use a resource-based approach that recognizes differences between various land forms and treats them differently.

6(b) Agency Findings. The proposed project is located in the Atlantic Ocean watershed and is outside of the Chesapeake Bay watershed; thus there are no comments or requirements under the Chesapeake Bay Preservation Area Designation and Management Regulations or the *Chesapeake Bay Preservation Act*.

6(c) CZMA Federal Consistency. The project is located outside of the Chesapeake Bay watershed. Therefore, the project is consistent to the maximum extent practicable with the coastal lands management enforceable policy of the Virginia CZM Program (see Federal Consistency under the CZMA section below for additional information).

7. Air Pollution Control. According to the DEA (page 3-12), the primary source of air pollution associated with this project would be emissions from the operation of mobile sources such as dredges and earth moving equipment. The anticipated emissions from the activity would not exceed the EPA comparative threshold (250 tons per year) of any criteria pollutant, under which an emission would be considered minor.

7(a) Agency Jurisdiction. The DEQ Air Division, on behalf of the State Air Pollution Control Board, is responsible for developing regulations that implement Virginia's Air Pollution Control Law (Virginia Code §10.1-1300 *et seq.*). DEQ is charged with carrying out mandates of the state law and related regulations as well as Virginia's federal obligations under the Clean Air Act as amended in 1990. The objective is to protect and enhance public health and quality of life through control and mitigation of air pollution. The division ensures the safety and quality of air in Virginia by monitoring and analyzing air quality data, regulating sources of air pollution, and working with local, state and federal agencies to plan and implement strategies to protect Virginia's air quality. The appropriate DEQ regional office is directly responsible for the issuance of necessary permits to construct and operate all stationary sources in the region as well as monitoring emissions from these sources for compliance. In the case of certain projects, additional evaluation and demonstration must be made under the general conformity provisions of state and federal law.

The Air Division regulates emissions of air pollutants from industries and facilities and implements programs designed to ensure that Virginia meets national air quality standards. The most common regulations associated with major projects are:

- Open burning: 9 VAC 5-130 *et seq.*
- Fugitive dust control: 9 VAC 5-50-60 *et seq.*
- Permits for fuel-burning equipment: 9 VAC 5-80-1100 *et seq.*

7(b) Agency Findings. According to the DEQ Air Division, the project site is located in a designated ozone attainment area.

7(c) Requirements.

7(c)(i) Fugitive Dust. During construction, fugitive dust must be kept to a minimum by using control methods outlined in 9 VAC 5-50-60 *et seq.* of the *Regulations for the Control and Abatement of Air Pollution*. These precautions include, but are not limited to, the following:

- Use, where possible, of water or chemicals for dust control;
- Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials;
- Covering of open equipment for conveying materials; and
- Prompt removal of spilled or tracked dirt or other materials from paved streets and removal of dried sediments resulting from soil erosion.

7(c)(ii) Open Burning. If project activities include the open burning of construction material or the use of special incineration devices, this activity must meet the requirements under 9 VAC 5-130 *et seq.* of the *Regulations* for open burning, and may require a permit. The *Regulations* provide for, but do not require, the local adoption of a model ordinance concerning open burning. The applicant should contact locality officials to determine what local requirements, if any, exist.

7(d) CZMA Federal Consistency. The project will be consistent to the maximum extent practicable with the air pollution control enforceable policy of the CZM Program, provided adherence to the above requirements (see Federal Consistency under the CZMA section below for additional information).

8. Solid and Hazardous Wastes and Hazardous Materials. The DEA (page 3-2) states the 2010 Final SRIPP PEIS concluded that there would be a negligible impact on hazardous materials and waste from shoreline stabilization activities.

8(a) Agency Jurisdiction. On behalf of the Virginia Waste Management Board, the DEQ Division of Land Protection and Revitalization is responsible for carrying out the mandates of the Virginia Waste Management Act (Virginia Code §10.1-1400 *et seq*.), as well as meeting Virginia's federal obligations under the Resource Conservation and Recovery Act and the Comprehensive Environmental Response Compensation Liability Act (CERCLA), commonly known as Superfund. The DEQ Division of Land Protection and Revitalization also administers those laws and regulations on behalf of the State Water Control Board governing Petroleum Storage Tanks (Virginia Code §62.1-44.34:8 *et seq*.), including Aboveground Storage Tanks (9VAC25-91 *et seq*.) and Underground Storage Tanks (9VAC25-580 *et seq*. and 9VAC25-580-370 *et seq*.), also known as 'Virginia Tank Regulations', and § 62.1-44.34:14 et seq. which covers oil spills.

Virginia:

- Virginia Waste Management Act, Virginia Code § 10.1-1400 *et seq.*
- *Virginia Solid Waste Management Regulations*, 9 VAC 20-81
    - (9 VAC 20-81-620 applies to asbestos-containing materials)
- *Virginia Hazardous Waste Management Regulations*, 9 VAC 20-60
    - (9 VAC 20-60-261 applies to lead-based paints)
- *Virginia Regulations for the Transportation of Hazardous Materials*, 9 VAC 20-110.

Federal:

- Resource Conservation and Recovery Act (RCRA), 42 U.S. Code sections 6901 *et seq.*
- U.S. Department of Transportation *Rules for Transportation of Hazardous Materials*, 49 *Code of Federal Regulations*, Part 107
- Applicable rules contained in Title 40, *Code of Federal Regulations*.

8(b) Agency Findings. The DEQ TRO Petroleum storage tank cleanup, tank compliance/inspections, and waste permit programs had no comments on this proposal.

8(c) Requirements.

8(c)(i) Waste Management. Any soil or groundwater that is suspected of contamination or wastes that are generated during construction-related activities must be tested and disposed of in accordance with applicable federal, state, and local laws and regulations. All construction waste, including excess soil, must be characterized in accordance with the *Virginia Hazardous Waste Management Regulations* prior to disposal at an appropriate facility. It is the generator's responsibility to determine if solid waste meets the criteria of a hazardous waste and is subsequently managed appropriately.

8(c)(ii) Petroleum Releases. If evidence of a petroleum release is discovered during implementation of this project, it must be reported to DEQ, as authorized by Virginia Code § 62.1-44.34.8 through 9 and 9 VAC 25-580-10 *et seq*.

8(d) Pollution Prevention Recommendation. DEQ recommends that the NASA implement pollution prevention principles, including the reduction, reuse, and recycling of all solid wastes generated. All generation of hazardous wastes should be minimized and handled appropriately.

9. Pesticides and Herbicides. DEQ recommends that the use of herbicides or pesticides for construction or landscape maintenance should be in accordance with the principles of integrated pest management. The least toxic pesticides that are effective in controlling the target species should be used to the extent feasible. Contact the Department of Agriculture and Consumer Services at (804) 786-3501 for more information.

10. Natural Heritage Resources. The DEA (page 3-20) notes that Wallops Island is home to a diverse mixture of species both onshore and offshore. Wallops Island Beach provides an important nesting and foraging habitat for migratory waterbirds. It is also used by the diamondback terrapin as a nesting site. Per its Protected Species Monitoring Program, NASA conducts regular monitoring of Wallops Island Beach between March and September to determine the level of bird nesting activity within and adjacent to the project area. The offshore portion of the project area is used by seabirds during the winter months as foraging grounds.

Temporary noise and visual disturbances are likely to occur to foraging habitat. Additionally, the placement of sand on the shoreline during re-nourishment activities would result in a reduction of food sources.

10(a) Agency Jurisdiction.

10(a)(i) The Virginia Department of Conservation and Recreation's (DCR) Division of Natural Heritage (DNH). DNH's mission is conserving Virginia's biodiversity through inventory, protection and stewardship. The Virginia Natural Area Preserves Act (Virginia Code §10.1-209 through 217), authorized DCR to maintain a statewide database for conservation planning and project review, protect land for the conservation of biodiversity, and the protect and ecologically manage the natural heritage resources of Virginia (the habitats of rare, threatened and endangered species, significant natural communities, geologic sites, and other natural features).

10(a)(ii) Virginia Department of Agriculture and Consumer Services (VDACS): The Endangered Plant and Insect Species Act of 1979 (Virginia Code Chapter 39 §3.1-1020 through 1030) authorizes VDACS to conserve, protect and manage endangered and threatened species of plants and insects. Under a Memorandum of Agreement established between VDACS and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species.

10(b) Agency Findings. DCR's Division of Natural Heritage (DNH) searched its Biotics Data System for occurrences of natural heritage resources in the project vicinity. The Wallops – Assawoman Islands Conservation Site is located within the project site. Wallops – Assawoman Islands Conservation Site has been given a biodiversity significance ranking of B2, which represents a site of very high significance. Twenty-one natural heritage resources of concern were identified at this site. Refer to the attached DCR memorandum dated January 7, 2019 for a listing of the resources.

DCR supports the planned mitigation measures to reduce the probability and intensity of potential effects to protected species. According to DCR's species distribution model, Sea-beach amaranth (*Amaranthus pumilus*, G2/S1/LT/LT) may exist within the project site.

10(b)(i) State-listed Plant and Insect Species. DCR found that the proposed project will not affect any documented state-listed plants or insects.

10(b)(ii) State Natural Area Preserves. There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

10(c) Recommendations. Due to the legal status of some of the species found in the Wallops – Assawoman Islands Conservation Site, DCR recommends continued coordination with the US Fish and Wildlife Service (USFWS) to ensure compliance with protected species legislation.

Coordinate with DCR if any occurrences of Sea-beach amaranth are documented.

Contact DCR-DNH to secure updated information on natural heritage resources if the scope of the project changes and/or six months has passed before it is utilized. New and updated information is continually added to the Biotics Data System.

11. Wildlife Resources, Fisheries, and Protected Species. The DEA (page 3-20) notes that the Wallops Island Beach provides an important nesting and foraging habitat for migratory waterbirds including gulls, terns, and sandpipers. Waterbird numbers peak on the beach during the fall and spring migrations. Additionally, the diamondback terrapin has regularly nested on the north beach and locations on the bay side of the island. Seabirds use the offshore portion of the project area as foraging grounds during winter months. Temporary disturbances related to construction activity will include noise and visual impacts to these species. Foraging areas are anticipated to recover within one year for onshore areas and two years for offshore areas. Time-of-year restrictions would be followed for Special Status Species such as no activity at the north Wallops Island borrow area during piping plover and loggerhead sea turtle nesting season.

The EIR (page 3-23) notes that there are managed fishery species located in the area of Unnamed Shoal A and the north Wallops Island beach. Commercially important shellfish fisheries (sea scallop and blue crab) are also present. The Wallops Island beach project area is coincident with eight Essential Fish Habitat (EFH) designations, while unnamed Shoal A is coincident with an additional three EFH designations. The proposed project would episodically increase water turbidity and temporarily displace motile species. Benthos species are expected to have 100 percent mortality, though species recovery is expected to begin immediately after the beach replenishment is completed.

11(a) Agency Jurisdiction.

11(a)(i) The Virginia Department of Game and Inland Fisheries. DGIF, as the Commonwealth's wildlife and freshwater fish management agency, exercises enforcement and regulatory jurisdiction over wildlife and freshwater fish, including state- or federally-listed endangered or threatened species, but excluding listed insects (Virginia Code, Title 29.1). DGIF is a consulting agency under the U.S. Fish and Wildlife

Coordination Act (16 U.S.Code §661 *et seq*.) and provides environmental analysis of projects or permit applications coordinated through DEQ and several other state and federal agencies. DGIF determines likely impacts upon fish and wildlife resources and habitat, and recommends appropriate measures to avoid, reduce or compensate for those impacts. For more information, see the DGIF website at *www.dgif.virginia.gov.*

11(a)(ii) VDH Shellfish Sanitation. The VDH's Division of Shellfish Sanitation is responsible for protecting the health of the consumers of molluscan shellfish and crustacea by ensuring that shellfish growing waters are properly classified for harvesting, and that molluscan shellfish and crustacea processing facilities meet sanitation standards. The mission of this Division is to minimize the risk of disease from molluscan shellfish and crustacea products at the wholesale level by classifying shellfish waters for safe commercial and recreational harvest; by implementing a statewide regulatory inspection program for commercial processors and shippers; and by providing technical guidance and assistance to the shellfish and crustacea industries regarding technical and public health issues.

11(b) Agency Findings.

11(b)(i) DGIF. DGIF is concerned about the proposal to use the north end of Wallops Island for sand excavation due to the area supporting nesting federal-listed endangered piping plovers and American oystercatchers which are designated as a Tier IIa Species of Greatest Conservation Need. In addition, DGIF believes the area provides nesting habitat for the state-listed threatened Wilson's plover, the federally-listed threatened loggerhead sea turtle, diamondback terrapins (Tier II Species of Greatest Conservation Need (SGCN)), and other species that are identified in Virginia's Wildlife Action Plan as SGCN. DGIF believes that sand excavation in this area is likely to result in direct adverse impacts upon these species as well as long-term adverse impacts upon the substrate which provides the nesting habitat. Based on these concerns, DGIF does not support the removal of sand from the Wallops island beach (Alternative I).

DGIF believes that Alternative 2, using Unnamed Shoal Area A for sand collection, is preferable to removal from the north end of Wallops Island, assuming it is performed with Best Management Practices (BMPs) in place to minimize impacts upon the oceanic environment and its inhabitants. Alternative 2 is not without impacts upon benthic communities and the wildlife that rely on these communities; however, if the project moves forward, DGIF prefers the removal of sand from areas other than the north end of Wallops Island where listed species are known to nest.

DGIF understands that erosive action along this section of the Eastern Shore is primarily due to northerly near-shore currents that continually transport sand from the southern end of the island to the northern end. As such, it is not clear how breakwaters constructed parallel to the shore will be effective in reducing sand loss from the southern end. Therefore, it is expected that future beach nourishment and associated dredging/borrow areas will be necessary for long-term infrastructure protection. There was no information in the JPA that DGIF reviewed about how placement of fill and installation of breakwaters in this area will impact barrier islands to the south of this site, which are also populated by nesting birds and sea turtles. Without these additional details, it is difficult for DGIF make any determinations about regional wildlife dynamics and population effects resulting from the proposed project.

11(b)(ii) VDH. VDH DSS did not comment on the proposal.

11(b)(iii) VIMS. According to VIMS, the post-mining sand flat at North Wallops Island beach will create a temporary intertidal area that may be utilized by crabs and fishes endemic to the near-shore and surf zone. Some individuals may become trapped and experience mortality at low tide. This shoreline feature is not expected to persist and losses are expected to be short-term and minimal.

11(c) DGIF Recommendation. DGIF recommends that Alternative 2, Unnamed Shoal A, be chosen as the sand borrow site. Utilize BMPs to minimize impacts to the oceanic environment and marine wildlife.

Routinely monitor and survey the project area ahead of work being performed so that any new sea turtle or shorebird nesting activity and nesting locations can be protected from harm. Ahead of project commencement, develop a plan of action to address newly found nest sites so that the plan can be put into action immediately upon documentation of a site.

Time construction and beach fill operations to avoid avian and sea turtle nesting seasons. Adhere to a time-of-year restriction (TOYR) of April 1 through November 30 or until the last turtle hatches or the nest is determined to have failed.

Monitor invertebrates at the borrow site located at the north end of Wallops Island, if that area is used for sand excavation, so that long-term impacts on the island's benthic invertebrate forage base can be determined and addressed, as necessary.

Additional consideration should be given to the significant impacts the project is likely to have on local wildlife, particularly the listed and tiered species mentioned above. Coordinate with DGIF's Eastern Shore Biologist (Ruth Boettcher, 757-709-0766) to ensure appropriate consideration of wildlife and their habitats during project design and implementation.

11(d) DGIF Conclusion. DGIF defers the federal consistency determination to VMRC since the site drains to marine waters.

As proposed (using Alternative 1), DGIF determined that this project is likely to result in adverse impacts upon beach nesting birds and seas turtles. DGIF does not support the selection of Alternative 1. DGIF may determine that mitigation to compensate for unavoidable impacts upon these species is necessary.

DGIF recommends the selection of Alternative 2, using Unnamed Shoal Area A for sand collection, assuming it is performed with Best Management Practices (BMPs) in place to minimize impacts upon the oceanic environment and its inhabitants.

11(e) CZMA Federal Consistency. The proposed project will be consistent to the maximum extent practicable with the fisheries management enforceable policy of the CZM Program, provided NASA obtains and complies with any applicable conditions of a VMRC permit.

12. Public Water Supply. The DEA does not address impacts to public water supplies.

12(a) Agency Jurisdiction. The Virginia Department of Health (VDH) Office of Drinking Water reviews projects for the potential to impact public drinking water sources (groundwater wells, springs and surface water intakes). VDH administers both federal and state laws governing waterworks operation.

12(b) Agency Findings. VDH-ODW found that there are no apparent impacts to public drinking water sources as a result of this project.

13. Historic and Archeological Resources. The DEA (page 3-34) states that in accordance with Section 106 and 110 of the National Historic Preservation Act, NASA developed a Programmatic Agreement with the Virginia State Historic Preservation Office and Advisory Council on Historic Preservation. The agreement outlines how WFF manages cultural resources as a part of its operations and missions. Section 106 consultation was opened while NASA prepared the DEA and DHR issued a Finding of No Historic Properties Affected on August 14, 2018.

13(a) Agency Jurisdiction. The Department of Historic Resources (DHR) conducts reviews of projects to determine their effect on historic structures or cultural resources under its jurisdiction. DHR, as the designated State’s Historic Preservation Office, ensures that federal actions comply with Section 106 of the National Historic Preservation Act of 1962 (NHPA), as amended, and its implementing regulation at 36 CFR Part 800. The NHPA requires federal agencies to consider the effects of federal projects on properties that are listed or eligible for listing on the National Register of Historic Places. Section 106 also applies if there are any federal involvements, such as licenses, permits, approvals or funding. DHR also provides comments to DEQ through the state environmental impact report review process.

13(b) Agency Findings. NASA consulted with DHR during development of the DEA and found that no historic properties will be affected (Appendix G). The agency has fulfilled its Section 106 responsibilities, according to the documentation provided with the DEA.

DHR did not provide additional comment on the DEA.

13(c) Agency Requirement. If for any reason the project cannot be completed as documented in the finding of No Historic Properties Affected, Section 106 coordination should be reopened.

14. Pollution Prevention. DEQ advocates that principles of pollution prevention and sustainability be used in all construction projects as well as in facility operations. Effective siting, planning, and on-site BMPs will help to ensure that environmental impacts are minimized. However, pollution prevention and sustainability techniques also include decisions related to construction materials, design, and operational procedures that will facilitate the reduction of wastes at the source.

14(a) Recommendations. We have several pollution prevention recommendations that may be helpful in the implementation of this project:

- Consider development of an effective Environmental Management System (EMS). An effective EMS will ensure that the proposed facility is committed to complying with environmental regulations, reducing risk, minimizing environmental impacts, setting environmental goals, and achieving improvements in its environmental performance. DEQ offers EMS development assistance and recognizes facilities with effective Environmental Management Systems through its Virginia Environmental Excellence Program (VEEP). VEEP provides recognition, annual permit fee discounts, and the possibility for alternative compliance methods.
- Consider environmental attributes when purchasing materials. For example, the extent of recycled material content, toxicity level, and amount of packaging should be considered and can be specified in purchasing contracts.
- Consider contractors' commitment to the environment (such as an EMS) when choosing contractors. Specifications regarding raw materials and construction practices can be included in contract documents and requests for proposals.
- Choose sustainable materials and practices for infrastructure construction and design. These could include asphalt and concrete containing recycled materials, and integrated pest management in landscaping, among other things.
- Integrate pollution prevention techniques into the facility maintenance and operation, to include inventory control for centralized storage of hazardous materials and source reduction (fixing leaks, energy efficient products). Maintenance facilities should have sufficient and suitable space to allow for effective inventory control and preventive maintenance.

DEQ's Office of Pollution Prevention provides information and technical assistance relating to pollution prevention techniques and EMS. For more information, contact DEQ's Office of Pollution Prevention, Meghann Quinn at (804) 698-4021.

FEDERAL CONSISTENCY UNDER THE COASTAL ZONE MANAGEMENT ACT

Pursuant to the Coastal Zone Management Act of 1972 (§ 1456(c)), as amended, and the federal consistency regulations implementing the CZMA (15 CFR Part 930, Subpart

C, § 930.30 *et seq*.), federal actions that can have reasonably foreseeable effects on Virginia's coastal uses or resources must be conducted in a manner which is consistent, to the maximum extent practicable, with the Virginia Coastal Zone Management (CZM) Program. The CZM Program is comprised of a network of programs administered by several agencies. In order to be consistent with the CZM Program, the federal agency must obtain all the applicable permits and approvals listed under the enforceable policies of the CZM Program prior to commencing the project.

Federal Consistency Public Participation
In accordance with 15 CFR § 930.2, public notice of the proposed action was published in the OEIR Program Newsletter and on DEQ's web site from December 14, 2018 to January 4, 2019. No public comments were received in response to the notice.

Federal Consistency Determination
A Federal Consistency Determination for the proposed Wallops Flight Facility Shoreline Enhancement and Restoration Project was included in Appendix C of the DEA received on December 6, 2018. The document provided an analysis of the project's impact on each of the nine enforceable policies. According to the FCD, the project will be consistent to the maximum extent practicable with Virginia's Coastal Zone Management Program.

The FCD states that proposed activity will have no effect on the following enforceable policies of the Coastal Zone Management Program: wetlands management, point source pollution control, coastal lands management and shoreline sanitation.

The project is expected to affect the following enforceable policies: fisheries management, subaqueous lands management, dunes management, non-point source pollution control, and air pollution control. These impacts and jurisdictional agency comments, recommendations, and requirements are discussed above in the "Environmental Impacts and Mitigation" section of this document.

Federal Consistency Conditional Concurrence
Based on our review of the FCD and the comments submitted by agencies administering the enforceable policies of the CZM Program, DEQ **conditionally concurs** that the proposal is consistent to the maximum extent practicable with the CZM Program provided all applicable permits and approvals are obtained as described below in the Regulatory and Coordination Needs section. VMRC is still evaluating the JPA for the project and a consistency decision will be made pending the approval of a VMRC permit for the project (refer to Item 2 and Item 3) in the Environmental Impacts and Mitigation section, pages 4 and 5).

If, prior to construction, the project should change significantly and any of the enforceable policies of the Virginia CZM Program would be affected, pursuant to 15 CFR 930.66, the applicant must submit supplemental information to DEQ for review and approval. Additionally, other state approvals which may apply to this project are not included in this consistency concurrence. Therefore, NASA must ensure that this project is operated in accordance with all applicable federal, state and local laws and regulations. NASA is encouraged to consider the Advisory Polices of the CZM Program as well (Attachment 2).

Condition of Concurrence with the FCD
The condition of the Commonwealth's concurrence includes the following authorization under the Virginia CZM Program:

- a permit issued by VMRC for encroachments on or over state-owned subaqueous beds authorized under § 28.2-1200 to §28.2-1213 of the Virginia Code.
- a permit issued by VMRC for encroachments on or over state-owned coastal primary sand dunes and beaches authorized under §28.2-1400 through §28.2-1420 of the Virginia Code.

In accordance with the *Federal Consistency Regulations* 15 CFR Part 930, section 930.4, this conditional concurrence is based on NASA obtaining the necessary authorizations prior to initiating project activities. If the requirements of section 930.4, sub-paragraphs (a)(1) through (a)(3) are not met, this conditional concurrence becomes an objection under 15 CFR Part 930, section 930.63.

PREFERRED ALTERNATIVE RECOMMENDATION

DGIF recommends **Alternative 2**, Unnamed Shoal A be utilized for sand collection. VIMS additionally recommend the use of an offshore site to obtain the sand for the beach re-nourishment. The offshore source could be any approved offshore site, including **Alternative 2,** Unnamed Shoal A. The other natural resource agencies that participated in this review did not make a recommendation for alternative selection.

REGULATORY AND COORDINATION NEEDS

1. Surface Waters and Wetlands. A VWP Individual Permit Waiver has been issued for this project. Coordinate with the DEQ TRO VWP Permit program (Jeff Hannah, 757-518-2146) with questions regarding VWP permitting requirements and the status of the JPA review.

2. Subaqueous Lands. A VMRC permit is required for the impacts to State-owned subaqueous bottom. The JPA is currently under review. Coordinate with VMRC (Lyle Varnell, 804-684-7764) with questions regarding the status of the JPA review or the required permit.

Contact VIMS (Emily Hein, 804-684-7482) with questions related to their findings or recommendations.

3. Erosion and Sediment Control and Stormwater Management*.*

3(a) Erosion and Sediment Control and Stormwater Management*.* This project must comply with Virginia's *Erosion and Sediment Control Law* (Virginia Code § 62.1-44.15:61) and *Regulations* (9 VAC 25-840-30 *et seq*.) and *Stormwater Management Law* (Virginia Code § 62.1-44.15:31) and *Regulations* (9 VAC 25-870-210 *et seq*.) as administered by DEQ. Activities that disturb equal to or greater than 10,000 square feet would be regulated by *VESCL&R* and *VSWML&R*. Erosion and sediment control, and stormwater management requirements should be coordinated with the DEQ Tidewater Regional Office, Janet Weyland (757-518-2151).

3(b) Virginia Stormwater Management Program General Permit for Stormwater Discharges from Construction Activities (VAR10). For projects involving land-disturbing activities of equal to or greater than one acre the project owner is required to register for coverage under the Virginia Stormwater Management Program General Permit for Discharges of Stormwater from Construction Activities (9 VAC 25-870-1 *et seq.*). Specific questions regarding the Stormwater Management Program requirements should be directed to DEQ, Holly Sepety at (804) 698-4039.

4. Point Source Pollution Control. The NASA must comply with its existing VPDES Individual Permit (VA0024457). Contact the DEQ TRO permit writer (Deanna Austin, 757-518-2008) as necessary for questions related to permit or map requirements as warranted due to project activities.

5. Air Quality Regulations*.* For more information, questions, and coordination related to air pollution control requirements, contact DEQ TRO, Laura Corl (757-518-2178).

6. Solid and Hazardous Wastes*.* All solid waste, hazardous waste, and hazardous materials must be managed in accordance with all applicable federal, state, and local environmental regulations. For additional information concerning location and availability of suitable waste management facilities in the project area or if free product, discolored soils, or other evidence of contaminated soils are encountered, contact DEQ-TRO, Sean Priest at (757) 518-2141.

7. Natural Heritage Resources. Contact DCR-DNH, Rene Hypes at (804) 371-2708, to secure updated information on natural heritage resources if the scope of the project changes and/or six months has passed before the project is implemented, since new and updated information is continually added to the Biotics Data System.

Contact DCR (Rene Hypes, 804-371-2709) if any occurrences of Sea-beach amaranth are documented once the project commences.

Due to the legal status of some of the species found in the Wallops – Assawoman Islands Conservation Site, coordinate with the USFWS (Troy Andersen, troy_andersen@fws.gov) to ensure compliance with protected species legislation.

8. Wildlife Resources, Fisheries, and Protected Species. Contact Amy Ewing (804-367-2211) with questions related to DGIF's comments and recommendations. DGIF recommends the selection of Alternative 2, Unnamed Shoal A for the sand borrow site.

9. Historic Resources. If for any reason the project cannot be completed as documented in the DHR finding of No Historic Properties Affected, Section 106 coordination should be reopened. Contact Laura Lavernia (804-482-8097) with questions.

10. Dunes Management. A VMRC permit is required for the impacts to beaches and dunes. The JPA is currently under review. Coordinate with VMRC (Lyle Varnell, 804-684-7764) with questions regarding the status of the JPA review or the required permit.

Contact VIMS (Emily Hein, 804-684-7482) with questions related to their findings or recommendations.

Thank you for the opportunity to review and respond to the Draft Environmental Assessment and Federal Consistency Determination for the Wallops Flight Facility Shoreline Enhancement and Restoration Project in Accomack County, VA. Detailed comments of reviewing agencies are attached for your review. Please contact me at (804) 698-4204 or Janine Howard at (804) 698-4299 for clarification of these comments.

Sincerely,

Bettina Rayfield, Program Manager
Environmental Impact Review

Ec: Amy Ewing, DGIF
Robbie Rhur, DCR
Arlene Warren, VDH
Roger Kirchen, DHR
Tony Watkinson, VMRC
Emily Hein, VIMS
Michael Mason, Accomack County
Elaine Meil, Accomack-Northampton Planning District Commission
Shari Miller, NASA

Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

Re: ESSLog# 39481_18-171F_WallopsShoreline_DGIF_AME20181218

1 message

Ewing, Amy <amy.ewing@dgif.virginia.gov> Mon, Jan 7, 2019 at 11:53 AM
To: "Howard, Janine" <janine.howard@deq.virginia.gov>

Hi Janine,
I have looked back over the project documents and offer the below comments per your questions. I thought the preferred alternative was Alt 1, but they were referring back to the SRIPP project. Confusing. Let me know if you continue to have any questions. Thanks!

1. Alternative 2 - using Unnamed Shoal Area A for sand collection: Although collection of sand from such areas is not without impacts upon benthic communities and the wildlife that rely upon them, we believe it preferable to removal from the north end of wallops island, assuming it is performed with BMPs in place to minimize impacts upon the oceanic environment and its inhabitants. So, if this project must move forward, we would prefer it include collection of sand from areas other than the north end of wallops, where we know listed species nest.

2. Re-nourishment cycle of 5 years. Thanks for clearing this up. No comments.

3. Federal Consistency: We defer to VMRC as this site drains to marine waters.

Thanks, Amy

Amy Ewing
Environmental Services Biologist
Manager, Fish and Wildlife Information Services
P 804.367.2211
Virginia Department of Game & Inland Fisheries
CONSERVE. CONNECT. PROTECT.
A 7870 Villa Park Drive, P.O. Box 90778, Henrico, VA 23228
www.dgif.virginia.gov

On Thu, Jan 3, 2019 at 3:18 PM Howard, Janine <janine.howard@deq.virginia.gov> wrote:

> Thanks Amy. Tuesday morning before 11am will work for me. I probably will need something in writing eventually, particularly if we decide to issue a conditional. So with that in mind if you could plan for having something to me by Jan 11th that would be great. That gives me time to edit the report as well as the needed time for it to go through internal review.
>
> Let me know if Tuesday AM for a chat works for you!
>
> Janine Howard
> Environmental Impact Review Coordinator
> Virginia Department of Environmental Quality
> 1111 East Main Street, Suite 1400
> Richmond, VA 23219
> 804-698-4299
>
> For program updates and public notices please subscribe to the OEIR News Feed
>
> On Thu, Jan 3, 2019 at 3:13 PM Ewing, Amy <amy.ewing@dgif.virginia.gov> wrote:

Hi Janine,
I'd be happy to discuss this with you. I am really busy right now....can we chat on Tuesday? If you need something sooner, that's ok too...I can get something to you via email. I guess I'm asking for your timeframe. Let me know when you need answers to your questions and then I'll figure out how to fit it in.

Amy

Amy Ewing
Environmental Services Biologist
Manager, Fish and Wildlife Information Services
P 804.367.2211
Virginia Department of Game & Inland Fisheries
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www.dgif.virginia.gov

On Thu, Jan 3, 2019 at 2:57 PM Howard, Janine <janine.howard@deq.virginia.gov> wrote:

Hello Amy,

Thank you for your comments and I hope you had a great holiday as well!

I have a few follow-up questions with regard to your comments/recommendations and it may be necessary to have a quick call about it.

1. You comments are clear that DGIF does not support using North Wallops Island beach as a borrow area for this project (Alternative 1). However, the proposal includes Alternative 2 which would take sand from Unnamed Shoal A (offshore sand ridge located in the outer continental shelf at the southern end of the Assateague ridge field). Do you have any specific comments about that location and/or do you want to endorse that Alternative over Alternative 1? Alternative 3 involves the construction of the parallel breakwaters in addition to the beach nourishment from one of the aforementioned locations (Alt 3+1 or Alt 3+2). NASA does not identify a Preferred Alternative in the Draft Environmental Assessment.

2. With regard to the breakwaters (Alternative 3) you mention that the proposed re-nourishment frequency or type is not discussed. I believe this particular project builds on previously reviewed NEPA documents that specified renourishment cycles of every five years. Specifically I am referring to the Final Programmatic Environmental Impact Statement for the Shoreline Restoration and Infrastructure Protection Program (SRIPP) at Wallops Island (DEQ 10-156F) which was reviewed in November 2010. This project appears to be more of a one-off effort to make repairs/renourish the shoreline due to losses sustained in 2015 (Hurricane Joaquin), 2016 (Winter Storm Jonas) and 2018 (Winter Storm Riley).

3. This document includes a Federal Consistency Determination so we need to discuss how to address the fisheries management enforceable policy. Are we objecting or conditionally concurring with regarding to fisheries management and if it is conditional, what are the conditions?

I have attached VMRC's comment letter on this project for your reference. Based on the information in that letter I will conditionally concur (for subaqueous lands and dunes management), provided a VMRC permit is issued and that the included special conditions are adhered to. I mention this in case this has any bearing on how we want to proceed with regard to fisheries management.

Just FYI, I have to issue the response by January 22nd.

Thank you,

Janine

Janine Howard
Environmental Impact Review Coordinator
Virginia Department of Environmental Quality
1111 East Main Street, Suite 1400
Richmond, VA 23219
804-698-4299

For program updates and public notices please subscribe to the OEIR News Feed

On Tue, Dec 18, 2018 at 4:38 PM Ewing, Amy <amy.ewing@dgif.virginia.gov> wrote:

Janine,

Please see attached the comments we provided to MRC when they were looking for comments on the project. They constitute a valid response to your request for comments.

Thanks and happy holidays.

Amy

Amy Ewing
Environmental Services Biologist
Manager, Fish and Wildlife Information Services
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Commonwealth of Virginia

Ewing, Amy <amy.ewing@dgif.virginia.gov>

ESSLog# 39481_20181590_WallopsShoreline_DGIF_AME20181116

1 message

Ewing, Amy <amy.ewing@dgif.virginia.gov> Fri, Nov 16, 2018 at 2:28 PM
To: George Badger <hank.badger@mrc.virginia.gov>
Cc: "Boettcher, Ruth" <ruth.boettcher@dgif.virginia.gov>

Hank,
We have reviewed the subject project that proposes to perform shoreline stabilization along Wallops Island shoreline in Accomac County, borrowing fill from the north end shoreline, depositing it along southern shorelines, and installing parallel breakwaters.

As stated during our 2010 review of of Wallops' Shoreline Restoration and Infrastructure Protection Program, similar in nature to what is currently being proposed, we are concerned about NASA using the north end of Wallops Island for sand excavation as we believe this area to support nesting federal Endangered piping plovers and American oystercatchers, designated a Tier IIa Species of Greatest Conservation Need. In addition, we believe this are provides nesting habitat for state Threatened Wilson's plovers, federal Threatened loggerhead sea turtles, diamond-backed terrapins (Tier II SGCN), and other species identified in Virginia's Wildlife Action Plan as Species of Greatest Conservation Need (SGCN). We believe that the excavation of sand from this area is likely to not only result in direct adverse impacts upon these species, but also result in long term adverse impacts upon the substrate which provides them nesting habitat. As such, we cannot support removal of sand from the proposed borrow area.

It is our understanding that erosive action along this section of the Eastern Shore is primarily due to northerly near-shore currents that continually transport sand from the southern end of the island to the northern end. As such, it is not clear how breakwaters constructed parallel to the shore will be effective in reducing sand loss from the southern end. Therefore, it is expected that future beach nourishment and associated dredging/borrow areas will be necessary for long-term infrastructure protection. However, there is no information in the application about proposed re-nourishment frequency or type. In addition, there is no information in the application about how placement of fill and installation of breakwaters in this area will impact barrier islands to the south of this site, islands populated by nesting birds and sea turtles. Without these additional details, it is difficult for us to make any determinations about regional wildlife dynamics and population effects resulting from the proposed project.

We recommend that the project area be routinely monitored and surveyed ahead of work being performed so that any new sea turtle or shorebird nesting activity and nesting locations can be protected from harm. We also recommend that a plan of action to address newly found nest sites be developed ahead of project commencement so that the plan can be enacted immediately upon documentation of a site, rather than waiting while coordination with the appropriate agencies is performed. We continue to recommend timing construction and beach fill operations to avoid avian and sea turtle nesting seasons (adherence to time of year restrictions), as indicated in the application. We note that the time of year restriction fro sea turtles is from April 1 thourhg November 30 OR until the last turtle hatches or the nest is determined to have failed. We recommend monitoring of the invertebrates at the borrow site located at the north end of Wallops Island, assuming this area used for sand excavation, so that the long-term impacts on the island's benthic invertebrate forage base can be determined and addressed, if necessary.

We recommend additional consideration about the significant impacts this project is likely to have on the local wildlife, particularly the listed and tiered species mentioned above. We recommend inclusion of greater detail within the application about the proposed actions, how they will affect nearby environs, and how imperiled wildlife and their habitats can be better protected from project activities and benefit them in the long-term. We recommend coordination with VDGIF's Eastern Shore Biologist, Ruth Boettcher, at 757-709-0766 or Ruther.Boettcher@dgif.virginia.gov to ensure appropriate consideration of wildlife and their habitats during project design and implementation.

If this project moves forward, as proposed, it is likely to result in adverse impacts upon beach nesting birds and sea turtles. As such, we cannot support the project. In addition, we may determine that mitigation to compensate for unavoidable impacts upon these species is necessary.

Thanks, Amy

Amy Ewing
Environmental Services Biologist
Manager, Fish and Wildlife Information Services
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Virginia Department of Game & Inland Fisheries
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www.dgif.virginia.gov

Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

Re: EXPEDITED REVIEW-NEW PROJECT NASA WFF Shoreline Restoration DEQ #18-171F

1 message

Warren, Arlene <arlene.warren@vdh.virginia.gov> Wed, Dec 19, 2018 at 3:42 PM
To: Janine Howard <janine.howard@deq.virginia.gov>

Project Name: Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Project
Project #: 18-171F
UPC #: N/A
Location: Accomack County

VDH – Office of Drinking Water has reviewed the above project. Below are our comments as they relate to proximity to **public drinking water sources** (groundwater wells, springs and surface water intakes). Potential impacts to public water distribution systems or sanitary sewage collection systems **must be verified by the local utility.**

There are no public groundwater wells within a 1-mile radius of the project site.

There are no surface water intakes located within a 5-mile radius of the project site.

The project is not within the watershed of any public surface water intakes.

There are no apparent impacts to public drinking water sources due to this project.
The Virginia Department of Health – Office of Drinking Water appreciates the opportunity to provide comments. If you have any questions, please let me know.

Best Regards,

Arlene Fields Warren

GIS Program Support Technician

Office of Drinking Water

Virginia Department of Health

109 Governor Street

Richmond, VA 23219

(804) 864-7781

On Tue, Dec 11, 2018 at 1:35 PM Fulcher, Valerie <valerie.fulcher@deq.virginia.gov> wrote:

> **Good afternoon - this is a new OEIR review request/project:**
>
> **Document Type: Draft Environmental Assessment/Federal Consistency Determination**
> **Project Sponsor: National Aeronautics and Space Administration**
> **Project Title: Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Project**
> **Location: Accomack County**

January 8, 2019

Mr. Hank Badger
Environmental Engineer, Sr.
Habitat Management Division
Virginia Marine Resources Commission
2600 Washington Avenue
Newport News, VA 23607

Dear Mr. Badger:

The Virginia Institute of Marine Science (VIMS) has completed its review of the proposed project on Wallops Island for the construction of six breakwaters upon state-owned subaqueous bottomlands, placement of sand landward of the breakwaters, nourishment of approximately 19,850 linear feet of beach, and removal of up to 1.3 million cubic yards of sand from a 150 acre area at the north end of the island for nourishment material. Personnel from the departments of Physical Sciences and Fisheries Science, and the Office of Research and Advisory Services contributed to these analyses.

The Virginia barrier islands are a series of dynamic geological features that function collectively as marine and coastal habitat; and also as protection for state-owned marshes and subaqueous bottomlands, public shellfish grounds, private aquaculture capital, and ultimately the oceanside uplands of the Eastern Shore. The continued integrity of the barrier islands is critical to the coastal bay ecosystem, coastal communities, and water-based economic development of the Eastern Shore. These islands are a largely integrated system connected through the flow of sand between the beaches, dunes, and shorefaces of individual islands and across islands in response to tidal currents, winds, waves, and storms (Rice *et al*., 1976; Rice and Leatherman, 1983; McBride *et al*., 2015). As such, shoreline modifications to one island must be analyzed for effects not only locally, but also for the potential to affect the natural processes of adjacent islands and waterways.

Wallops Island contains critical infrastructure highly vulnerable to ocean forces. Protective measures including beach nourishment and rock seawalls have been utilized in the past to address these threats, but events have shown that additional and alternative approaches are necessary. The proposed plan incorporates greater continuing control of shoreline processes than past projects, and these control elements expand the potential to alter natural barrier island processes. Ultimate outcomes of alterations to dynamic marine environments are difficult to foresee; however, elements of the project as proposed have the potential to alter local and remote marine resources beyond those resulting from natural processes.

The proposed project will significantly increase storm protection, especially directly leeward of the breakwaters, but is unlikely to provide the level of long-term protection necessary for the Wallops Island shoreline and upland infrastructure. The placement of six stone breakwaters with sand nourishment landward of each structure will have minimal direct impacts to state-owned subaqueous resources, and the additional nourishment of 19,850 feet of shoreline will result only in temporary and minimal impacts to the littoral marine environment. Therefore, minimal adverse environmental impacts will result within the footprint of these isolated shoreline stabilization actions. However, there is potential for remote and secondary impacts to marine resources dependent upon the proposed sand source and likely disruptions of littoral and longshore sand transport to adjacent shores due to the influences of the breakwaters. Below we discuss separate aspects of the proposed project and their likely environmental consequences, and also describe relational elements than may compound potential impacts to Wallops Island and beyond.

Sand Mining

Previous beach nourishment relied on offshore sand resources and resulted in only temporary protection due to erosion and sand migration during both storms and quiet-water conditions. This project proposes to mine sand from a 150-acre on-island area north of the target shoreline. The sediment in this area is dominated by previous beach nourishment material displaced by longshore transport. Although northern Wallops Island has been growing wider historically in response to natural barrier island and tidal-inlet processes, the mining site developed very rapidly compared with normal barrier island processes due to the large volume of artificially supplemented sand displaced northward by significant storm forces. The combination of these manmade and natural events subsequently created the current robust beach and dune environment at this northern end of the island. It is important to note that barrier island and tidal-inlet processes will continue to affect the geomorphology of this area, and its current configuration cannot be considered stable.

There are consequences to local barrier island geology from mining or allowing the area to remain intact. Beach and dune resources will be removed within the footprint of the area proposed for mining. Removal and relocation of this magnitude of sand will instantaneously (relative to general island geological processes) destabilize adjacent beaches and dunes, and the adjacent and local nearshore. The applicant reports that mining will occur above mean low water (MLW) and that the mean low water line will remain in its current location with a wide horizontal plane extending landward at the MLW elevation. This may be difficult to achieve, but even if successful, it is highly likely that the large remaining shoreface intertidal flat and the adjacent subaqueous shore component will undergo relatively rapid and significant erosion as the beach and nearshore adjusts towards an equilibrium profile. The applicant provided modeling that demonstrated sand movement back into this area from the south; however, we are not confident in those results due to the model relying on artificial parameters, a unidirectional wave field, and the assumption that the mined area will be geologically stagnant. Additionally, should the breakwaters be constructed and nourished as planned, they will reduce the rates and volumes of northerly longshore sand transport (as they are designed to do). The transport of sand alongshore from the north, around Fishing Point (the southern tip of Assateague Island), and bypassing Chincoteague Inlet to reach Wallops Island and its nearshore (Goettle, 1981; Morang *et al*., 2006) will surely continue, but it is highly unlikely that it will occur at rates necessary to reconstruct the mining area prior to its alteration by wind and wave forces. We have great confidence that this area will not retain its post-mining form nor naturally fill again with sand to near its current profile and volume in response to reworking by waves and tidal currents. The timing and processes necessary for this to occur cannot be accurately predetermined, but there will surely be alterations to adjacent island and nearshore geomorphology that may create vulnerabilities well beyond the mining footprint.

Should sand mining occur as planned, secondary erosional impacts to dunes and beaches adjacent to the limits of mining can be expected, but no near-term concerns for significant dune erosion are anticipated. Depending on the response of this and adjacent shoreline areas, the remaining dunes landward of the mined area may be positioned for increased vulnerability.

Another concern for geomorphic alterations beyond those associated with natural processes involves the configuration of Chincoteague Inlet. Alterations to an inlet's geometry, e.g., through growth of, re-shaping of, or mining from the northern end of Wallops Island, can result in reworking of inlet sediments in order to maintain a stable cross-sectional area. It is probable that the mining area is affecting inlet dynamics by constricting inlet width, causing it to narrow and deepen to maintain its current cross-sectional area in equilibrium with its tidal prism (O'Brien, 1967; Jarrett, 1976; FitzGerald *et al*., 2012). Sand mining is likely to ultimately widen the inlet (particularly after the beach has returned to an equilibrium state) and may result in subsequent shoaling of the inlet to an unknown degree.

Fishing Point is a growing landmass that influences local geological processes; and this added variable cannot be ignored when attempting to determine potential effects of the proposed project beyond natural processes. Even without considering the potential impact to Chincoteague Inlet of natural or manmade changes in the width, volume, or shape of northern Wallops Island, the configuration of this dynamic inlet will surely be modified in response to geomorphic changes to Fishing Point. For example, a westward growth of Fishing Point would narrow the inlet, causing its channel to naturally shift westward or deepen in order to maintain its cross-sectional area. Given past natural changes observed within and around Chincoteague Inlet, and the relatively rapid removal of a large volume/area of sand combined with the influences of Fishing Point, some unknown degree and rate of changes to inlet geometry are expected.

We also anticipate an unknown degree of effect to Chincoteague Inlet if sand mining does not occur and sand from nourishment continues migrating north towards the inlet. The previous nourishment migrated to the north along an unobstructed linear path as demonstrated by the applicant's shoreline monitoring data. That volume of sand currently rests in a curvilinear embayment bounded to the north by a pre-existing headland spit or salient. This current shoreline configuration could modify transport processes and may provide for northerly sand transport to continue in smaller and continual volumes. If this occurs, the inlet is expected to receive migrating sand from this direction at a rate and degree more similar to natural processes.

The post-mining sand flat will create a large intertidal area that is available for exploitation by fishes and crabs endemic to the nearshore and surf zone. This abnormal habitat feature has the potential to trap species at low tide, and some level of mortality is expected. However, this shoreline configuration is relatively small in scale and is not expected to persist. Therefore, losses are likely to be minimal and generally short-term. Sea turtles and various shorebirds have been documented in the area targeted for mining, and potential impacts to these species are analyzed under authority of the Virginia Department of Game and Inland Fisheries, the United States Fish and Wildlife Service, and the National Oceanic and Atmospheric Administration's Office of Protected Resources. We recommend referencing their analyses regarding those particular species.

<u>Breakwaters and Longshore Sand Transport</u>

Regionally the dominant longshore sediment transport along the Eastern Shore barrier islands is to the south (Finkelstein and Ferland, 1987; Fenster *et al*., 2016). However, reversals of regional longshore transport are common at the downdrift side of inlets and shorelines influenced by wave fields created by remote offshore spits such as Fishing Point (Hayes *et al*., 1970; Hayes, 1980; Hayes, 1991). Such a scenario controls local sediment transport along northern Wallops Island, driving sediment to the north from a dynamic, migrating nodal zone located centrally along the length of the island; dominant sand transport south of this nodal point remains to the south (King *et al*., 2011). The opportunity for the breakwaters to disrupt natural and large-scale sand transport is dependent upon the path of sand migrating around Fishing Point and across Chincoteague Inlet (a primary source of sand for the barrier island system), whether or not the breakwaters are within the path of the migrating sand, and the sand-capturing capacity of the breakwaters. Sand supply and transport dynamics are critical to the entire barrier island system (McBride *et al*., 2015; Fenster *et al*., 2016), and disruption of natural processes is expected from the placement of breakwaters; indeed, it is the inherent strategy for breakwater design and application. It is reasonable to conclude that some scale of change to adjacent shoreline dynamics upon and beyond Wallops Island will occur, with the northern area of Assawoman Island particularly vulnerable to these influences.

The shoreline stabilization plan appears to reflect a minimalist approach designed to protect the most sensitive and vulnerable upland infrastructure. The sand nourishment between the breakwaters will rework beyond and within the footprint of the design shoreline in response to local wind and wave energy, with the breakwaters influencing rates and volumes of sand transport in the vicinity of the structures. The disruption of longshore transport by the breakwaters will affect the sand supply to areas north and south of the project footprint at an unknown distance. Disruption of northward longshore transport is expected to alter sand migration rates and the volume of sand available for the mined area, which has the added potential to contribute to long-term effects to northern Wallops Island. Whether or not this may directly contribute to eventual added erosion and an increased vulnerability to Commonwealth natural resources behind and adjacent to the northern end of Wallops Island cannot be interpreted from the available information.

A characteristic of breakwaters that can eventually self-mitigate potential adverse effects to barrier island sand supplies is their sand storage capacity, which is related to breakwater length and distance offshore (Chasten *et al*. 1993). Once maximum capacity is reached and the breakwaters are fully connected to shore, longshore sand transport by wind and waves has the potential to occur at rates and volumes more similar to natural processes. However, facilitation of this process depends heavily on breakwater design and the integration of the breakwaters into local shoreline processes. Furthermore, storm events can reduce sand volumes landward of the breakwaters to below maximum capacity, thus initiating a new cycle of sand transport disruption. Providing guidance on if, and when, these situations develop and establish as normal shoreline processes is infeasible. We assume and strongly recommend continuation of the shoreline monitoring program to continue providing an empirical basis for future adaptive management.

Conclusions and Recommendations

The continued and integrated geological and marine processes indigenous to the Virginia barrier islands creates challenging shoreline management problems and complicated scenarios from which to assess potential benefits or detriments to local natural resources. Accounting for these difficulties, we have confidence that (1) the breakwaters and beach nourishment will provide protection to Wallops Island, but for an unknown period of time; (2) the post-mining footprint and adjacent areas of northern Wallops Island will undergo relatively rapid changes that could affect the island and adjacent inlet beyond natural processes; and (3) the breakwaters will have some unknown degree of effect on longshore sand transport rates and volumes, both north and south of their locations.

To reduce uncertainties and potential adverse environmental impacts, strong consideration should be given to again utilizing offshore sand for nourishment. This would eliminate direct impacts to beaches and dunes on northern Wallops Island and significantly decrease likelihoods of rapid geological alterations and responses of the affected and adjacent beach, dunes, and shoreface. If offshore sand is used, we further recommend consideration of management strategies and structures that semi-contain the sand within and around the proposed beach mining location at the north end of the island to prevent the possibility of an abnormally large volume of sand moving into Chincoteague Inlet.

Some concerning environmental effects could be addressed by applying an additional number of breakwaters designed to contain all sand nourishment, and nourished to maximum capacity. This would stabilize the shoreline to the maximum extent possible while providing added protection for the Wallops Island shoreline and infrastructure. Until a full build-out scenario such as this occurs, frequent and unknown degrees of impact to natural shoreline and island processes should be expected. Continued protection of Wallops Island will undoubtedly require future beach nourishment that will introduce other large sand volumes to this environment, with related unknown concerns and consequences.

Please contact me if you have questions or require additional information.

Sincerely,

Lyle Varnell
Associate Director for Advisory Services

Literature Cited

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Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

RE: EXPEDITED REVIEW-NEW PROJECT NASA WFF Shoreline Restoration DEQ #18-171F

1 message

Emily A. Hein <eahein@vims.edu> Thu, Jan 10, 2019 at 9:26 AM
To: "Howard, Janine" <janine.howard@deq.virginia.gov>

Good morning, Janine,

Our report recommends using an offshore source for the sand nourishment material. The source can be any approved offshore site, including Unnamed Shoal A referenced in the EA.

Please let me know if you have any additional questions.

Best,

Emily

Emily Hein

Assistant Director

Research & Advisory Services

eahein@vims.edu, 804-684-7482

VIMS | William & Mary
Virginia Institute of Marine Science

From: Emily A. Hein
Sent: Tuesday, January 08, 2019 3:15 PM
To: 'Howard, Janine' <janine.howard@deq.virginia.gov>
Subject: RE: EXPEDITED REVIEW-NEW PROJECT NASA WFF Shoreline Restoration DEQ #18-171F

COMMONWEALTH of VIRGINIA

Marine Resources Commission
2600 Washington Avenue
Third Floor
Newport News, Virginia 23607

Matthew J. Strickler
Secretary of Natural Resources

Steven G. Bowman
Commissioner

January 2, 2019

Department of Environmental Quality
Attn: Janine Howard
1111 East Main St.
Richmond, VA 23219

Re: Federal Consistency Determination and
Draft Environmental Assessment
Wallops Flight Facility Project

Dear Ms. Howard:

This will respond to the request for comments regarding the Federal Consistency Determination and Draft Environmental Assessment for the Wallops Flight Facility Shoreline Restoration and Infrastructure Protection project (DEQ #18-171F). Specifically, the National Aeronautics and Space Administration (NASA) has proposed to construct six approximately 150-foot long offshore breakwaters and place approximately 1.3 million cubic yards of sandy beach nourishment material landward of the breakwaters along approximately 19,850 feet of shoreline. The project is located at the Wallops Island facility in Accomack County, Virginia.

Please be advised that the Commission pursuant to Chapter 12, 13, & 14 of Title 28.2 of the Code of Virginia administers permits required for submerged lands, tidal wetlands, and beaches and dunes. As such, the Commission administers the enforceable policies of fisheries management, subaqueous lands, tidal wetlands, and coastal primary sand dunes and beaches which comprise some of Virginia's Coastal Zone Management Program.

We received the applicant's information on October 9, 2018, JPA #18-1590. This project is in the JPA review process and will require a permit from this agency for submerged land and coastal primary sand dune/beach encroachments. Our final consistency recommendation cannot be reached until completion of our permit review process. Once the applicant has receive a permit specifying any necessary special conditions from the Commission, the project will be consistent with our enforceable polices. Conditioned on the issuance of the VMRC permit, the Commission has no objection to the consistency findings provided by the applicant.

Should you have any questions please contact me at (757) 414-0710 or by email at hank.badger@mrc.virginia.gov. Thank you for the opportunity to comment.

Sincerely,

George H. Badger, III
Environmental Engineer, Habitat Management

GHB/lrp
HM

Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

Re: Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Project

1 message

Pudvah, Lauren <lauren.pudvah@mrc.virginia.gov> Tue, Jan 15, 2019 at 4:15 PM
To: "Howard, Janine" <janine.howard@deq.virginia.gov>
Cc: George Badger <hank.badger@mrc.virginia.gov>

Hi Janine,

This language looks good. Thank you!

Best,

Lauren Pudvah

On Tue, Jan 15, 2019 at 12:02 PM Howard, Janine <janine.howard@deq.virginia.gov> wrote:

> Hi Lauren,
>
> Thanks for submitting VMRC's comments on this project. Below is the draft conditional concurrence language that I proposed to use in our response to NASA. Please take a look and let me know that you concur and that the citations are correct. Thanks for your help!
>
> **Condition of Concurrence with the FCD**
>
> The condition of the Commonwealth's concurrence includes the following authorization under the Virginia CZM Program:
>
> - a permit issued by VMRC for encroachments on or over state-owned subaqueous beds authorized under § 28.2-1200 to §28.2-1213 of the Virginia Code.
> - a permit issued by VMRC for encroachments on or over state-owned coastal primary sand dunes and beaches authorized under §28.2-1400 through §28.2-1420 of the Virginia Code.
>
> In accordance with the *Federal Consistency Regulations* 15 CFR Part 930, section 930.4, this conditional concurrence is based on NASA obtaining the necessary authorizations prior to initiating project activities. If the requirements of section 930.4, sub-paragraphs (a)(1) through (a)(3) are not met, this conditional concurrence becomes an objection under 15 CFR Part 930, section 930.63.
>
> Janine Howard
> Environmental Impact Review Coordinator
> Virginia Department of Environmental Quality
> 1111 East Main Street, Suite 1400
> Richmond, VA 23219
> 804-698-4299
>
> For program updates and public notices please subscribe to the OEIR News Feed
>
> On Wed, Jan 2, 2019 at 11:07 AM Pudvah, Lauren <lauren.pudvah@mrc.virginia.gov> wrote:
>
> > Ms. Howard,

Please find attached the VMRC's comments on the above referenced project. Thank you for the opportunity to comment.

Best,

Lauren Pudvah

--
Lauren Pudvah
Comments Coordinator
VA Sea Grant Fellow
Marine Resources Commission
2600 Washington Ave., 3rd Floor
Newport News, VA 23607
lauren.pudvah@mrc.virginia.gov

We're moving! **On January 28th, 2019 we will open our doors at our new location at **380 Fenwick Road, Bldg. 96, Fort Monroe, VA.** To prepare for the move, our current main office **will be closed January 24-25, 2019**. Should you have any communications, permits, reports, etc. that need to be attended to the week of January 21 – 25, we ask that you try and have them delivered no later than January 17, 2019. We will make every effort to avoid any interruptions in service and should you have any questions or concerns please call 757-247-2200.**

--
Lauren Pudvah
Comments Coordinator
VA Sea Grant Fellow
Marine Resources Commission
2600 Washington Ave., 3rd Floor
Newport News, VA 23607
lauren.pudvah@mrc.virginia.gov

We're moving! **On January 28th, 2019 we will open our doors at our new location at **380 Fenwick Road, Bldg. 96, Fort Monroe, VA.** To prepare for the move, our current main office **will be closed January 24-25, 2019**. Should you have any communications, permits, reports, etc. that need to be attended to the week of January 21 – 25, we ask that you try and have them delivered no later than January 17, 2019. We will make every effort to avoid any interruptions in service and should you have any questions or concerns please call 757-247-2200.**

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR PROGRAM COORDINATION

ENVIRONMENTAL REVIEW COMMENTS APPLICABLE TO AIR QUALITY

TO: Janine L. Howard **DEQ - OEIR PROJECT NUMBER: DEQ #18-171F**

PROJECT TYPE: ☐ STATE EA / EIR **X FEDERAL EA / EIS** ☐ SCC

X CONSISTENCY DETERMINATION

PROJECT TITLE: Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Project

PROJECT SPONSOR: National Aeronautics and Space Administration

PROJECT LOCATION: ☐ OZONE ATTAINMENT AREA

REGULATORY REQUIREMENTSMAY BE APPLICABLE TO: **X CONSTRUCTION**
☐ OPERATION

STATE AIR POLLUTION CONTROL BOARD REGULATIONS THAT MAY APPLY:

1. ☐ 9 VAC 5-40-5200 C & 9 VAC 5-40-5220 E – STAGE I
2. ☐ 9 VAC 5-45-760 et seq. – Asphalt Paving operations
3. **X 9 VAC 5-130 et seq. – Open Burning**
4. **X 9 VAC 5-50-60 et seq. Fugitive Dust Emissions**
5. ☐ 9 VAC 5-50-130 et seq. - Odorous Emissions; Applicable to____________________
6. ☐ 9 VAC 5-60-300 et seq. – Standards of Performance for Toxic Pollutants
7. ☐ 9 VAC 5-50-400 Subpart_____, Standards of Performance for New Stationary Sources, designates standards of performance for the______________________________
8. ☐ 9 VAC 5-80-1100 et seq. of the regulations – Permits for Stationary Sources
9. ☐ 9 VAC 5-80-1605 et seq. Of the regulations – Major or Modified Sources located in PSD areas. This rule may be applicable to the ______________________________
10. ☐ 9 VAC 5-80-2000 et seq. of the regulations – New and modified sources located in non-attainment areas
11. ☐ 9 VAC 5-80-800 et seq. Of the regulations – State Operating Permits. This rule may be applicable to ____

COMMENTS SPECIFIC TO THE PROJECT:

(Kotur S. Narasimhan)
Office of Air Data Analysis **DATE: December 12, 2018**

Matthew J. Strickler
Secretary of Natural Resources

Clyde E. Cristman
Director

COMMONWEALTH *of* VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

Rochelle Altholz
Deputy Director of Administration and Finance

Russell W. Baxter
Deputy Director of Dam Safety & Floodplain Management and Soil & Water Conservation

Thomas L. Smith
Deputy Director of Operations

MEMORANDUM

DATE: January 7, 2019

TO: Janine Howard, DEQ

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: DEQ 18-171F, WFF Shoreline Restoration and Infrastructure Protection Project Draft EA

Division of Natural Heritage

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in our files, the Wallops – Assawoman Islands Conservation Site is located within the project site. Conservation sites are tools for representing key areas of the landscape that warrant further review for possible conservation action because of the natural heritage resources and habitat they support. Conservation sites are polygons built around one or more rare plant, animal, or natural community designed to include the element and, where possible, its associated habitat, and buffer or other adjacent land thought necessary for the element's conservation. Conservation sites are given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain; on a scale of 1-5, 1 being most significant. Wallops – Assawoman Islands Conservation Site has been given a biodiversity significance ranking of B2, which represents a site of very high significance. The natural heritage resources of concern at this site are:

Eupatorium maritimum	A Eupatorium	G2?/S1/NL/NL
Charadrius melodus	Piping plover	G3/S2B,S1/LT/LT
Caretta caretta	Loggerhead (Sea Turtle)	G3/S1B,S1/LT/LT
Papaipema araliae	Aralia Shoot Borer Moth	G3G4/S2S3/NL/NL
Juncus megacephalus	Big-headed rush	G4G5/S2/NL/NL
Ammodramus caudacutus	Saltmarsh sparrow	G4/S2B,S3/NL/NL
Euphorbia bombensis	Southern seaside spurge	G4G5/S2/NL/NL
Falco peregrinus	Peregrine falcon	G4/S1B,S2/NL/LT
Papaipema duovata	Seaside Goldenrod Stem Borer	G4/S1S3/NL/NL
Sternula antillarum	Least tern	G4/S2B/NL/NL
Charadrius wilsonia	Wilson's plover	G5/S1B/NL/LE
Circus hudsonius	Northern harrier	G5/S1S2B,S3N/NL/NL
Rynchops niger	Black skimmer	G5/S2B,S1/NL/NL
Plantago maritima var. juncoides	Seaside plantain	G5T5/S1/NL/NL
Tidal Herbaceous Vegetation Low Salt Marsh (Salt Panne Type)		GNR/S3/NL/NL
Bird Nesting Colony		G5/SNR/NL/NL

Wax Myrtle Interdune Shrubland	G3G4/S2S3/NL/NL
Interdune Swale / Pond	G2/S2/NL/NL
Interdune Swale (Northern Mixed Grassland Type)	G1G2/S1? /NL/NL
Woodland Black Cherry Xeric Dune Woodland	G1G2/S1/NL/NL
Shrub Herbaceous Vegetation Xeric Backdune Grassland	G2/S2/NL/NL

Due to the legal status of some of the species listed above, DCR recommends continued coordination with the US Fish and Wildlife Service (USFWS) and the Virginia Department of Game and Inland Fisheries (VDGIF), Virginia's regulatory authority for the management and protection of these species to ensure compliance with protected species legislation. DCR supports the planned mitigation measures to reduce the probability and intensity of potential effects to protected species.

Please note according to DCR's species distribution model, Sea-beach amaranth (*Amaranthus pumilus*, G2/S1/LT/LT) may exist within the project site. Please coordinate with DCR if any occurrences of Sea-beach amaranth are documented.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please re-submit project information and map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

The VDGIF maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis/ or contact Ernie Aschenbach at 804-367-2733 or Ernie.Aschenbach@dgif.virginia.gov.

The remaining DCR divisions have no comments regarding the scope of this project. Thank you for the opportunity to comment.

CC: Troy Andersen, USFWS
Amy Ewing, VDGIF

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 1111 East Main Street, Suite 1400, Richmond, VA 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

MEMORANDUM

TO: Janine Howard, DEQ Office of Environmental Impact Review

FROM: Rachel Hamm, DEQ Principal Environmental Planner

DATE: December 18, 2018

SUBJECT: DEQ #18-171F: NASA Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Project– Accomack County

We have reviewed the Federal Consistency Determination submittal for the proposed project and offer the following comments regarding consistency with the provisions of the Chesapeake Bay Preservation Area Designation and Management Regulations.

The proposed project is located in the Atlantic Ocean watershed and is outside of the Chesapeake Bay watershed; thus there are no comments or requirements under the Chesapeake Bay Preservation Area Designation and Management Regulations or the *Chesapeake Bay Preservation Act*.

DEPARTMENT OF ENVIRONMENTAL QUALITY
TIDEWATER REGIONAL OFFICE
ENVIRONMENTAL IMPACT REVIEW COMMENTS

January 17, 2019

PROJECT NUMBER: 18-171F

PROJECT TITLE: Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Project

As Requested, TRO staff has reviewed the supplied information and has the following comments:

Petroleum Storage Tank Cleanups:
No comments.

Petroleum Storage Tank Compliance/Inspections:
No comments.

Virginia Water Protection Permit Program (VWPP):
On October 9, 2018, the VWP program received a joint permit application for the proposed activities and on December 12, 2018, we waived the requirement for a VWP permit pursuant to 9 VAC 25-210-220.B. Provided the applicant complies with the VWP waiver, the project will be consistent with the VWP program.

Air Permit Program :
The following air regulations of the Virginia Administrative Code may be applicable: 9VAC5-50-60 *et seq*. which addresses the abatement of visible emissions and fugitive dust emissions, and 9VAC5-130-10 et *seq*. which addresses open burning. For additional information, contact Laura Corl at (757) 518-2178.

Water Permit Program :
The Wallops Flight Facility is covered under a VPDES individual permit (VA0024457). If there are any industrially related activities that will discharge pollutants to surface waters or facility changes that may require map or permit revisions, please contact the permit writer, Deanna Austin, at (757) 518-2008 or deanna.austin@deq.virginia.gov.

Waste Permit Program :
No Comment.

Storm Water Program:
No comments.

The staff from the Tidewater Regional Office thanks you for the opportunity to provide comments.

DEPARTMENT OF ENVIRONMENTAL QUALITY
TIDEWATER REGIONAL OFFICE
ENVIRONMENTAL IMPACT REVIEW COMMENTS

January 17, 2019

PROJECT NUMBER: 18-171F

PROJECT TITLE: Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Project

Sincerely,

Cindy L. Robinson

Cindy Robinson
Environmental Specialist II
5636 Southern Blvd.
VA Beach, VA 23462
(757) 518-2167
Cindy.Robinson@deq.virginia.gov

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 1111 East Main Street, Suite 1400, Richmond, VA 23219
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Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

Attachment 2

Advisory Policies for Geographic Areas of Particular Concern

a. Coastal Natural Resource Areas - These areas are vital to estuarine and marine ecosystems and/or are of great importance to areas immediately inland of the shoreline. Such areas receive special attention from the Commonwealth because of their conservation, recreational, ecological, and aesthetic values. These areas are worthy of special consideration in any planning or resources management process and include the following resources:

a) Wetlands
b) Aquatic Spawning, Nursery, and Feeding Grounds
c) Coastal Primary Sand Dunes
d) Barrier Islands
e) Significant Wildlife Habitat Areas
f) Public Recreation Areas
g) Sand and Gravel Resources
h) Underwater Historic Sites

b. Coastal Natural Hazard Areas - This policy covers areas vulnerable to continuing and severe erosion and areas susceptible to potential damage from wind, tidal, and storm related events including flooding. New buildings and other structures should be designed and sited to minimize the potential for property damage due to storms or shoreline erosion. The areas of concern are as follows:

i) Highly Erodible Areas
ii) Coastal High Hazard Areas, including flood plains.

c. Waterfront Development Areas - These areas are vital to the Commonwealth because of the limited number of areas suitable for waterfront activities. The areas of concern are as follows:

i) Commercial Ports
ii) Commercial Fishing Piers
iii) Community Waterfronts

Although the management of such areas is the responsibility of local government and some regional authorities, designation of these areas as Waterfront Development Areas of Particular Concern (APC) under the VCP is encouraged.

Designation will allow the use of federal CZMA funds to be used to assist planning for such areas and the implementation of such plans. The VCP recognizes two broad classes of priority uses for waterfront development APC:

i) water access dependent activities;
ii) activities significantly enhanced by the waterfront location and complementary to other existing and/or planned activities in a given waterfront area.

Advisory Policies for Shorefront Access Planning and Protection

a. Virginia Public Beaches - Approximately 25 miles of public beaches are located in the cities, counties, and towns of Virginia exclusive of public beaches on state and federal land. These public shoreline areas will be maintained to allow public access to recreational resources.

b. Virginia Outdoors Plan - Planning for coastal access is provided by the Department of Conservation and Recreation in cooperation with other state and local government agencies. The Virginia Outdoors Plan (VOP), which is published by the Department, identifies recreational facilities in the Commonwealth that provide recreational access. The VOP also serves to identify future needs of the Commonwealth in relation to the provision of recreational opportunities and shoreline access. Prior to initiating any project, consideration should be given to the proximity of the project site to recreational resources identified in the VOP.

c. Parks, Natural Areas, and Wildlife Management Areas - Parks, Wildlife Management Areas, and Natural Areas are provided for the recreational pleasure of the citizens of the Commonwealth and the nation by local, state, and federal agencies. The recreational values of these areas should be protected and maintained.

d. Waterfront Recreational Land Acquisition - It is the policy of the Commonwealth to protect areas, properties, lands, or any estate or interest therein, of scenic beauty, recreational utility, historical interest, or unusual features which may be acquired, preserved, and maintained for the citizens of the Commonwealth.

e. Waterfront Recreational Facilities - This policy applies to the provision of boat ramps, public landings, and bridges which provide water access to the citizens of the Commonwealth. These facilities shall be designed, constructed, and maintained to provide points of water access when and where practicable.

f. Waterfront Historic Properties - The Commonwealth has a long history of settlement and development, and much of that history has involved both shorelines and near-shore areas. The protection and preservation of historic shorefront properties is primarily the responsibility of the Department of Historic Resources. Buildings, structures, and sites of historical, architectural, and/or archaeological interest are significant resources for the citizens of the Commonwealth. It is the policy of the Commonwealth and the VCP to enhance the protection of buildings, structures, and sites of historical, architectural, and archaeological significance from damage or destruction when practicable.

APPENDIX E
AIR QUALITY EMISSIONS CALCULATIONS

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Emissions Summary

	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2e
Alternative 1	11.15	33.74	174.72	0.20	5.73	5.56	20,175
Alternative 2	5.02	56.47	234.13	0.18	10.03	8.65	18,843
Alternative 1 & 3	13.52	49.18	190.48	0.27	21.63	5.90	31,011
Alternative 2 & 3	7.38	71.91	249.89	0.25	25.93	8.99	29,679

Emission Calculations for Alternative 1

Dump trucks
Bulldozers
Mobile generators
tractor scraper
loader

1,300,000 CY of sand truck cap 12 CY

Material	Source Location	One way distance (mi)	Total Round Trip Time (hrs)	CY19 Total # of trips	Computed Total time (hrs)	Total mi traveled
Sand transport by dump trucks	stockpile	3.25	0.75	108,333	81,250	704,167

	VOC	CO	NOx	SO2	PM10	PM2.5	N2O	CH4	CO2
	lb/mile	lb/mile	lb/mile	lb/mile	lb/mile	lb/mile	lb/mile	lb/mile	lb/mile
Dump Trucks	1.59E-03	8.31E-03	3.78E-02	1.79E-05	1.60E-03	1.6E-03	1.06E-05	1.12E-05	4.21
	VOCs	**CO**	**NOx**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**N2O**	**CH4**	**CO2**
CY 2019	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton
Dump Trucks	0.56	2.93	13.33	0.01	0.56	0.55	0.00	0.00	1,481.64
								CO2e in metric tons/year	**1,344**

Truck emission factors from MOVES

Equipment Usage	CY 19 Hours
Bulldozer	81,250
Wheel Tractor	54,167
Scraper	54,167
Loader	18,056
Gen Set	22,750

24 CY capacity
6 CY bucket capacity

CY 19 Equipment Emissions

Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**N2O** g/gal	**CH4** g/gal	**CO2** g/hp-hr	**BSFC** lb/hp-hr
Bulldozer	81,250	215	0.59	0.31	0.75	4.00	0.005	0.13	0.13	0.22	0.58	530	0.367
Wheel Tractor	54,167	407	0.59	0.17	0.84	4.34	0.005	0.13	0.13	0.22	0.58	531	0.367
Scraper	54,167	290	0.59	0.31	0.75	4.00	0.005	0.13	0.13	0.22	0.58	530	0.367
Loader	18,056	262	0.59	0.31	0.75	4.00	0.005	0.13	0.13	0.22	0.58	530	0.367
Generator	22,750	13	0.43	0.44	2.16	4.44	0.005	0.27	0.27	0.22	0.58	589	0.408

	VOC	CO	NOx	SO2	PM10	PM2.5	N2O	CH4	CO2
	lb	lb	lb	lb	lb	lb	lb	lb	lb
Bulldozer	7,381	16,985	90,889	111	2,990	2,901	260	686	12,044,107
Wheel Tractor	5,040	24,159	124,312	140	3,774	3,661	328	865	15,212,802
Scraper	6,637	15,273	81,729	100	2,689	2,608	234	616	10,830,359
Loader	1,999	4,600	24,613	30	810	785	70	186	3,261,557
Generators	129	606	1,245	2	75	75	4	9	165,129
Tons/year:	**10.6**	**30.8**	**161.4**	**0.2**	**5.2**	**5.0**	**0.4**	**1.2**	**20,757**
								CO2e in metric tons/year	**18,830**

Emission factors and BFSC from Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition, USEPA 2010; Tier 2

Except for N2O and CH4 which are from Federal Greenhouse Gas Accounting and Reporting Guidance Technical Support Document, Revision 1, Page D-7. USEPA 2012.

Load factors from Median Life, Annual Activity and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA 2010

VOC correction from Conversion Factors for Hydrocarbon Emission Components, USEPA 2010

Wheel Tractor Scraper Engine and Capacity Ratings from Caterpillar 627H

BSFC = brake specific fuel consumption

Total Emissions

	VOC	CO	NOx	SO2	PM10	PM2.5	CO2e
Tons per Year	11.15	33.74	174.72	0.20	5.73	5.56	20,175

Emission Calculations for Alternative 2 1,300,000 CY of sand + 25% for loss 325000 1,625,000 Total CY

110 days

Material	Source Location	One way distance (mi)	Total Round Trip Time (hrs)	CY19 Total # of trips	Computed Total time (hrs)	Total mi traveled
Mobilization - supplies	Newport News	114	2.5	90	228	20,520
Tug & barge - mob supplies	Norfolk	100	40	10	400	2,000

	VOC	CO	NOx	SO2	PM10	PM2.5	N2O	CH4	CO2
	lb/mile	lb/mile	lb/mile	lb/mile	lb/mile	lb/mile	lb/mile	lb/mile	lb/mile
Dump/Supply Trucks	1.59E-03	8.31E-03	3.78E-02	1.79E-05	1.60E-03	1.6E-03	1.06E-05	1.12E-05	4.21
	VOCs	**CO**	**NOx**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**N2O**	**CH4**	**CO2**
CY 2019	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton
Dump/Supply Trucks	0.02	0.09	0.39	0.00	0.02	0.02	0.00	0.00	43.18
								CO2e in metric tons/year	**39**

Deliveries	**Engine HP**	**# Engines**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**N2O** g/gal	**CH4** g/gal	**CO2** g/hp-hr	**BSFC** lb/hp-hr
Tugboat - propulsion	2000	2	0.85	0.11	1.49	6.21	0.004	0.24	0.23	0.26	0.74	531	0.367
				VOC Ton	**CO** Ton	**NOx** Ton	**SO2** Ton	**PM10** Ton	**PM2.5** Ton	**N2O** Ton	**CH4** Ton	**CO2** Ton	
	Tugboat Annual Emissions (CY 19)			0.16	0.95	0.49	0.01	1.11	0.00	0.00	0.00	103.43	
											CO2e in metric tons/year	**94**	

Equipment Usage	CY 19 Hours
Derrick barge	240
Work barge	240
Work Tug	5,040
Bulldozer	9,600
Trailing Suction Dredge-propulsion	9,600
Trailing Suction Dredge - pumps	6,720

CY 19 Equipment Emissions

Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**N2O** g/gal	**CH4** g/gal	**CO2** g/hp-hr	**BSFC** lb/hp-hr
Derrick barge	240	2,500	0.85	0.11	1.49	6.21	0.004	0.24	0.23	0.26	0.74	531	0.367
Work barge	240	1,000	0.85	0.11	1.49	6.21	0.004	0.24	0.23	0.26	0.74	531	0.367
Work Tug	5,040	500	0.85	0.11	1.49	6.21	0.004	0.24	0.23	0.26	0.74	531	0.367
Bulldozer	9,600	215	0.59	0.31	0.75	4.00	0.005	0.13	0.13	0.22	0.58	530	0.367
Trailing Suction Dredge-propulsion	9,600	4,000	0.4	0.11	1.49	6.21	0.004	0.24	0.23	0.26	0.74	531	0.367
Trailing Suction Dredge - pumps	6,720	2,500	0.85	0.11	1.49	6.21	0.004	0.24	0.23	0.26	0.74	531	0.367

1.053 VOC corr f

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	N2O lb	CH4 lb	CO2 lb
Derrick barge	125	1,677	6,984	5	268	260	15	43	596,708
Work barge	50	671	2,794	2	107	104	6	17	238,683
Work Tug	523	7,043	29,334	21	1,127	1,093	64	182	2,506,174
Bulldozer	872	2,007	10,739	13	353	343	31	81	1,423,058
Trailing Suction Dredge-propulsion	3,752	50,504	210,348	152	8,081	7,838	458	1,304	17,971,443
Trailing Suction Dredge - pumps	3,488	46,953	195,558	141	7,512	7,287	426	1,212	16,707,826
Tons/year:	**4.4**	**54.4**	**227.9**	**0.2**	**8.7**	**8.5**	**0.5**	**1.4**	**19,721.9**
								CO2e in metric tons/year	**18,059**

Vessel emission factors from page 3-22 of Regulatory Impact Analysis: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder, USEPA 2008.

All vessels are presumed to use 2 propulsion engines, table lists total HP.

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	N2O g/gal	CH4 g/gal	CO2 g/hp-hr	BSFC lb/hp-hr
Bulldozer	9,600	215	0.59	0.31	0.75	4.00	0.005	0.13	0.13	0.26	0.58	530	0.367
				VOC **lb**	**CO** **lb**	**NOx** **lb**	**SO2** **lb**	**PM10** **lb**	**PM2.5** **lb**	**N2O** **lb**	**CH4** **lb**	**CO2** **lb**	
			Bulldozer	872	2,007	10,739	13	353	343	36	81	1,423,058	
			Tons/year:	**0.4**	**1.0**	**5.4**	**0.0**	**0.2**	**0.2**	**0.02**	**0.04**	**711.5**	
											CO2e in metric tons/year	**651**	

Total Emissions

	VOC	CO	NOx	SO2	PM10	PM2.5	CO2e
Tons per Year	5.02	56.47	234.13	0.18	10.03	8.65	18,843

Emission Calculations for Alternative 3

130	ft long	Type 2 stone	150 - 299
10	ft wide at top	Type 3 stone	500-1500
8	ft depth	200 lb stone	2.3 ft long
50	ft width at base assumed based on std breakwater design		0.78 ft wide
21.5	ft width of long sides		1.45 ft thickness type 2
31,200	CY volume of one breakwater - ends		0.10 CY volume of 1 Type 2 200 lb stone
2,000	CY volume of one breakwater end	1000 lb stone	3.7 ft long
33,200	CY Total volume of one breakwater		1.25 ft wide
6	total		2.2 ft thickness
1	month construction period		0.377 CY volume of 1 Type 3 1000 lb stone
rocks brought by water from Norfolk		35	stones for one 130 ft length
1,500	tons ave barge capacity	17	stones for one 21.5 ft width course
15,000	Type 2 stone capacity for 1 barge	8	stones for 10 ft top width
3,000	Type 3 stone capacity for 1 barge	40	stones for 50 ft base width
Deposited using barge excavator		562	Total Type 3 stones for double row on top
31,318	CY of Type 2 stone required for breakwater	1,209	Total Type 3 stones for double row on long sides
325,061	Total Type 2 stones for 1 breakwater	2,811	Total Type 3 stones for double row on bottom
22	barges to bring this number of Type 2 stone	413	Total Type 3 stones for ends
		4,994	Total Type 3 stones for 1 breakwater
		2	barges to bring this number of Type 3 stone
		1,882	CY volume of Type 3 stone in 1 breakwater

Material	Source Location	One way distance (mi)	Total Round Trip Time (hrs)	CY19 Total # of trips	Computed Total time (hrs)	Total mi traveled
Tug & barge - riprap	Norfolk	100	40	140	5,601	28,003

Deliveries	Engine HP	# Engines	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	N2O g/gal	CH4 g/gal	CO2 g/hp-hr	BSFC lb/hp-hr
Tugboat - propulsion	2000	2	0.85	0.11	1.49	6.21	0.004	0.24	0.23	0.26	0.74	531	0.367
				VOC Ton	**CO** Ton	**NOx** Ton	**SO2** Ton	**PM10** Ton	**PM2.5** Ton	**N2O** Ton	**CH4** Ton	**CO2** Ton	
	Tugboat Annual Emissions (CY 19)			2.21	13.30	6.86	0.07	15.56	0.01	0.10	0.29	11,139.61	
											CO2e in metric tons/year	**10,140**	

Equipment Usage	CY 19 Hours
Work Tug	960
Excavator	960

CY 19 Equipment Emissions

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	N2O g/gal	CH4 g/gal	CO2 g/hp-hr	BSFC lb/hp-hr
Work Tug	960	2000	0.5	0.11	1.49	6.21	0.004	0.24	0.23	0.26	0.74	531	0.367
Excavator	960	417	0.85	0.11	1.49	6.21	0.004	0.24	0.23	0.26	0.74	531	0.367

	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	N2O lb	CH4 lb	CO2 lb
Work Tug	234	3,156	13,147	9	505	490	29	81	1,123,215
Excavator	83	1,119	4,660	3	179	174	10	29	398,124
Tons/year:	**0.2**	**2.1**	**8.9**	**0.0**	**0.3**	**0.3**	**0.0**	**0.1**	**760.7**
CO2e in metric tons/year									**697**

Vessel emission factors from page 3-22 of Regulatory Impact Analysis: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder, USEPA 2008.

All vessels are presumed to use 2 propulsion engines, table lists total HP.

Total Emissions

	VOC	CO	NOx	SO2	PM10	PM2.5	CO2e
Tons per Year	2.37	15.44	15.76	0.08	15.90	0.34	10,836

average passenger vehicle					
404			grams of CO_2 per mile		
0.89			lb of CO_2 per mile		
CO_2e					
Tons/yr		45,333,824		miles	
Alt 1	20,175		3,942		cars driving 11,500 miles per year
40,578,601			miles		
Alt 2	18,059		3,529		cars driving 11,500 miles per year
69,682,638			miles		
Alt 3 - north wallops	31,011		6,059		cars driving 11,500 miles per year
66,689,595			miles		
Alt 3 - unnamed shoal	29,679		5,799		cars driving 11,500 miles per year

CY 2019

North Wallops Beach - sand coming from (Alternative 1) 200 acres
Offshore Shoal A - sand coming from (Alternative 2)
Nearshore Breakwaters Add to Alt 1 or Alt 2 and becomes Alt 3
Remove, store, replace sand fencing
Estimated distance from southern edge of borrow
area to northern edge of renourishment area 0.5 mi
Total distance from north to south of both areas 9 mi

Alternative 1 1,300,000 cubic yards of sand
Excavate sand to 2.35 feet 2 mi approx length of borrow area
tractor scraper with low pressure tires remove sand from beach
stockpile sand assume 0.25 mi from fill area
dump trucks would transport to fill area 6.5 mi approx length of renourishment area 3.25 mi is avg distance
bulldozers spread the sand 4 215 HP each 24 hr/day
ATVs
mobile generators for lighting
mobile fuel tanks

Alternative 2 1,625,000 cubic yards of sand
Equipment mobilization 30-45 days Dodge Island 4350 HP propulsion
discharge pipe (several miles) 3000 HP dredge pump power
productivity = 18,513 CY/day based on 2010 EIS
pump out buoys
multiple barges
tugboats 4000 HP X 2
derrick barge
crew transport vehicles
Onshore discharge lines trucked in and placed using loader or crane
onshore equipment
bulldozers
ATVs
mobile generators
mobile fuel tanks
suction hopper dredges self propelled 8000 HP assume 2 dredges 3 RT/day
pumping/jetting engines 5000 HP centrifugal pumps
mooring buoy placement using derrick barge 5000 HP 2 work barges 2000 HP 2 tender tu 1000 HP Placement and remova 12 hrs
12-14 hr dredging days
Dredge over a large area from unnamed Shoal A to mooring buoy 17 mi
length of pipeline to placement 2 mi
7-10 ft depth
hopper capacity 4000 CY actual capacity 3000 CY
booster pumps for moving sand from offload point to placement area

Alternative 3	combined with either 1 or 2
Type 1 stone =	0.75 to 2 tons
Type 2 stone =	150 to 500 pounds
130	ft long
10	ft high at crest
100	ft apart
water depth	4 to 8 ft
6	total
rock transport by rail	
offloaded than moved by truck to staging location	

APPENDIX F
ESSENTIAL FISH HABITAT ASSESSMENT

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

NOV 19 2018

Ms. Shari A. Miller
Center NEPA Manager
Environmental Planning Lead
National Aeronautics and Space Administration
Goddard Space Flight Center, Wallops Flight Facility
Wallops Island, Virginia 23337

Re: Draft NASA WFF Shoreline Enhancement and Restoration Project; Essential Fish Habitat Assessment

Dear Ms. Miller,

NOAA Fisheries Service has reviewed the National Aeronautics and Space Administration (NASA) draft essential fish habitat (EFH) assessment for the proposed NASA WFF Shoreline Enhancement and Restoration Project (SERP) at Wallops Island, Virginia. This consultation is part of the tiered consultations from the 2010 Final Shoreline Restoration and Infrastructure Protection Program (SRIPP) Final Programmatic Environmental Impact Statement (PEIS) as presented in the 2013 Final Post-Hurricane Sandy Environmental Assessment (EA). As you know, the project area is designated as EFH for various life stages of twenty-one (21) federally managed species. There is no habitat area of particular concern (HAPC) designated for the project area.

In the Record of Decision (ROD) issued December 13, 2010 for the WFF SRIPP PEIS, (2010 Final SRIPP PEIS) the stated goal of the SRIPP is to reduce direct impacts to Wallop's Island infrastructure that supports the aerospace programs at the heart of NASA's mission. NASA selected Alternative 1: full beach fill and seawall extension, which included the placement of approximately 3.2 million cubic yards of sand dredged from Unnamed Shoal A, located approximately 5 miles east of Assateague Island on the Outer Continental Shelf (OCS), and the initial 1,430 ft. southerly extension of the Wallops rock seawall, with future extension up to a maximum length of 4,300 ft. to be completed on a funds-available basis. An estimated nine beach re-nourishment maintenance cycles were projected to occur at approximately 5-year intervals. The ROD stated that sandy beach fill material for future re-nourishment cycles would be dredged from either Unnamed Shoal A, Unnamed Shoal B, or excavated from the northern beach on Wallops Island.

Since issuing the ROD, NASA has nourished the Wallops Island beach twice, once in 2012 during initial 3.7-mile beach fill and again in 2014 following Hurricane Sandy (October 2012) when repairs to a section of the seawall and two-thirds of the recently nourished beach were necessary to restore designed sand volume and elevations. Subsequent storms in 2015, 2016 and 2018 have reduced the sand volume to 43 percent of the design levels. Topographic and hydrographic monitoring conducted bi-annually (spring and fall) by the USACE Norfolk District indicates sediment is being transported from the southern end of the project area to the northern end of the island. Consequently, the USACE Norfolk District has evaluated construction of offshore stone breakwaters to reduce the rate of sediment transport and erosion.

As you know, the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267; 11 October 1996), requires all Federal agencies to consult with us on all actions, or proposed actions, permitted, funded, or undertaken, that may adversely affect EFH. As the lead Federal agency for this project, you are responsible for EFH consultation. Based on our review of the draft EFH assessment for the WFF Shoreline Enhancement and Restoration Project, our comments and conservation recommendations are provided below.

Beach Renourishment and Breakwater Construction

The currently proposed re-nourishment cycle requires approximately 1.3 million cubic yards of material and would utilize sand from either the beach on the northern end of Wallops Island (Alternative 1) or from Unnamed Shoal A (Alternative 2). If sand is mined from Unnamed Shoal A, the renourishment cycle and impacts to EFH are essentially equivalent to the project's renourishment component described in the 2010 *SRIPP EFH Assessment* and *Final PEIS.* Moving sand from the north back to the south, called "backpassing" sand (Alternative 1) would include excavating sand using heavy equipment from the beach on the northern end of Wallops Island and hauled by truck down the beach to the south where it would be dumped and spread channelward using bulldozers. Sand would be excavated from MLW landward to beyond the existing primary dune, along the historic 2007 shoreline.

The bi-annual shoreline analysis conducted by the USACE Norfolk District indicates large amounts of accretion has occurred at the northern end of the island due to longshore transport of material from the southern portion of the project area and possibly from sediment bypassing Assateague Island. However, they also noted that there were large losses of material (erosion) experienced in Subreach 3 of Wallops Island – North, adjacent to Chincoteague Inlet. We are concerned that excavation of sand material in the accretion area (Alternative 1) may exacerbate the erosion occurring in the area adjacent to the inlet.

Impacts to EFH would be limited to sand excavated below MHW at the northern end of the island and placed below MHW along the southern nourishment area. The draft EFH assessment states that "sand sourced from an active beach is coarser and typically cleaner than sand from offshore shoals" resulting in less turbidity during construction than slurried material pumped via hydraulic pipeline. Impacts to the existing benthos and EFH would occur below existing MHW at both the northern excavation and southern placement areas.

In addition to sand excavation/dredging and placement of sand along the beach, NASA may construct two (2) sets of three (3) offshore, stone breakwaters designed to reduce wave energy and help hold the sand in place. Each set of breakwaters will be comprised of three (3) structures measuring 130 ft. long, 55 ft. base width, and 10 ft. crest width extending 5.7 ft. above mean high water (MHW). The breakwaters will be sited approximately 300 ft. (BK-1, 2, 3) and 475 ft. (BK-4, 5, 6) offshore from existing mean high water (MHW), and will be constructed with 100 ft. wide gaps spaced between structures. Impacts to the existing benthos and EFH will occur within the 0.98-acre footprint of the stone breakwaters, while a portion of the water column will be displaced by stone and permanently lost.

Magnuson-Stevens Act Conservation Recommendations

Section 305(b)(2) of the MSA requires you to consult with us on any action you authorize, fund, or undertake that may adversely affect EFH. As we have stated, the project area is designated as EFH for various life stages of 21 federally managed species including Albacore tuna (*Thunnus alalunga*), Atlantic angel shark (*Squatina dumerili*), Atlantic butterfish (*Peprilus triacanthus*), Atlantic sea herring (*Clupea harengus*), black sea bass (*Centropristus striata*), blacktip shark (*Carcharhinus limbatus*), bluefish (*Pomatomus saltatrix*), clearnose skate (*Raja eglanteria*), cobia (*Rachycentron canadum*), common thresher shark (*Alopias vulpinus*), dusky shark (*Charcharinus obscures*), king mackerel (*Scomberomorus cavalla*), red hake (*Urophycis chuss*), sand tiger shark (*Odontaspis taurus*), sandbar shark (*Charcharinus plumbeus*), skipjack tuna (*Katsuwonus pelamis*), smooth dogfish (Mustelus canis), Spanish mackerel (*Scomberomorus maculatus*), summer flounder (*Paralicthys dentatus*), windowpane flounder (*Scopthalmus aquosus*), and winter skate (*Leucoraja ocellata*).

Therefore, pursuant to 305(b)(4)(A) of the MSA, we recommend the following EFH conservation recommendations:

1. If Alternative 2 is implemented, target accretion areas of Unnamed Shoal A for dredging to obtain the necessary beach fill material.
2. If Alternative 2 is implemented, dredge over a large area, leaving undisturbed areas between dredged areas to provide for benthic recruitment and recolonization of impacted areas and avoid creating deep pits; follow the existing bathymetry/morphology of shoal to the extent possible, limit depth of cut not to exceed 10 ft. and confirm by conducting post-dredge survey.
3. Construct proposed offshore breakwaters with sand tombolo such that the beach connects with the structures to reduce starving down-drift beaches of sand.
4. If Alternative 1 is implemented, conduct bi-annual post-construction monitoring of the accretion area at northern end of Wallops Island and adjacent erosion area at Chincoteague Inlet. Adaptively manage any unforeseen consequences of "backpassing" sand to the southern project area.

Provided the Conservation Recommendations listed above are accepted and implemented into the project, we concur with your determination that the Shoreline Enhancement and Restoration Project (SERP) on Wallops Island will not substantially adversely affect essential fish habitat (EFH).

Please note that Section 305(b)(4)(B) of the MSA requires you to provide us with written response to these EFH conservation recommendations including a description of measures you have adopted that avoid, mitigate or offset the impacts of the project on EFH.
In the case where your response is inconsistent with our recommendations, Section 305(b)(4)(B) of the MSA also indicates that you must provide reasons for not following our recommendations. Included in your response should be the scientific justification for your disagreement over the anticipated effects of the proposed project and the measures necessary to avoid, minimize,

mitigate or offset such effects pursuant to 50 CFR 600.920(k). If new information becomes available or the project is revised in such a manner that affects the basis for our EFH conservation recommendations, consultation must be reinitiated with us pursuant to 50 CFR 600.920(1).

Please note that this EFH determination does address threatened and endangered species under the purview of NOAA Fisheries Service. Therefore, please contact Mr. Brian Hopper, NOAA Protected Resources Division at 410-573-4592 (Brian.D.Hopper@noaa.gov) to discuss your obligations under Section 7 of the Endangered Species Act (ESA) regarding potential impacts to the federally listed sea turtles.

Conclusions
Thank you for the opportunity to comment on the Draft NASA WFF Shoreline Enhancement and Restoration Project EFH assessment. Please feel free to contact Mr. David O'Brien of our Virginia field office at 804-684-7828 (david.l.o'brien@noaa.gov) if you have any questions regarding these recommendations.

Sincerely,

Louis A. Chiarella
Assistant Regional Administrator
for Habitat Conservation

cc: Chris Moore, NEFMC
Lisa Havel, ASMFC
Brian Hopper, PRD

APPENDIX G
ENDANGERED SPECIES ACT CONSULTATIONS

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National Aeronautics and
Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W

September 27, 2018

Ms. Kimberly Damon-Randall
Deputy Regional Administrator
Northeast Region
Protected Resources Division
National Marine Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts 01930-2276

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Dear Ms. Damon-Randall:

Per our recent conversation with Mr. Brian Hopper of your staff, this correspondence serves as the National Aeronautics and Space Administration's (NASA) notification to the National Marine Fisheries Service (NMFS) Protected Resources Division of its proposed Shoreline Enhancement and Restoration Project at Wallops Flight Facility (WFF), Wallops Island, Virginia.

As you are aware, on August 3, 2012, NMFS issued NASA a *Biological Opinion on the Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Program (SRIPP BO)* and issued an amendment to the SRIPP BO on September 26, 2014. Due to storm- and wave-induced erosion of the beach berm and dune system, renourishment of the Wallops Island beach is needed again, as was analyzed in the *SRIPP BO*. Therefore, the purpose of this correspondence is to request NMFS concurrence regarding the level of Endangered Species Act (ESA) consultation required to conduct the work, especially in consideration of the 2010 *Biological Assessment Shoreline Restoration and Infrastructure Protection Program,* August 2011 *Supplemental Biological Assessment Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Program,* (collectively, *SRIPP BAs*), the *SRIPP BO*, and consultation letters dated March 7, 2013, and August 15, 2014.

Similar to the last two beach fill events, NASA had considered multiple borrow area alternatives, including obtaining the necessary sand from offshore shoals in Federal waters, which would require authorizations from both the U.S. Department of the Interior's Bureau of Ocean Energy Management (BOEM) and the U.S. Army Corps of Engineers (USACE). Therefore, both BOEM and USACE are serving as cooperating agencies on this project. The BOEM has jurisdiction over mineral resources on the Federal Outer Continental Shelf (OCS) and would enter into a negotiated agreement with NASA and USACE pursuant to section 8(k)(2)(d) of the OCS Lands Act. Under Section 404 of the Clean Water Act (CWA), the USACE Regulatory Program has jurisdiction over the disposal of dredged and fill material in Waters of the U.S. Similarly, under Section 10 of the Rivers and Harbors of Act of 1899, the USACE has jurisdiction over the placement of structures and work conducted in navigable waters of the U.S. and would issue a permit to enable the proposed project. Finally, in addition to its regulatory role in the project, the USACE Norfolk District is overseeing project design, construction, and monitoring on NASA's behalf.

To this end, NASA has assumed the role of Lead Federal Agency for ESA compliance and both BOEM and USACE are participating in NASA's ESA consultation. The effects of their actions are considered in all project documents, including this correspondence.

Background

On December 13, 2010, NASA issued a Record of Decision (ROD) for the *Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Program Programmatic Environmental Impact Statement*, hereafter referred to as the *2010 Final SRIPP PEIS*. The primary goal of the SRIPP is to reduce direct damage to Wallops Island's infrastructure; however, its true benefit is the continued use of the island to support the aerospace programs that are at the core of WFF's mission (**NASA, 2010**). In its ROD, NASA selected *Alternative One: Full Beach Fill, Seawall Extension* and adopted a suite of mitigation and monitoring protocols to both reduce potential environmental impacts and track project performance. Implementing the initial phase of Alternative One entailed: 1) the placement along the Wallops Island shoreline of approximately 3.2 million cubic yards (yd^3) of sand dredged from Unnamed Shoal A located in the Atlantic Ocean; and 2) an initial 1,430-foot (ft) southerly extension of the Wallops Island rock seawall with future extensions completed on a funds-available basis to a maximum length of 4,600 ft. An estimated nine beach renourishment cycles at approximately five-year intervals would be implemented (**NASA, 2010**). The ROD stated that fill material for future renourishment cycles could be taken from either Unnamed Shoal A, Unnamed Shoal B, or north Wallops Island beach and left the specifics of how and when the fill material was obtained to be addressed in future action-specific NEPA documentation.

Hurricane Sandy made landfall in October 2012. Monitoring surveys following the storm event identified the need to repair a section of the seawall and the southern two-thirds of the recently nourished beach. Public Law 113-2, *Disaster Relief Appropriations Act, 2013*, was signed into law on January 29, 2013. The bill included a provision for NASA to repair facilities that sustained damage during the Hurricane. NASA signed a Finding of No Significant Impact (FONSI) on June 6, 2013 for the *Wallops Island Post-Hurricane Sandy Shoreline Repair Final Environmental Assessment* (**NASA, 2013**), hereafter referred to as the *2013 Final Post-Hurricane Sandy EA*. Repairs to the seawall and beach renourishment were completed in September 2014. Subsequent storms in 2015 (Hurricane Joaquin) and in 2016 (Winter Storm Jonas) have reduced the sand volume to approximately 43 percent of the design levels (**NASA, 2018**). Additional sand volume reduction occurred most recently in 2018 with Winter Storm Riley.

Description of Proposed Action

The beach system constructed under the SRIPP has served its intended purpose of reducing damage to the range assets. However, a notable portion of sub-aerial (i.e., on land surface) sand has been relocated by storm winds and waves with a majority of this sand volume transported to the north end of Wallops Island as was expected and analyzed in the 2010 PEIS/ROD. The effects of storms are most apparent within the southern half of the Wallops Island beach, where many of the most critical launch assets are located. Within this area, the seaward half of the beach berm has been lowered by up to 3 ft. or more. As such, the beach berm and dune system

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can no longer provide the level of storm damage reduction for which it was originally intended and must be repaired to regain full functionality.

NASA is currently proposing to renourish the beach along the Wallops Island shoreline infrastructure protection area with sand recycled, or "backpassed", from the north end of Wallops Island. Before the renourishment, NASA would construct a series of parallel nearshore breakwater structures that would reduce the intensity of wave action and slow sediment transport. Though obtaining fill material from the north end of Wallops Island is the preferred alternative for this nourishment event, the use of offshore sand resources are still considered as alternatives for this and future nourishment events.

The proposed action and alternatives are described in the 2018 *NASA WFF Shoreline Enhancement and Restoration Project Environmental Assessment*, hereafter referred to as the *2018 SERP EA*. Elements of *2018 SERP EA* Alternative 1 (backpassing sand) and Alternative 3 (construction of breakwaters) that would be relevant to ESA analysis are summarized in the following abridged sections. Full details are in the *2018 SERP EA* are hereby incorporated by reference.

Construction of Nearshore Detached Parallel Breakwaters

Nearshore breakwaters reduce both the amount of storm related wave energy reaching protected beach areas and the rate of longshore sediment transport, thereby increasing the longevity of a beach fill project. NASA is proposing to construct a series of rubble mound breakwaters approximately 200 ft. offshore from the renourished shoreline mean high water (MHW) line (**Figure 1**). Each breakwater would be constructed of Virginia Department of Transportation (VDOT) Type I stone for the outer layer which ranges from 0.75 to 2 tons and VDOT Class II Stone for the core layer which range from 150 to 500 pounds. All stone would be placed parallel to the shore and would measure approximately 130 ft long and 10 ft wide at top crest elevation. The breakwaters would be placed approximately 100 ft apart from each other. Water depths in these areas is approximately 4 to 8 ft. The initial breakwaters would be placed offshore of Launch Pad 0B and continue north to the Horizontal Integration Facility (HIF) (Building X-079). Depending upon economic, engineering, and environmental factors, additional series may be added (Error! Reference source not found.). Note that the area highlighted in Error! Reference source not found. is broadly indicative of potential breakwater location and dramatically overstates the actual affected area.

The rocks for constructing each breakwater would be transported to the WFF area by rail, offloaded, and then trucked to the handling or placement site on Wallops Island. Construction, estimated to last approximately 1 month, would take place in the water using a barge and heavy lifting equipment. These breakwaters would be permanent structures as removal would be impractical and cost prohibitive (**NASA, 2010**). Construction of the offshore breakwaters would be completed prior to starting beach renourishment.

Construction-related stressors imposed on ESA species include nearshore turbidity and water quality. Artificial lighting, noise, ingestion, entanglement, and chemical stressors are not imposed by construction – or are not meaningfully increased above background, and these stressors would not be carried forward in this analysis.

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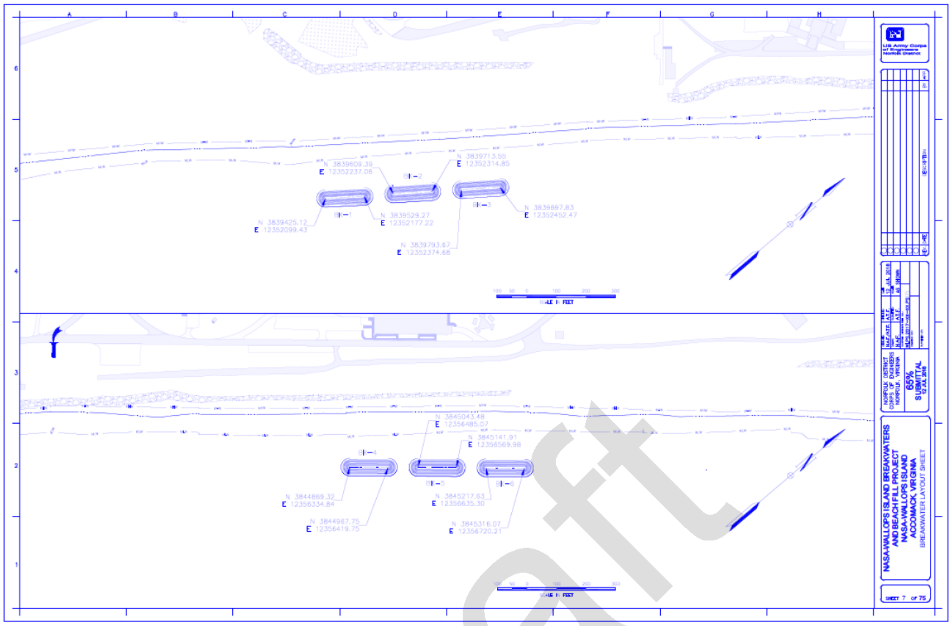

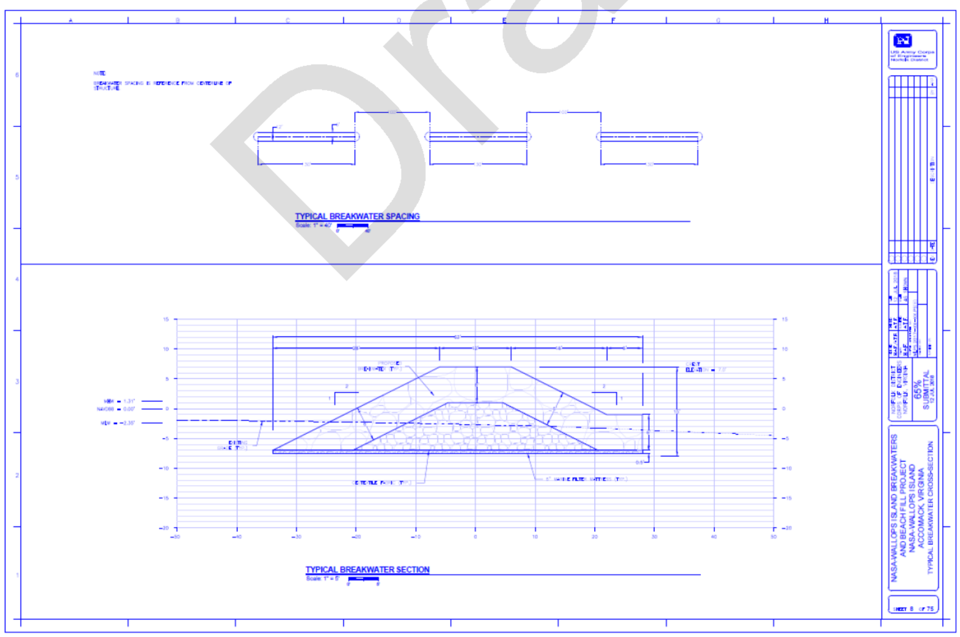

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Figure 1: Breakwater Layout and Typical Cross Section

Figure 2: Full Possible Extent of Breakwater Locations

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Beach Renourishment

The beach renourishment fill template (**Figure 3**) requires approximately 1.3 million yd^3 of sand material to restore the shoreline areas that have sustained berm and dune system reductions. Either the sand for renourishment would come from north Wallops Island beach (Alternative 1), or would come from unnamed shoal A (Alternative 2). The less efficient methods of offshore dredging would require collection of 1.625 million yd^3 to meet the 1.3 million yd^3 fill template.

North Wallops Island beach (**Figure 4**) has been accreting due to wind and wave transport of material from the south; mechanically moving sand from the north end of the island back south to the restoration area is called "backpassing" (Alternative 1). Sand collected from north Wallops Island beach would be transported by truck to the renourishment area (**Figure 3**). Truck haul under backpassing does not require large volumes of water needed to transport sand in a slurry through a pipeline, and, therefore, does not impose the associated turbidity and water quality stressors associated with offshore dredging. The highly efficient method of backpassing would require collection of approximately 1.3 million yd^3 of sand to meet the 1.3 million yd^3 fill template. The most relevant aspect of backpassing to ESA is that none of the source sand would be essential fish habitat, and none of the collection and transport methods intersect with ESA. Taken together, the impacts and stressors imposed on ESA and managed species through backpassing sand would be substantially less than offshore sources, as described in previous consultations

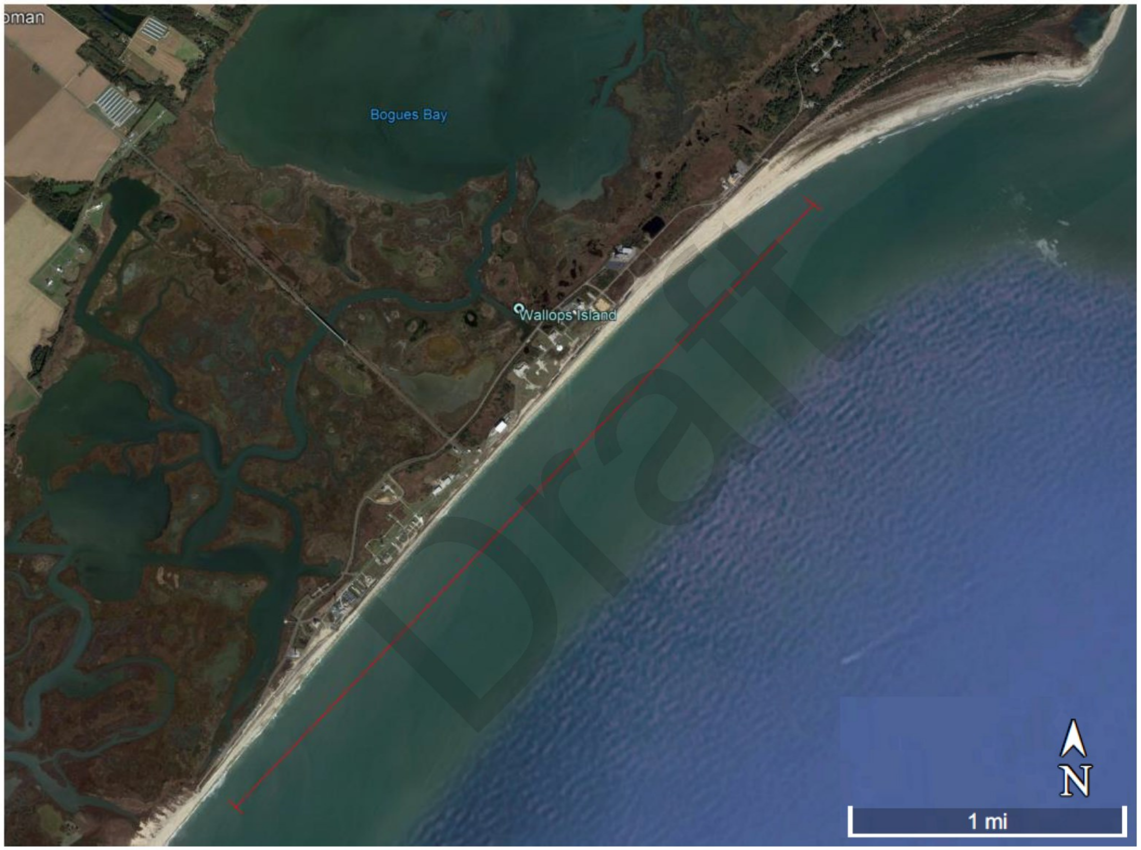

Figure 3: Approximate Sand Placement Area

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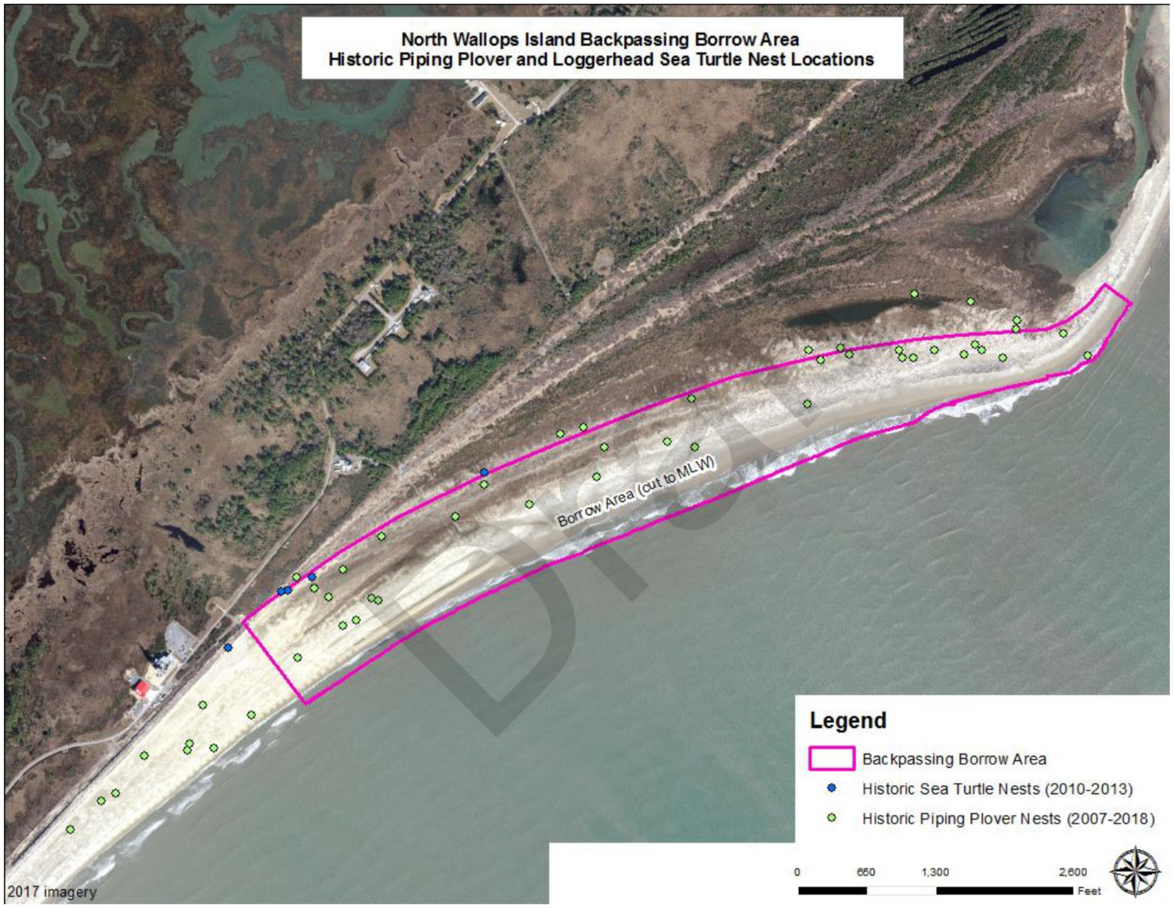

Figure 4: Backpassing Area with Historic Piping Plover and Loggerhead Sea Turtle Nest Sites

Elements relevant to ESA of renourishment with sand from unnamed shoal A were extensively documented in the SRIPP and Post-Sandy actions. Approximately 515 acres of unnamed shoal A were used in the SRIPP and Post-Sandy actions to source 3.2 million and 800,000 yd^3 of sand, respectively. The current backpassing proposal would avoid the use of approximately 206 additional acres of the shoal's 1,800 acre borrow area to source 1.625 million yd^3 of sand from unnamed shoal A.

Fill placement-related stressors imposed on ESA and managed species related to backpassing sand include nearshore turbidity and water quality. Other stressors imposed by fill placement (i.e., artificial lighting, noise, and chemical stressors) are not relevant because their nature and magnitude would be discountable, stressor and receptor are not co-located, and ESA and managed species have little-to-no meaningful susceptibilities in this context.

Post-Renourishment Activities

Additional activities would include post-renourishment installation of sand fencing and planting dune grasses. It would be NASA's intent to re-use as much of the existing sand fencing as possible. Therefore, the proposed project would include removing the existing sand fencing, stockpiling it until the beach fill is complete, and then re-installing it as needed. It is expected that a majority of the existing dune grass within the work site would be covered with sand, therefore requiring re-planting.

<u>Description of the Action Area</u>

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR §402.02). For this project, the action area includes the portion of Atlantic Ocean from the edge of Wallops Island shoreline and adjacent to the outboard side of the proposed breakwater structures (see Error! Reference source not found.), all areas in the immediate vicinity of the shoreline renourishment project to account for suspended sediment, and the surrounding area where any increase in vessel traffic may occur. Previous studies have reported that elevated total suspended sediment (TSS) concentrations associated with the type of shoreline restoration proposed for the breakwater construction are limited to areas within the swash zone (defined as the area of the nearshore that is intermittently covered and uncovered by waves) and close to where renourishment sand is being placed (**Wilber et al., 2006; Burlas et al., 2001**). Thus, elevated suspended sediment levels are expected to occur only in the swash zone and in bottom waters in the immediate vicinity of shoreline restoration and would be contained within the study area indicated in **Figure 3**. This area is expected to encompass all of the effects of the proposed project. No aquatic resources will be exposed to the effects of land-based activities and, thus, will not be considered further.

<u>Status of Species within the Action Area</u>

In preparing the *SRIPP BAs*, NASA determined that project activities may affect the following species under NMFS's jurisdiction:

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Table 1. Listed Species Which May Exist within the Action Area

Common Name	Scientific Name	ESA Status
Atlantic sturgeon	*Acipenser oxyrhinchus oxyrhinchus*	Endangered
Green sea turtle (North Atlantic DPS)	*Chelonia mydas*	Threatened
Hawskbill sea turtle	*Eretmochelys imbricata*	Endangered
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle (Northwest Atlantic Ocean DPS)	*Caretta caretta*	Threatened
Blue whale	*Balaenoptera musculus*	Endangered
Fin whale	*Balaenoptera physalus*	Endangered
North Atlantic right whale	*Eubalaena glacialis*	Endangered
Sei whale	*Balaenoptera borealis*	Endangered
Sperm whale	*Physeter macrocephelus*	Endangered

Key: DPS = distinct population segment

The SRIPP BO considered the effects of offshore dredging and beach renourishment on these listed species, and based on these effects, also includes an Incidental Take Statement (ITS) for those species that may be adversely affected, but not jeopardized, by the SRIPP. More specifically, the ITS exempts the take of 9 sea turtles and 2 Atlantic sturgeon during these operations over the 50 year life of the SRIPP. A separate, 2010 USFWS SRIPP BO addressed ITS associated with onshore renourishment activities.

Two sea turtle nests were discovered in each year 2010, 2012, and 2013. **Figure 5** displays historic sea turtle nesting sites in relation to the backpassing area and proposed breakwaters. No sea turtle activity has been found on Wallops Island since 2013, indicating that the individuals which previously utilized Wallops Island for nesting may be deceased or have begun nesting elsewhere.

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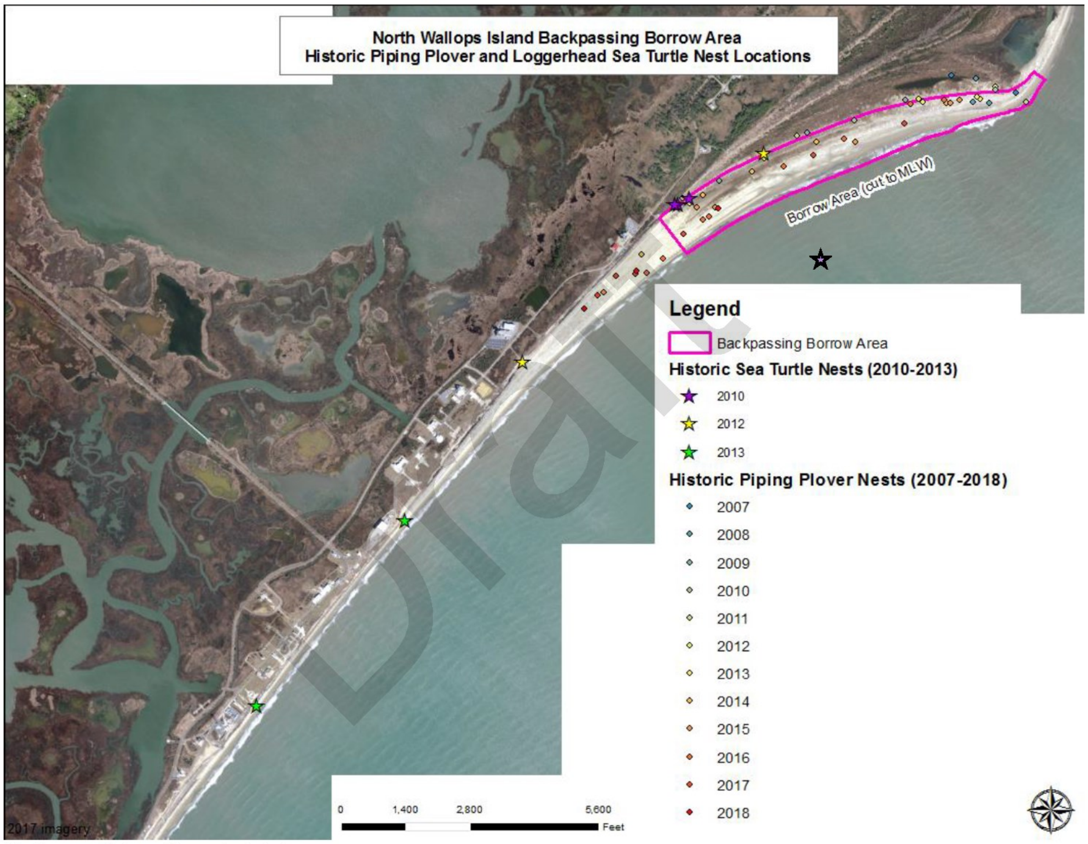
The giant manta ray (*Manta birostris*) was recently listed as threatened in January of 2018. According to **NOAA (2018)**, the giant manta ray is the world's largest ray with a wingspan of up to 29 ft and can weigh up to 5,300 pounds. Giant manta rays are slow-growing, migratory animals with small, highly fragmented populations that are sparsely distributed across the world. It has the potential to be within the offshore borrow area during the summer months. It is found worldwide in tropical, subtropical, and temperate bodies of water and is commonly found offshore, in oceanic waters, and near productive coastlines. It has been found in waters as cool at 66° F and has been observed in estuarine waters near oceanic inlets (**NOAA, 2018**).

Manta rays primarily feed on planktonic organisms such as euphausiids, copepods, mysids, decapod larvae, and shrimp, but some studies have noted their consumption of small and moderately sized fishes as well. During feeding, giant manta rays may be found aggregating in shallow waters at depths less than 33 ft; however, tagging studies have also shown that the species conducts dives of up to 650 to 1,500 ft and is capable of diving to depths exceeding 3,200 ft. This diving behavior may be influenced by season and shifts in prey location associated with the thermocline (**NOAA, 2018**).

<u>Effects of the Action on Listed Species</u>

Impacts on listed species from renourishment would be the same as those discussed in the *SRIPP BAs* and *SRIPP BO* NMFS issued to NASA; therefore, this analysis focuses only on potential impacts from backpassing sand and the construction of the breakwaters as described below.

Figure 5: Historic Loggerhead Sea Turtle Nesting Locations on Wallops Island



Sediment Disturbing Activities

Construction of the breakwaters would have the potential to result in sediment suspension during placement of the materials (e.g., marine mattresses, armor stone) and the movement of construction barges and vessels. Increases in suspended sediment would be temporary, localized, and would dissipate upon cessation of sediment disturbing activities. To construct the breakwater segments, each prefabricated geotextile marine mattresses would be floated out to its final location, and then lowered to the bottom by the weight of large rocks to minimize sediment resuspension. Rocks would be placed inside the geotextile mattress in a manner that limits sediment resuspension. Rocks used for armoring and to construct the breakwaters would be made of "clean" material, further minimizing the potential for release of suspended material into the water column. Crane barges would be continually moved during construction, and vessels carrying construction materials. Construction vessels would maintain at least 2 ft of clearance from the bottom of the ocean, or work only at tide levels sufficient to keep the barges off the ocean bottom to further minimize sediment disturbance. Expected increases to suspended sediment concentrations related to vessel activity during construction would likely be minimal relative to background levels.

Temporary increases in suspended sediment would occur during the sand harvesting backpassing and during the shoreline renourishment components. However, these components would be conducted from land using bulldozers, frontend loaders, and excavators rather than from a discharge pipe. As such, the shoreline restoration would use sand and not a slurry mixture. Any increase in turbidity would be expected to be limited to the swash zone and bottom waters in the immediate vicinity of the placement site and would be temporary and localized. Sediment suspended during the sand harvesting and placement activities would dissipate quickly upon completion of those actions. The majority of the sand harvesting and shoreline restoration areas would be above mean low water (MLW), and the sand harvesting and placement and subsequent grading would be conducted from land. To minimize potential impacts to aquatic resources, the equipment would likely concentrate on the intertidal and subtidal zones during low tide, whereas during high tide, work would be focused on the upper beach berm and dune. After each section of beach is confirmed to meet design criteria, the process would continue in the longshore direction.

TSS would most likely affect sea turtles, subadult and adult Atlantic sturgeon, or giant manta rays if a plume causes a barrier to normal behaviors or if sediment settles on the bottom affecting prey of these species. While the increase in suspended sediments may cause Atlantic sturgeon, giant manta rays, and sea turtles to alter their normal movements, any change in behavior would not able to be measured or detected, as it would only involve minor movements that alter their course out of the sediment plume which would not disrupt any essential life behaviors. As sturgeon, rays, and sea turtles are highly mobile, they are likely able to avoid any sediment plume. Temporary increases in suspended sediment during construction of the breakwaters would be below thresholds shown to have an adverse effect on fish (580.0 milligrams per liter [mg/L] for the most sensitive species, with 1,000.0 mg/L more typical; see summary of scientific literature in **Burton, 1993**) and benthic communities (390.0 mg/L [**USEPA, 1986**]). Thus, any potential effects of sediment disturbance to sea turtles, giant manta rays, or sturgeon would be too small to be meaningfully measured or detected and are insignificant.

Project Vessels

In this analysis, three elements were considered: (1) the existing baseline conditions, (2) the action and what it adds to existing baseline conditions, and (3) new baseline conditions (the existing baseline conditions and the action together). NASA has determined that vessel traffic added to baseline conditions as a result of the proposed project would not be likely to adversely affect ESA-listed species for the following reasons.

Adding project vessels (e.g., barges during breakwater construction) to the existing baseline would not increase the risk that any vessel in the area would strike an individual, or would increase it to such a small extent that the effect of the action (i.e., any increase in risk of a strike caused by the project) cannot be meaningfully measured or detected. During the project activities, a minimal number of project vessels would be added to the baseline. Therefore, the increase in traffic associated the proposed project would be extremely small. The addition of project vessels would also be intermittent, temporary, and restricted to a small portion of the overall action area on any given day. Additionally, **Pace and Silber (2005)** found that the probability of death or serious injury to large whales increased rapidly with increasing vessel speed. Specifically, the predicted probability of serious injury or death increased from 45 percent to 75 percent as vessel speed increased from 10 to 14 knots, and exceeded 90 percent at 17 knots. Since, all barges would steam to construction locations at slow rates of speed or would remain almost stationary during construction activities, any increased risk of a vessel strike caused by the project would be too small to be meaningfully measured or detected. As a result, the effect of the action on the risk of a vessel strike in the action area would be insignificant.

In-water/Over-water Structures and Material Placed on Bottom/Shoreline

Breakwaters

Breakwaters would extend approximately 7 ft above MHW. Two sets of three breakwaters are initially proposed along the mid (HIF) and southern portions (Launch Pad 0B) of Wallops Island (**Figure 2**). As funding allows, more breakwaters may be installed in the approximately 40-acre area. Unlike the sand backpassing portion of the project, breakwater construction will not subject to time-of-year restrictions.

Each breakwater would be approximately 130 ft long and would displace approximately 7,580 yd^3 with approximately 4,700 yd^3 below MWH. Each breakwater in a set of three would be separated by 100 ft from the next, with the total set occupying an approximately 35,400-square foot (0.8-acre) footprint. Together the initial six segments would be approximately 780 ft long, permanently converting approximately 0.34 acres from sand to new hardbottom habitat and resulting in the placement of approximately 45,500 yd^3 of stone in the ocean, of which 28,200 yd^3 would be below MHW. The two initial sets of three breakwaters (i.e., oceanward of Launch Pad 0B and the HIF) would be separated from each other by approximately 12,000 ft.

It is important to note that breakwaters have been shown to impact the ingress and egress of nesting sea turtles and the egress of hatchlings. Aside from the physical obstruction of the breakwater blocking access to the beach for the mother and the open ocean for both the mother and emergent hatchlings, the structures can redirect the direction of the turtles and possibly point them towards a light source. Hoggard **(1991**), describes sea turtle hatchlings which emerged from their nest who apparently swam the length of a 300 meter breakwater off Biloxi, Mississippi only to be misdirected by the bright lights of a marina just off the terminus of the breakwater. Three live hatchlings were recovered inside the marina. In the long term, longshore transport will be altered by the breakwaters and may enhance or denigrate nesting habitat for sea turtles on Wallops Island. However, modeling by the Corps of Engineer suggests that the borrow area would recover in 5 to 6 years from continued northerly sediment transport even with the breakwaters in place. (**A. Farrow, personal communication 2018**).In the short term, it is unlikely that six breakwaters with a total length of 780 ft (4 percent of the 19000 foot replenishment project) will provide a significant impediment to sea turtle ingress and egress to and from the beach.

Backpassing and Beach Renourishment

The proposed project would restore approximately 19,000 ft of shoreline. Of the approximately 230 acres of renourished area, approximately 140 acres would be below MHW. About 1.3 million yd^3 of sand would be harvested from across 200 acres on the north end of Wallops Island and mechanically moved to the renourishment area to establish a wider beach in what is currently a narrow and erosion-prone section of the island.

Benthic organisms living in the sandy beach area of Wallops Island would experience direct mortality from the sand removal on the north end and relocation to the renourishment area. This would be due to disturbance and crushing from excavators removing sand and burial in the renourishment area. The physical oceanographic conditions would be essentially unchanged, and after the renourishment reaches equilibrium, there would be no net change in the physical environment available for benthos.

Recovery time of benthos within the surf zone would likely be short given the dynamic conditions within the nearshore and surf zones. **Burlas *et al.* (2001)** estimated that the recovery time for benthos in a 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. **Dalfsen and Essink (2001)** noted that recolonization is generally defined by two patterns: the rapid development of "opportunistic" species, and the subsequent recovery of community composition and structure. It is expected that organisms from adjacent areas would recolonize the new beach. Additionally, backpassed material would not be substantially different than native material, and some benthic organisms may survive in the transition to the renourished area; therefore, it is expected that recovery would occur over a relatively short time (i.e., on the order of 6 to 12 months post-project).

Effects Determination

Sea Turtles: Effects on in-water sea turtles could include interaction with the sediment plume, reduction in available forage, disturbance due to vessel created sounds, and ingress and egress for adult females and hatchlings around breakwater.. The construction of breakwaters could potentially cause disturbance and area avoidance by sea turtles, depending on the time of year construction was initiated. Additionally, if work continued throughout the night, lighting would cause confusion for sea turtle hatchlings traveling to the water. The area offshore of Wallops Island would be considered to be marginal as sea turtle habitat, and observations of sea turtles in these waters are infrequent.

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Table 2. Recorded Sea Turtle Nesting on Wallops Island Beaches

Year	Species	Number of Nests
1979	Loggerhead (*Caretta caretta*)	1
1982	Loggerhead (*Caretta caretta*)	1
1989	Loggerhead (*Caretta caretta*)	1
2002	Loggerhead (*Caretta caretta*)	1
2008	Loggerhead (*Caretta caretta*)	1
2010	Loggerhead (*Caretta caretta*)	4
2012	Loggerhead (*Caretta caretta*)	2
2013	Loggerhead (*Caretta caretta*)	2

Nesting on Wallops Island beaches is infrequent as well. From 1979 to 2008, a total of five loggerhead sea turtle nests occurred on Wallops Island. A flurry (for Wallops Island) of nesting occurred from 2010 to 2013. The USFWS performed genetic testing on eggs taken from nests from this period. The same individual dug the six nests in 2010 and 2012, while a different female(s) was responsible for the 2013 nests. (**K. Holcomb, personal communication 2018)** No loggerhead sea turtle nesting activity has occurred on Wallops Island since 2013, suggesting that the individuals which previously utilized Wallops Island for nesting may be deceased or have begun nesting elsewhere. Sea turtles species are considered to occur within the study area, although only loggerhead sea turtles have nested on Wallops Island.

Impacts to nesting sea turtles could include avoided nesting attempts due to nighttime construction activity (particularly artificial lighting) on the beach, disorientation of hatchlings (due to project-related light sources), obstruction to hatchlings during their emergence and subsequent trip to the ocean, or loss of beach habitat. Given that the beach fill material from backpassing would be from sourced from Wallops Island, it is not expected that fill material would affect sea turtle nesting success. In fact, sea turtle nesting occurred on the new Wallops Island dune during the initial beach fill, indicating that it is very possible that the additional elevated beach provides suitable nesting habitat, a net benefit to the species.

Consistent with the monitoring proposed for piping plovers and red knots, NASA's biological monitor would also survey the work site for signs of sea turtle nesting activity. Should a nest be detected within the work site, the daily surveys would continue throughout the hatch window until the last hatchlings emerge. Additionally, situation-specific mitigation measures, which could include shading nests from artificial light or establishing defined emergence corridors, would be developed in consultation with USFWS should a nest be identified within an active work site.

Atlantic Sturgeon: Effects on sturgeon would be similar to those of in-water sea turtles and could include interaction with the sediment plume, reduction in available forage, and disturbance due to vessel created sounds. However, given the limited number of sturgeon expected to use the breakwater area as habitat and the limited portion of available habitat that would be affected, the potential for interaction would be limited.

Direct mortality of all benthos within the footprint of breakwater construction would be likely. The footprint of the breakwaters would be permanently converted from sand to approximately 0.34 acres of new hardbottom habitat. However, because the regional coastline has very little hardbottom habitat in the surf zone the concept of recovery is not applicable and colonization of the breakwaters would provide habitat for an essentially novel community of benthos. Potential direct benefits to native benthos would be minimal, but the breakwaters would provide attachment points for sessile creatures, refuge and cover for mobile macrobenthos, such as polychaete worms or amphipods, and could offer some minor beneficial impacts in the long term.

Existing benthic habitat displaced by the initial breakwater construction would lessen forage available for Atlantic sturgeon. However, there is no indication that the study area could provide unique ecological opportunities; the loss of this specific bottom forage habitat would happen sequentially over the 6 to 9 month construction period. Shading may reduce photosynthesis in these areas, which forms the basis of benthic food chains, and may reduce the forage base in the area shaded by the breakwaters.

In addition, subadult and adult Atlantic sturgeons consume a greater proportion of fish in their diets compared to younger life stages and would be expected to forage on and in the vicinity of the breakwater segments. Those sturgeon that do choose to opportunistically forage in the action area would be physically able to shift to other nearby areas in the estuary where the preferred benthic community is more readily accessible. Thus, any potential effects of habitat modification to sturgeon would be too small to be meaningfully measured or detected and are insignificant.

Giant Manta Ray: Impacts to giant manta ray would be similar to those described for in water sea turtles and Atlantic sturgeon and could include interaction with the sediment plume and disturbance due to vessel created sounds. As rays do not forage on benthic organisms, construction of breakwaters would not present a direct impact to food sources. These species are highly mobile and would likely avoid the breakwater construction area during construction activities. Those rays that do choose to opportunistically forage in the action area would be physically able to shift to other nearby areas where zooplankton is more readily accessible. Thus, any potential effects of habitat modification to giant manta rays would be too small to be meaningfully measured or detected and are insignificant.

Should the offshore dredging option be employed, impacts to giant manta rays could expected to be similar or less than impacts to Atlantic sturgeons and sea turtles described in previous SRIPP BO's. While Atlantic sturgeons are bottom feeders and sea turtles often rest on the sea bottom, giant manta rays feed on planktonic and nektonic species throughout the water column and are less likely to be trapped or crushed by the drag head or entrained in the dredge.

Conclusion

In consideration of the scope of the proposed project, listed species known to inhabit the project area, and the potential effects on those species, NASA has determined that the project *may affect, but is not likely to adversely affect* loggerhead sea turtles, Atlantic sturgeon, and giant manta rays. As the proposed action is substantially similar to that considered within the *SRIPP BAs* and

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subsequent *SRIPP BO*, NASA concludes that reinitiating formal ESA consultation is not necessary. NASA requests NMFS concurrence with this determination.

If you have any questions or require additional information, please contact Ms. Shari Miller of my staff at (757) 824-2327.

Sincerely,

T. J. Meyer

Theodore J. Meyer
Associate Chief, Medical and Environmental Management Division

cc:
228/Mr. J. Saecker
250/Ms. K. Finch
250/Ms. S. Miller
BOEM/Mr. D. Piatowski
USACE/Mr. J. Altuna

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National Aeronautics and
Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W

September 27, 2018

Ms. Cindy Schulz
Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, Virginia 23061

Dear Ms. Schulz:

The purpose of this correspondence is to request United States Fish and Wildlife Service (USFWS) concurrence regarding Endangered Species Act (ESA) consultation required to continue and expand beach renourishment activities at the NASA Goddard Space Flight Center's Wallops Flight Facility (WFF) on Wallops Island, Virginia. In consideration of the *2010 Biological Assessment Shoreline Restoration and Infrastructure Protection Program* (**SRIPP BA**; **NASA, 2010a**), the subsequent July 30, 2010 *Programmatic Biological Opinion on the Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Program* (**2010 PBO**; **USFWS, 2010**), and the subsequent June 22, 2016 *Consolidated Biological Opinion for Wallops Flight Facility Proposed and Ongoing Operations and Shoreline Restoration/ Infrastructure Protection Program* (**2016 BO**; **USFWS, 2016**), NASA requests that this letter serves as informal ESA consultation.
NASA is preparing the *Shoreline Enhancement and Restoration Project Environmental Assessment* (**SERP EA; NASA, 2018**) as a tiered document off of the *2010 SRIPP Programmatic Environmental Impact Statement* (**2010 SRIPP PEIS**; **NASA, 2010b**). The alternatives for beach nourishment considered in the SERP EA include Alternative 1, removal of sand from a north Wallops Island borrow site for shoreline renourishment purposes ("backpassing") and Alternative 2, offshore dredging. As described in the SRIPP BA, the 2010 PBO, and 2016 BO, NASA has considered backpassing as an alternative since its initial consultation under the ESA for the SRIPP PEIS. While offshore dredging has been NASA's preferred alternative for the SRIPP PEIS and subsequent *Final Environmental Assessment: Wallops Island Post-Hurricane Sandy Shoreline Repair* (**Post-Sandy EA**; **NASA, 2013**), the SERP EA would consider backpassing as an equally viable alternative for acquisition of sand for beach nourishment. In addition, consistent with the 2010 SRIPP PEIS, the SERP EA considers the use of offshore breakwaters to reduce erosion and longshore transport. As such, the SERP

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EA considers beach nourishment (accomplished either through backpassing or dredging) with and without construction of breakwaters.

Similar to the last two beach fill events, NASA had considered multiple borrow area alternatives, including obtaining the necessary sand from offshore shoals in Federal waters which would require authorizations from both the U.S. Department of the Interior's Bureau of Ocean Energy Management (BOEM) and the U.S. Army Corps of Engineers (USACE). Therefore, both BOEM and USACE are serving as cooperating agencies on this project. The BOEM has jurisdiction over mineral resources on the Federal Outer Continental Shelf (OCS) and would enter into a negotiated agreement with NASA and USACE pursuant to section 8(k)(2)(d) of the OCS Lands Act. Under Section 404 of the Clean Water Act (CWA), the USACE Regulatory Program has jurisdiction over the disposal of dredged and fill material in Waters of the U.S. Similarly, under Section 10 of the Rivers and Harbors of Act of 1899, the USACE has jurisdiction over the placement of structures and work, conducted in navigable waters of the U.S., and would issue a permit to enable the proposed project. Finally; in addition to its regulatory role in the project, the USACE Norfolk District is overseeing project design, construction, and monitoring on NASA's behalf. To this end, NASA has assumed the role of Lead Federal Agency for ESA compliance and both BOEM and USACE are participating in NASA's ESA consultation. The effects of their actions are considered in all project documents, including this correspondence.

The Virginia Department of Game and Inland Fisheries would also be consulted to ensure compliance with all Commonwealth of Virginia requirements.

Background

On December 13, 2010, NASA issued a Record of Decision (ROD) for the 2010 Final SRIPP PEIS. The primary goal of the SRIPP are to reduce direct damage to Wallops Island's infrastructure; however, its true benefit is the continued use of the island to support the aerospace programs that are at the core of WFF's mission (**NASA, 2010b**). In its ROD, NASA selected *Alternative One: Full Beach Fill, Seawall Extension* and adopted a suite of mitigation and monitoring protocols to both reduce potential environmental impacts and track project performance. Implementing the initial phase of Alternative One entailed: 1) the placement along the Wallops Island shoreline of approximately 3.2 million cubic yards (yd^3) of sand dredged from Unnamed Shoal A located in the Atlantic Ocean; and 2) an initial 1,430-foot (ft) southerly extension of the Wallops Island rock seawall with future extensions completed on a funds-available basis to a maximum length of 4,600 ft. An estimated nine beach renourishment cycles at approximately five-year intervals would be implemented (**NASA, 2010b**). The ROD stated that fill material for future renourishment cycles could be taken from either Unnamed Shoal A, Unnamed Shoal B, or north Wallops Island beach and left the specifics of how and when the fill material was obtained to be addressed in future action-specific NEPA documentation.

Hurricane Sandy made landfall in October 2012. Monitoring surveys following the storm event identified the need to repair a section of the seawall and the southern two-thirds of the recently nourished beach. Public Law 113-2, *Disaster Relief Appropriations Act, 2013*, was signed into

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law on January 29, 2013. The bill included a provision for NASA to repair facilities that sustained damage during the Hurricane. NASA signed a Finding of No Significant Impact (FONSI) on June 6, 2013 for the *Wallops Island Post-Hurricane Sandy Shoreline Repair Final Environmental Assessment* (**NASA, 2013**), hereafter referred to as the *2013 Final Post-Hurricane Sandy EA*. Repairs to the seawall and beach renourishment were completed in September 2014. Subsequent storms in 2015 (Hurricane Joaquin) and in 2016 (Winter Storm Jonas) have reduced the sand volume to approximately 43 percent of the design levels (**NASA, 2018**). Additional sand volume reduction occurred most recently in 2018 with Winter Storm Riley.

Description of the Action

The beach system constructed under the SRIPP has served its intended purpose of reducing damage to the range assets. However, a notable portion of sub-aerial (i.e., on land surface) sand has been relocated by storm winds and waves with a majority of this sand volume transported to the north end of Wallops Island. The effects of storms are most apparent within the southern half of the Wallops Island beach, where many of the most critical launch assets are located. Within this area, the seaward half of the beach berm has been lowered by up to 3 ft. or more. As such, the beach berm and dune system can no longer provide the level of storm damage reduction for which it was originally intended and must be repaired to regain full functionality.

NASA is currently proposing to renourish the beach along the Wallops Island shoreline infrastructure protection area with sand recycled, or "backpassed", from the north end of Wallops Island. Before the renourishment, NASA would construct a series of parallel nearshore breakwater structures that would reduce the intensity of wave action and slow sediment transport.

The proposed action and alternatives are described in the 2018 *NASA WFF Shoreline Enhancement and Restoration Project Environmental Assessment*, hereafter referred to as the *2018 SERP EA*. Elements of *2018 SERP EA* Alternative 1 (backpassing sand) and Alternative 3 (construction of breakwaters) that would be relevant to ESA analysis are summarized in the following abridged sections. Full details are in the *2018 SERP EA* are hereby incorporated by reference.

Construction of Nearshore Detached Parallel Breakwaters

Nearshore breakwaters reduce both the amount of storm related wave energy reaching protected beach areas and the rate of longshore sediment transport thereby increasing the longevity of a beach fill project. NASA is proposing to construct a series of rubble mound breakwaters approximately 200 ft. offshore from the renourished shoreline mean high water (MHW) line). Each breakwater would be constructed of Virginia Department of Transportation (VDOT) Type I stone for the outer layer which ranges from 0.75 to 2 tons and VDOT Class II Stone for the core layer which range from 150 to 500 pounds. All stone would be placed parallel

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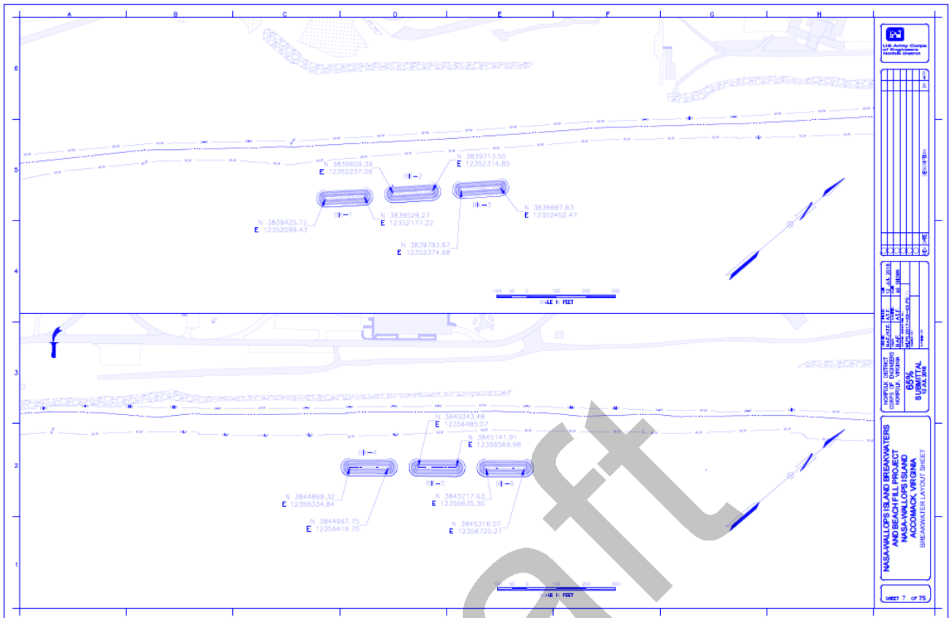

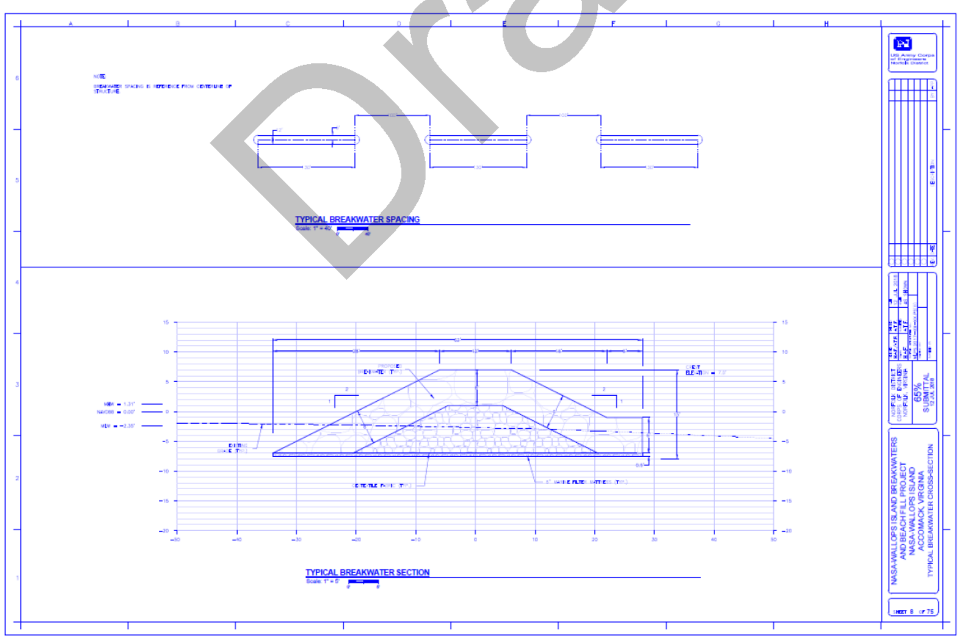

Figure 1: Breakwater Layout and Typical Cross Section

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to the shore and would measure approximately 130 ft long and 10 ft wide at top crest elevation. The breakwaters would be placed approximately 100 ft apart from each other. Water depths in these areas is approximately 4 to 8 ft. The initial breakwaters would be placed offshore of Launch Pad 0B and continue north to the Horizontal Integration Facility (HIF) (Building X-079). Depending upon economic, engineering, and environmental factors, additional series may be added (

Figure 2). Note that the area highlighted in

Figure 2 is broadly indicative of potential breakwater location and dramatically overstates the actual affected area.

The rocks for constructing each breakwater would be transported to the WFF area by rail, offloaded, and then trucked to the handling or placement site on Wallops Island. Construction, estimated to last approximately 1 month, would take place in the water using a barge and heavy lifting equipment. These breakwaters would be permanent structures as removal would be impractical and cost prohibitive (**NASA, 2010b**). Construction of the offshore breakwaters would be completed prior to starting beach renourishment.

Figure 2: Full Possible Extent of Breakwater Locations

Beach Renourishment
The beach renourishment fill template (**Figure 3**) requires approximately 1.3 million yd^3 of sand material to restore the shoreline areas that have sustained berm and dune system reductions. Either the sand for renourishment would come from north Wallops Island beach (Alternative 1), or would come from unnamed shoal A (Alternative 2). The less efficient methods of offshore dredging would require collection of 1.625 million yd^3 to meet the 1.3 million yd^3 fill template.

One potential source of sand for renourishment is the existing beach on the northern end of Wallops Island, an area where sediment accumulates by longshore transport from the south. USACE modeling showed that prior to initial shoreline restoration, on average, approximately 40,000 yd^3 of sediment per year was accumulating at the northern end of Wallops Island by longshore transport from the south (**NASA, 2010b**). A requirement of the SRIPP PEIS was the establishment of semi-annual (fall and spring) beach monitoring. A trend in sediment transport was identified from the fall 2016 survey assessment (**USACE, 2017**) suggesting that while the

Figure 3: Approximate Sand Placement Area

USACE modeling of sediment transport is occurring, the material transport volume may be much greater. This was supported by the Fall 2017 Monitoring Report (**USACE, 2018**), which observed high erosion rates and substantial losses of sediment in the southern portion of the project area (sub-reaches 1 and 2) and significant accretion resulting from longshore transport in the northern portion of the project area (sub-reach 3).

It is estimated that 1.7 million yd^3 of sand is available at the north Wallops Island beach site, more than enough to provide volumes required for the proposed renourishment. Excavation depth is expected to be limited to mean low water (MLW; 2.35 feet below mean tide level), based on USACE calculations (**A. Farrow, personal communication 2018**). Based on target depth of sediment removal, the area to be excavated would be approximately 176 acres (ac) to provide the required volume for the proposed renourishment (**Figure 3**).

Using sand from the northern end of Wallops Island (**Figure 4**) would offer a material without the mobilization and operational costs associated with offshore dredging. Sediment transported alongshore to the north from a previous fill cycle would be of the proper grain size and could be effectively recycled (backpassed) by excavating it and placing it in eroding areas in the southern project area.

A pan excavator would likely be used to remove sand from north Wallops Island beach. Because it 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 excavator 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. Other onshore equipment may include all-terrain vehicles (ATVs), an office trailer, mobile generators, construction site lighting, and mobile fuel tanks. 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.

Prior to excavation, a pre-project topographic and hydrographic survey would be conducted. Multiple survey crews would employ ATVs and light trucks to conduct pre-project surveys of the project site.

Elements relevant to ESA of renourishment with sand from unnamed shoal A were extensively documented in the SRIPP and Post-Sandy actions. Approximately 515 acres of unnamed shoal A were used in the SRIPP and Post-Sandy actions to source 3.2 million and 800,000 yd^3 of sand, respectively. The current backpassing proposal for this nourishment event would avoid the use of approximately 206 additional acres of the shoal's 1,800 acre borrow area to source 1.625 million yd^3 of sand from unnamed shoal A.

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Figure 4: Backpassing Borrow Area

Post-Renourishment Activities

Additional activities would include post-renourishment installation of sand fencing and planting dune grasses. It would be NASA's intent to re-use as much of the existing sand fencing as possible. Therefore, the proposed project would include removing the existing sand fencing, stockpiling it until the beach fill is complete, and then re- installing it as needed. It is expected that a majority of the existing dune grass within the work site would be covered with sand, therefore requiring re-planting.

Action Area

In the 2010 PBO and 2016 BO, USFWS considered the action area for beach nourishment to include the entire land area of Wallops Island, the shoreline and beaches of Assawoman Island, the aquatic environment adjacent to these lands, three borrow sites including Unnamed Shoals A and B and north Wallops Island, and the waters through which dredges would transit from borrow sites to pumpout areas. The action area also included the hook and overwash segments of Assateague Island.

In consideration of the scope of the proposed action, all expected effects on listed species would be within the action area considered in the 2010 PBO and 2016 BO.

Changes to Environmental Context Since SRIPP BA, 2010 PBO, and 2016 BO

As in previous fill cycles, storm conditions encountered between the Post-Sandy fill and today relocated much of the sub-aerial dune and berm east in the cross-shore direction, with large amounts of fill material on south Wallops Island migrating north or offshore. The extent of accretion and erosion experienced between 2014 and 2017 is indicated in **Figure 5**.

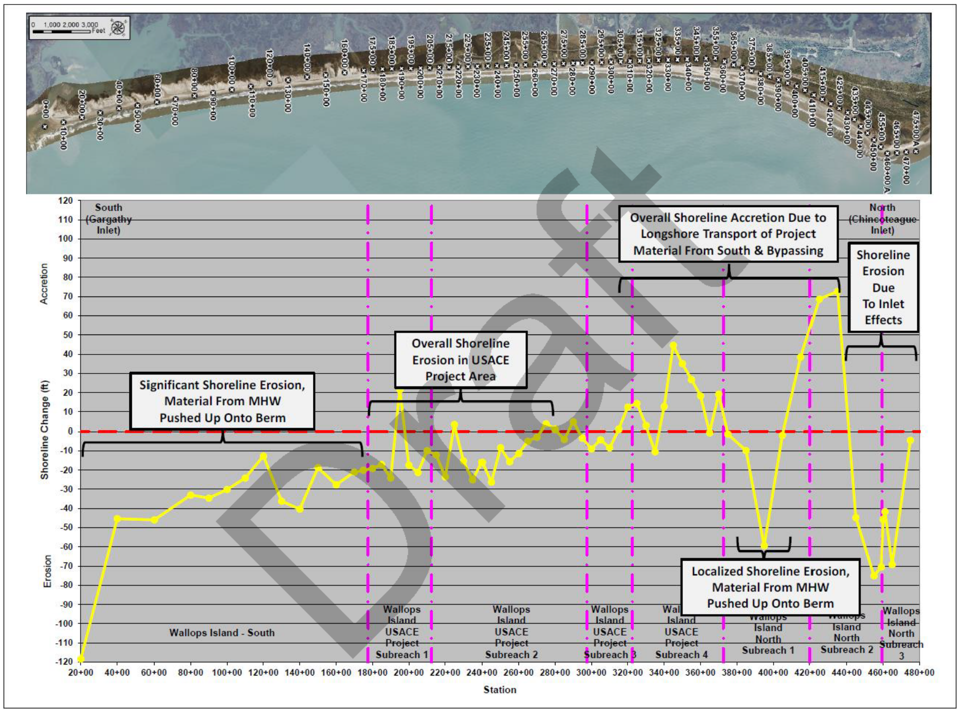

Figure 5: Beach Profile Changes at Wallops Island (2014-2017)
Red line indicates design build shoreline; yellow line indicates accretion (up) or erosion (down); purple lines indicate extent of project reaches

Status of Species within the Action Area

A review of the Accomack County species list indicates that the species have not changed from those considered in the SRIPP BA, 2010 PBO, and 2016 BO. In preparing the SRIPP BA, NASA determined that project activities may affect the threatened piping plover (*Charadrius melodus*), candidate red knot (*Calidris canutus rufa*), and several species of nesting sea turtles, including loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidechelys kempii*), and Atlantic green (*Chelonia mydas*). The USFWS concurred with NASA in the 2016 BO that the proposed and ongoing actions discussed in the document, including beach nourishment, may affect, but are not likely to adversely affect, the federally listed roseate tern (*Sterna dougallii dougallii*), leatherback, Kemp's ridley, and Atlantic green sea turtles, and federally listed threatened seabeach amaranth (*Amaranthus pumilius*). No new information indicates that effects to additional species would be anticipated; therefore, this section focuses only on updated information regarding piping plovers, red knots, and sea turtles.

Piping Plover: In accordance with the SRIPP BA, 2010 PBO, and 2016 BO, NASA monitors for piping plover nests between March 15 and September 15 each year. NASA has conducted piping plover surveys 3 to 4 times weekly since 2010, during which 44 nests were found. Records of historic nesting dates between 2010 and 2018 indicate that nesting on Wallops Island may occur between May 1 and June 29. As shown in **Table 1**, the earliest recorded piping plover nesting date on Wallops Island is May 1.

Table 1: Piping Plover Nest Date Analysis

Year	Earliest Nest	Latest Nest Date	Number of Nests
2010	May 3	May 21	3
2011	May 16	June 7	3
2012	May 24	June 29	5
2013	May 15	June 9	4
2014	May 20	June 18	5
2015	May 13	May 22	6
2016	May 31	June 14	9
2017	May 1	June 20	6
2018	May 21	May 24	3

Red Knot: Between 2012 and 2018 monitoring seasons, red knots have not been observed earlier than May 1st. During the month of May, NASA has observed flocks of red knots ranging in size from just under 10 individuals to more than 650. All red knots were on the recreational beach and north end of Wallops Island.

Sea Turtles

Sea Turtles Recorded Sea Turtle Nesting on Wallops Island Beaches

Year	Species	Number of Nests
1979	Loggerhead (*Caretta caretta*)	1
1982	Loggerhead (*Caretta caretta*)	1
1989	Loggerhead (*Caretta caretta*)	1
2002	Loggerhead (*Caretta caretta*)	1
2008	Loggerhead (*Caretta caretta*)	1

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2010	Loggerhead (*Caretta caretta*)	4
2012	Loggerhead (*Caretta caretta*)	2
2013	Loggerhead (*Caretta caretta*)	2

Nesting on Wallops Island beaches is infrequent.From 1979 to 2008, a total of five loggerhead sea turtle nests occurred on Wallops Island. A flurry (for Wallops Island) of nesting occurred from 2010 to 2013. The USFWS performed genetic testing on eggs taken from nests from this period. The same individual dug the six nests in 2010 and 2012, while a different female(s) was responsible for the 2013 nests. (**K. Holcomb, personal communication 2018)** No loggerhead sea turtle nesting activity has occurred on Wallops Island since 2013, suggesting that the individuals which previously utilized Wallops Island for nesting may be deceased or have begun nesting elsewhere. Sea turtles species are considered to occur within the study area, although only loggerhead sea turtles have nested on Wallops Island.

Effects of the Action on Listed Species

Impacts on listed species from renourishment would be the same as those discussed in the SRIPP BA, 2010 PBO, and 2016 BO. Although installation of breakwaters may impact in-water sea turtles (NASA is undergoing consultation with the National Marine Fisheries Service regarding potential in-water impacts to ESA species), it would not impact terrestrial species. Therefore, this analysis focuses only on potential impacts from backpassing sand as described below.

The proposed project would restore approximately 19,000 ft of shoreline. Of the approximately 230 acres of renourished area, approximately 140 acres would be below MHW. About 1.3 million yd^3 of sand would be harvested from across 200 acres on the north end of Wallops Island and mechanically moved to the renourishment area to establish a wider beach in what is currently a narrow and erosion-prone section of the island.

Benthic organisms living in the sandy beach area of Wallops Island would experience direct mortality from the sand removal on the north end and relocation to the renourishment area. This would be due to disturbance and crushing from excavators removing sand and burial in the renourishment area. The physical oceanographic conditions would be essentially unchanged, and, after the renourishment reaches equilibrium, there would be no net change in the physical environment available for benthos.

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Figure 6: Historic Loggerhead Sea Turtle Nesting Locations on Wallops Island

Recovery time of benthos within the surf zone would likely be short given the dynamic conditions within the nearshore and surf zones. **Burlas *et al.* (2001)** estimated that the recovery time for benthos in a 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. **Dalfsen and Essink (2001)** noted that recolonization is generally occurs in two stages: (1) the rapid development of "opportunistic" species, and (2) the subsequent recovery of community composition and structure. It is expected that organisms from adjacent areas would recolonize the new beach. Additionally, backpassed material would not be substantially different than native material, and some benthic organisms may survive in the transition to the renourished area; therefore, it is expected that recovery would occur over a relatively short time (i.e., on the order of 6 to 12 months post-project).

Backpassing was discussed in the 2016 BO as a means of acquiring up to half of the sand volume required for renourishment. The document discussed a borrow area of 150 acres excavated to a depth of about 3.5 feet (**USFWS, 2016**). For the proposed backpassing activities, the USACE identified an area of approximately 175 acres excavated to MLW (-2.35 ft, referencing NAVD88; **Moffat & Nichols, 2018**). A comparison of these areas is shown in **Table 3**.

Table 2: Borrow Area Volume Comparisons

Reference	Area (acres)	Depth (ft)	Volume (yd^3)	Difference (%)
2016 BO	150	3.5	847,000	-
USACE 2018	175	Various to MLW	1,700,000	200

As expected, the volume of sand proposed for removal from the USACE borrow area is almost exactly double the size of the borrow area identified in the 2016 BO. The main difference between the two borrow areas is the depth of excavation. In the case of the 2016 BO borrow area, sand would be removed to a specific depth, leaving a beach of a profile similar, albeit more landward, to its current configuration. In contrast, under the current proposal, sand would be excavated throughout the borrow area to a constant depth identified as MLW, resulting in removal of sub-aerial beach habitat (**Figure 4**). Generally both bird and sea turtle species generally do not nest deep into the primary/secondary dune; therefore, such alterations to the beach would result in a short-term loss of habitat for piping plovers, red knots, and sea turtles. However, removal of sediment will have short term impacts, as the primary dune would quickly equilibrate and create a new non-vegetated berm with foraging and nesting area for birds and sea turtles. Moreover, the borrow area would recover in 5 to 6 years from continued northerly sediment transport (**A. Farrow, personal communication 2018**). Additionally, as indicated in the 2016 BO, effects to these species would be minimal, provided that backpassing activities occur outside of foraging and nesting periods and assuming that these species adapt by nesting and/or foraging in nearby beach habitats, either on Wallops Island or on neighboring barrier islands.

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Avifauna: Effects would include the potential for startle or disruption of foraging, reduction in benthic prey availability, and, for plovers, the potential for disruption of courtship and nesting activities. As both plover and red knot activity on Wallops Island has historically occurred on the north end of the island, potential impacts could be associated specifically with backpassing. The potential exists for plover nesting activity to occur within the proposed project site. The borrow area identified by USACE (2018; **Figure 4**) includes areas used preferentially by piping plovers and red knots. Geospatial density analysis of piping plover nest locations from 2007 to 2018 indicates that the proposed backpassing activities would remove up to 57% of areas preferred by piping plovers for nesting (**Table 2**). This analysis, shown graphically in **Figure 7**, did not consider success of the nests reported during this time period.

Table 3: Historic Nest Location Density Analysis

Historic Nest Location Density (nests per acre)	Category	Historic Nesting Sites (elements within bin)	Borrow Area (elements within bin)	Percent
<0.05	Negligible Use	213283	3255	1.52
0.06-0.10	Limited Use	113353	40518	35.74
0.11-0.15	Moderate Use	46680	23461	50.26
0.16-0.20	Preferred	13521	7759	57.38

As red knots only exist in the region as migrant species, the proposed backpassing activities would require members of this species to use other portions of Wallops Island or neighboring barrier island beaches for foraging.

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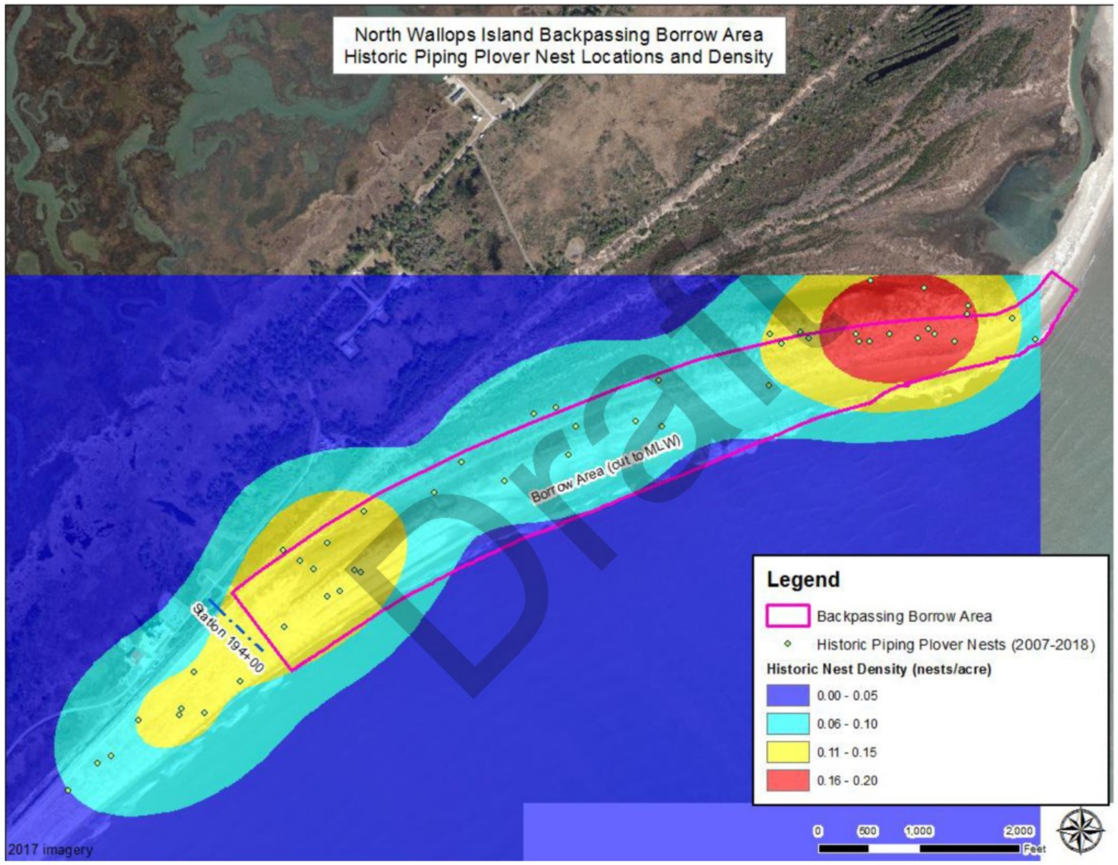

Figure 7: Backpassing Borrow Area Historic Piping Plover Nest Locations

Herpetofauna: Impacts to nesting sea turtles could include avoided nesting attempts due to nighttime construction activity (particularly artificial lighting) on the beach, unintentional excavation or burial of a newly dug nest if it were to go undetected, disorientation of hatchlings (due to project-related light sources), obstruction to hatchlings during their emergence and subsequent trip to the ocean, or loss of beach habitat. However, as indicated in the 2016 BO, effects to these species would be minimal, provided that backpassing activities occur outside of sea turtle nesting periods and assuming that these species adapt by nesting in nearby beach habitats, either on Wallops Island or on neighboring barrier islands.

Given that the beach fill material from offshore dredging or backpassing is similar to that on Wallops Island, it is not expected that fill material would have a long-term effect on sea turtle nesting success. In fact, sea turtle nesting occurred on the new Wallops Island dune during the initial beach fill, indicating that it is very possible that the additional elevated beach provides suitable nesting habitat, a net benefit to the species.

Mitigation Measures

To minimize potential impacts to federally listed species, NASA proposes to comply with the time-of-year mitigation measures established in the 2016 BO for backpassing sand from north Wallops Island, with the following changes based on the above analysis of piping plover and sea turtle nesting data and red knot foraging data:

> Excavate sand from the north Wallops Island borrow area for beach renourishment outside of plover and sea turtle nesting season (**May 1** through November 30 **or fledging of all known piping plover and the last sea turtle hatchling emergence**). Stockpile sand outside the north Wallops Island borrow area, and outside potential nesting habitat for plovers and sea turtles prior to placement for renourishment.

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Conclusion

In consideration of the scope of the proposed project, listed species known to inhabit the project area, and the potential effects on those species, NASA concludes that impacts associated with the project are substantially the same as those considered within the SRIPP BA, 2010 PBO, and 2016 BO; that is these action *may affect but are not likely to adversely affect* piping plovers, red knots, or loggerhead sea turtles. Furthermore, NASA proposes to observe the above-mentioned and existing restrictions on backpassing and beach nourishment activities to further minimize impacts to listed species. NASA hereby requests USFWS concurrence with this determination.

If you have any questions or require additional information please contact Ms. Shari Miller of my staff at (757) 824-2327.

Signature page follows.

Sincerely,

T.J. Meyer
Associate Chief, Medical and Environmental Management Division

Enclosure

cc:
228/Mr. P. Bull
228/Mr. J. Saecker
250/Ms. K. Finch
250/Ms. S. Miller
BOEM/Ms. L. Brandt
BOEM/Mr. D. Piatowski
USACE/Mr. J. Altuna
USACE/Dr. M. Wood

Draft

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United States Department of the Interior

FISH AND WILDLIFE SERVICE

Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

March 20, 2019

Ms. Shari A. Miller
Lead, Environmental Planning
Code 250.W
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337

Re: Wallops Flight Facility Update and Consolidation of Existing Biological Opinions, Accomack County, VA, Project # 2015-F-3317

Dear Ms. Miller:

This letter acknowledges the U.S. Fish and Wildlife Service's (Service) December 14, 2018 receipt of your December 14, 2018 letter requesting reinitiation of formal section 7 consultation under the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended. The referenced action involves expanding beach renourishment activities (backpassing) and constructing 2 sets of 3 breakwaters along Wallops Island, in Accomack County, VA. The remaining activities addressed in the Wallops Flight Facility Update and Consolidation of Existing Biological Opinions will remain the same. These include proposed and ongoing launch operation activities, seawall repair, shoreline reconstruction monitoring, and the use of sand from an offshore shoal for the purposes of renourishment.

The federally listed threatened piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), and loggerhead sea turtle (*Caretta caretta*) Northwest Atlantic Ocean distinct population segment are likely to be adversely affected by the proposed action of expanded beach renourishment activities (backpassing) and construction of 2 sets of 3 breakwaters. All information required to initiate consultation was either included with your letter or is otherwise accessible for our consideration and reference.

We concur with your determination that the federally listed endangered roseate tern (*Sterna dougalii dougalii*), hawksbill sea turtle (*Eretmochelys imbricata*), leatherback sea turtle (*Dermochelys coriacea*), and Kemp's ridley sea turtle (*Lepidechelys kempii*), and federally listed threatened green sea turtle (*Chelonia mydas*) North Atlantic distinct population segment and

Ms. Miller Page 2

seabeach amaranth (*Amaranthus pumilius*) are not likely to be adversely affected by the proposed action.

We concur with your determination that the federally listed threatened Northern long-eared bat (*Myotis septentrionalis*) is not likely to be adversely affected by the proposed action if the proposed avoidance and minimization measures in the August 18, 2015 reintiation and consolidation request letter are followed, with the exception of the removal of identified roost trees. If identified roost trees are proposed for removal at any time, additional consultation may be required on a project by project basis.

Section 7 implementing regulations (50 CFR 402.14) provide the Service up to 90 days to conclude formal consultation and an additional 45 days to prepare our biological opinion, unless we mutually agree to an extension. An extension of 35 days was discussed during a phone call between the National Aeronautics and Space Administration (Shari Miller and T.J. Meyer) and the Service (Emily Argo and Troy Andersen) on March 15, 2019 and subsequently confirmed on March 18, 2019. Therefore, we expect to provide the biological opinion on or before June 2, 2019.

As a reminder, the Endangered Species Act requires that after initiation of formal consultation, the Federal action agency shall make no irreversible or irretrievable commitment of resources that limits future options. This practice ensures agency actions do not preclude the formulation or implementation of avoidance and minimization measures or development of reasonable and prudent alternatives that avoid jeopardizing the continued existence of endangered or threatened species or destroying or modifying their critical habitat.

If you have any questions, please contact Emily Argo of this office at (804) 824-2405, or via email at Emily_Argo@fws.gov.

Sincerely,

Troy M. Andersen

For Cindy Schulz
Field Supervisor
Virginia Ecological Services

cc: FAA, Washington, D.C. (Attn: Daniel Czelusniak)
Service, Chincoteague Island, VA (Attn: Kevin Holcomb)
Service, Chincoteague Island, VA (Attn: Nancy Finley)
VDGIF, Richmond, VA (Attn: Ernie Aschenbach)
VDGIF, Machipongo, VA (Attn: Ruth Boettcher)
VDNH, Richmond, VA (Attn: Rene Hypes)

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

June 7, 2019

Ms. Shari Miller
Lead, Environmental Planning
Code 250.W
Wallops Flight Facility
Wallops Island, VA 23337

Re: Wallops Flight Facility Update and Consolidation of Existing Biological Opinions, Accomack County, VA, Project # 2015-F-3317

Dear Ms. Miller:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (Opinion) based on our review of the referenced project and its effects on the federally listed threatened piping plover (*Charadrius melodus*) (plover), red knot (*Calidris canutus rufa*) (knot), and loggerhead sea turtle (*Caretta caretta*) Northwest Atlantic Ocean distinct population segment (DPS) (loggerhead), in accordance with section 7 of the Endangered Species Act (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA). Your request to reinitiate formal consultation was received on December 18, 2018.

This Opinion is based on information provided in the National Aeronautics and Space Administration's (NASA) December 14, 2018 Shoreline Enhancement and Restoration Project (SERP) biological evaluation (BE); December 7, 2018 Draft NASA Wallops Flight Facility (WFF) SERP Environmental Assessment (EA); telephone conversations; field investigations; and other sources of information. The consultation history is located after the Literature Cited. A complete administrative record of this consultation is on file in this office.

This Opinion expires 15 years from the date of signature.

We concur with the NASA determination that the federally listed threatened northern long-eared bat (*Myotis septentrionalis*) is not likely to be adversely affected by the proposed action with the application of the proposed avoidance and minimization measures in the August 18, 2015 reinitiation and consolidation request letter are followed, with the exception of the removal of identified roost trees. If identified roost trees are proposed for removal at any time, additional consultation may be required on a project-by-project basis. The northern long-eared bat will not be considered further in this Opinion.

The BE included a request for Service concurrence with "not likely to adversely affect" determinations for certain listed resources. NASA determined the proposed action is not likely to adversely affect the federally listed endangered roseate tern (*Sterna dougalii dougalii*), hawksbill sea turtle (*Eretmochelys imbricata*), leatherback sea turtle (*Dermochelys coriacea*), and Kemp's ridley sea turtle (*Lepidechelys kempii*), and federally listed threatened green sea turtle (*Chelonia mydas*) North Atlantic DPS or seabeach amaranth (*Amaranthus pumilius*). We concur with your determination because the species are unlikely to be present or have not been identified in the area during annual monitoring.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

As defined in the ESA section 7 regulations (50 CFR 402.02), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas."

This Opinion serves 2 purposes: (1) provide an Opinion on the proposed SERP and (2) consolidate activities described in the 2016 Wallops Flight Facility Update and Consolidation of Existing Biological Opinions (Service 2016), that have not have changed, into a single Opinion. The following is a summary of the activities that are part of the proposed action requiring reinitiation. All other activities described the Service's 2016 Opinion will remain the same. For ease of reference and readability, information from the Service's 2016 Opinion is provided without edits throughout most of this document, but in some places has been edited for consistency with the actions resulting in reinitiation.

A detailed description of the proposed activities requiring reinitiation can be found in the 2010 Final Shoreline Restoration and Infrastructure Protection Program (SRIPP) Programmatic Environmental Impact Statement (renourishment component of Alternative 1), reexamined in the 2013 Final Post-Hurricane Sandy EA, and described in the SERP EA and SERP BE. NASA is funding the excavation, or "backpass," of approximately 1.3 million cubic yards (MCY) of sand sourced from the north Wallops Island beach to renourish and restore approximately 19,000 linear feet (ft) of shoreline. Additionally, NASA is funding construction of a series of parallel breakwaters approximately 200 ft offshore from the renourished shoreline.

To minimize impacts to knots, plovers, and loggerheads, sand excavation on north Wallops Island will not begin until after the last plover chick has fledged or the last loggerhead has hatched, whichever is later. Sand will continue to be excavated, transported south, and used to renourish the south and mid-island until the fill design template has been met (1.3. MCY of sand has been excavated and redistributed). Work is anticipated to take 6-9 months to complete and depending on the start date, the work may overlap with the arrival and/or nesting of the species in the following year. NASA is planning to renourish every 2-7 years, but the use of backpassing for renourishment is not expected for another 10 years and an offshore shoal will be used for interim renourishments.

Starting March 15 of each year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting plovers and sea turtles. Any nests discovered will be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status and the need to suspend work activities within 1,000 ft of a nest until chicks have fledged and/or sea turtles have hatched.

Establishment of upland areas for equipment and material staging will be discussed with the contractor may be discussed daily, depending on where they are working.

Proposed SERP Activities

Backpassing – The borrow area will be located on NASA property on the northern end of Wallops Island. During excavation, a pan excavator will remove sand from approximately 200 acres (ac) of north Wallops Island beach to the mean low water (MLW) line (Figure 1). The average excavation depth will be 2.35 ft. Sand excavation will impact approximately 169 ac of land above mean high water (MHW), and 31 ac of land seaward of MHW to provide the required volume for the proposed renourishment. Sand will be loaded onto dump trucks for transport to the southern end of the island and will be stockpiled on the southern end once enough beach has been built to accommodate the sand. Trucks will use existing access roads to gain entry to the beach and no new roads will be constructed.

Figure 1. Proposed borrow area, North Wallops Island beach.

Renourishment – Bulldozers will be used to spread the fill material once it is placed on the beach. All heavy equipment will access the beach from existing roads and established access points. No new temporary or permanent roads will be constructed to access the beach or to transport the fill material to renourishment areas. The beach fill will start approximately 1,500 ft north of the Wallops Island-Assawoman Island property boundary and extend north for approximately 3.7 miles (mi) (Figure 2 and 3). The initial fill will be placed to construct a 6 ft high berm extending a minimum of 70 ft seaward of the existing seawall. Remaining fill will slope seaward at varying distances along the length of the renourishment area. Beach renourishment activities may occur year-round. American beach grass (*Ammophila breviligulata*, cultivar "Cape") will be planted at 18 inch (in) intervals over the re-established dune. Plants will be installed between October 1 and March 31. The planting area will be approximately 150 ft wide along the entire length of the newly created dune in the beach renourishment area.

Figure 2. Proposed renourishment area.

<u>Breakwaters</u> – Six rubble mound breakwaters will be constructed in 2 sets of 3, each approximately 200 ft offshore from the MHW line of the renourished beach in the shoreline infrastructure protection area (Figures 3 and 4). Water depth in these areas is approximately 4-8 ft. Each breakwater will be constructed of Virginia Department of Transportation Type I armor stone (1,500-4,000 pounds [lbs]) for the outer layer and Class II Stone (150-499 lbs) for the core layer. All breakwaters will be placed parallel to the shore and measure approximately 130 ft long and 10 ft wide at top crest elevation. The breakwaters will be approximately 100 ft apart from each other. The southernmost set of 3 breakwaters will begin approximately 4,000 ft north of the southern extent of beach nourishment. The second set of 3 breakwaters will be constructed approximately 10,000 ft north of the southern extent of beach nourishment. The rocks for constructing each breakwater may be transported to the WFF area by barge and placed in the water using heavy lifting equipment.

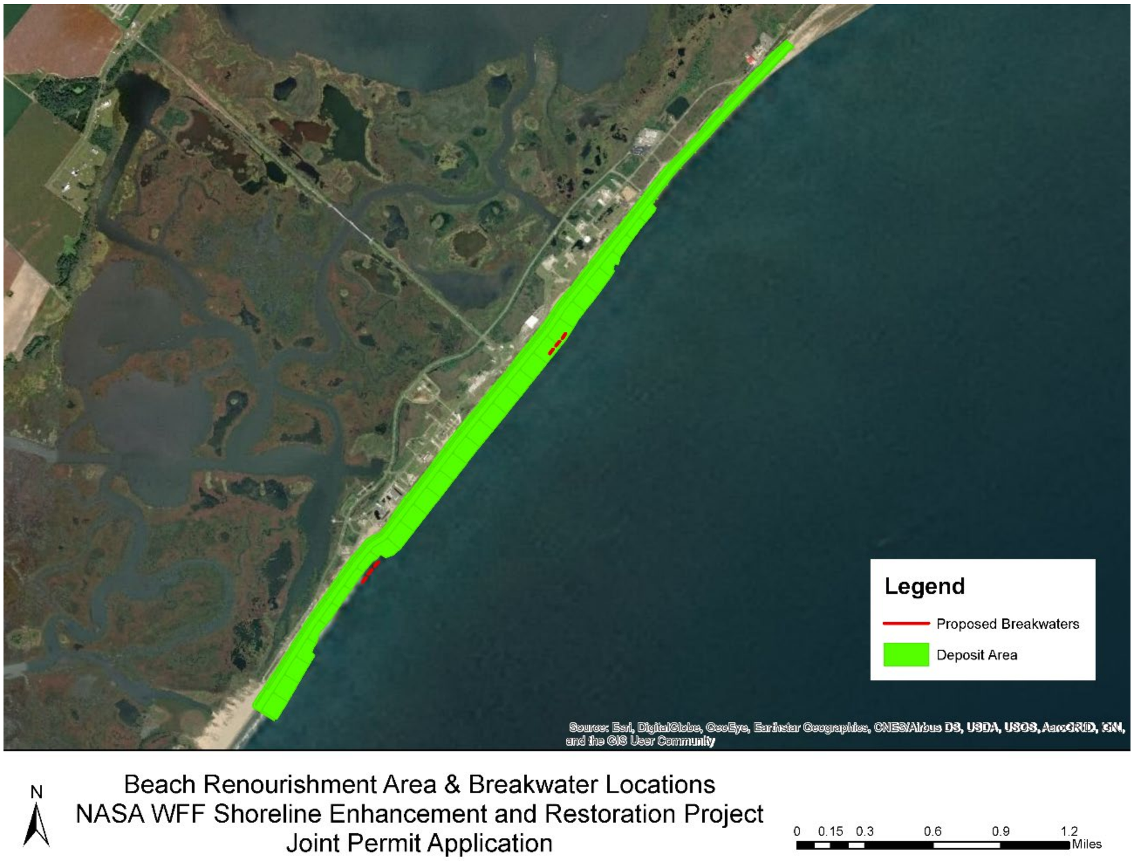

Figure 3. Breakwater and renourishment area overlap.

Figure 4. Breakwater locations.

Activities remaining unchanged from Service's 2016 Opinion are summarized in Table 1 and detailed below. The action of Beach Renourishment and Long-term Project Maintenance includes some activities that remain unchanged, described in subsequent paragraphs, while the altered activities have been described in earlier paragraphs in this Opinion.

Table 1. Ongoing launch operations and SRIPP at WFF.

Action	**Location**	**Frequency**	**Time of Year**	**Time of Day**
Liquid Fueled Expendable Launch Vehicle (ELV) Launches	Pad 0-A	6/year	Year-round	Either
Solid Fueled ELV launches	Pad 0-B	12/year	Year-round	Either
ELV Static Fires	Pad 0-A	2/year	Year-round	Either
Sounding Rocket Launches	Current: Pad 1 and Pad 2 Future: Pad 2 and south Unmanned Aircraft System (UAS) airstrip flat pad	60/year	Year-round	Either
Sounding Rocket Static Fires	Pad 2	33.5 tons double base & 38.3 tons composite propellants/12-month period	Year-round	Either
Disposal of Defective or Waste Rocket Motors	Open Burn Area, south Wallops Island		Year-round	Either
Drone Target Launches	Pad 1, 2, 3 or 4	30/year	Year-round	Either

UAS Flights	Wallops Main Base, South Wallops Island, North Wallops Island	75 missions/week	Year-round	Either
Piloted Aircraft Flights	Wallops Main Base and adjacent airspace	61,100 operations/year	Year-round	Either
Restricted Airspace Expansion	Main Base, Wallops Island, and adjoining airspace	No change in type or tempo or aircraft activity	Year-round	Either
Range Surveillance/Facility Security	Wallops Island	N/A	Year-round	Either
Construction	Wallops Island	N/A	Year-round	Either
Routine Facility Maintenance	Wallops Main Base, Wallops Island	As needed	Year-round	Day
Launch Pad Lighting	Wallops Island	30 days/launch	Year-round	Night
Recreational/ Off-road Vehicle (ORV) Beach Use	Wallops Island	N/A	Year-round	Day
Protected Species Management	Wallops Island	N/A	Spring and Summer	Day
Miscellaneous Activities on Wallops Island Beach	Wallops Island	As needed	Year-round	Day
Education Use of Wallops Island Beach	Wallops Island	Several trips/week	Year-round	Day
Seawall Repair	Wallops Island	As needed	Year-round	Day
Shoreline Reconstruction Monitoring	Wallops Island	2/year	August – October and March-May	Day
Beach Renourishment and Long-term Project Maintenance	Wallops Island	Every 2-7 years	Year-round	Day

Ongoing Launch Operation Activities

<u>Liquid and Solid Fueled ELV Launches and Static Fires</u> – ELVs are launched from Launch Complex 0 at the south end of Wallops Island, between the southernmost extent of the sea wall and the UAS runway. Pad 0-B is topped with a permanent gantry. A transporter erector launcher raises and launches rockets from Pad 0-A. Both launch pads are illuminated with broad spectrum night lighting for up to several weeks on either side of the launch window; effectively resulting in up to 30 calendar days of night lighting per launch event. Exhaust ports on each launch pad direct rocket motor exhaust to the east, across a narrow strip of steep sandy beach and over the Atlantic Ocean. Launches from either pad may occur at any time of day, on any day of the year, as dictated by weather conditions and program needs.

Rockets launched from Pad 0-B use solid fuel systems based on an ammonium perchlorate/aluminum (AP/AL) or nitrocellulose/nitroglycerine (NC/NG) combination. Many classes of rockets may be launched from this site, the largest of which will be equivalent to the LMLV-3(8). Rockets launched from Pad 0-A will use liquid fuel systems with refined petroleum or liquid methane and liquid oxygen as propellants, thus requiring liquid nitrogen prior to launch for cooling the propellants, and gaseous helium and nitrogen as pressurants and purge gases. The largest vehicle proposed to launch from Pad 0-A will be Orbital ATK's Antares 200 Configuration ELV. Orbital rockets deliver spacecraft into orbit that may utilize hypergolic propellants.

The Antares 200 Configuration ELV employs 2 NPO Energomash provided RD-181 engines, which also use liquid oxygen and refined petroleum as propellants. These motors will be more powerful (up to 17 percent more thrust at sea level) than the previous AJ-26 engines and consequently will allow for a heavier payload to be placed into orbit. The Antares 200 Configuration also utilizes modifications to valves and piping in the first stage fuel feed system, modifications to structural and thermal components in the first stage, and changes to avionics and wiring, and requires slightly different ground support equipment (used to handle and test rocket components) and fueling infrastructure. The Antares 200 Configuration will be launched from Pad 0-A, with up to 6 launches per year, and 2 static test fires per year.

Sounding Rocket Launches – Sounding rockets are currently launched from 2 launch pads in the vicinity of Launch Pad 1 and 2. In the future, sounding rockets will be launched from 2 launch pads in the vicinity of Launch Pad 2 and the south UAS airstrip flat pad. These launch pads are topped with mobile shroud sheds rather than gantries, and temporary rail launchers are used to orient the rockets for launch. Sounding rockets do not have a long loiter time on the launch pad after ignition, therefore these launch pads are not equipped with exhaust ports. Many classes of sounding rockets are used at these sites, the largest of which is the Black Brant XII burning 3,350 kilograms (kg) of solid propellant. Propellants used are based on an AP/AL or NC/NG combination. Sounding rockets do not deliver spacecraft into orbit, and therefore do not carry hypergolic propellants. As many as 60 sounding rockets are launched per year, at any time of day, on any day of the year, as dictated by weather conditions and mission needs.

Sounding Rocket Motor Static Fire Testing – NASA performs sounding rocket motor static fire tests so that motor operations can be observed in a non-flight position. Rocket motors may be static test fired from either a horizontal or vertical position. WFF has been authorized by the Virginia Department of Environmental Quality Air Division to perform static fire tests on solid propellant sounding rocket motors from Pad 2. The envelopes for static fire tests are governed by the limits set forth in the Wallops Island State operating permit. Exhaust from static test firings will be directed through a trench and over the Atlantic Ocean. The deluge system used for orbital launches from Pad 0-A will be used to cool the launch pad and dampen vibration during static firing tests. Sounding rocket motor static fire testing encompasses 33.5 tons of double base and 38.3 tons of composite propellants over a 12-month period.

Disposal of Defective or Waste Rocket Motors – Defective or waste rocket motors are ignited at the open burn area south of the UAS runway on the south end of Wallops Island. Motors that cannot be returned to the manufacturer or repurposed for other projects are placed on a concrete pad or bolted to a subunit and ignited to burn off any stored propellant. Multiple motors can be consolidated into a single burn. Ash remaining after a burn is burned again or shipped off-site for disposal. The remaining motor casings are steam cleaned and disposed of as scrap metal. The water used for steam cleaning is captured and tested for toxins before disposal under a Virginia Department of Environmental Quality permit. The maximum amount of propellant to be disposed of per year at the open burn area for sounding rocket static fires and disposal of defective or waste rocket motors is 33.5 tons double base and 38.3 tons composite propellants. Burns are infrequent and have not approached the disposal permit limit.

Drone Target Launches – Drone targets are launched from WFF or air launched from military aircraft in support of U.S. Navy (Navy) missile training exercises. These targets use a variety of fuels, including liquids such as JP-5 jet fuel or hydrazine derivatives, or solid fuels such as AP/AL or NC/NG. Drones travel on preprogrammed flight paths and are engaged by shipboard interceptor systems over the Virginia Capes Operating Area (VACAPES OPAREA), with all debris from the intercept falling within the VACAPES OPAREA boundary. Drone flights may occur at any time of day, on any day of the year, as dictated by training needs and may occur up to 30 times per year.

UAS Flights – UAS are used at WFF in support of scientific missions. UAS flights may use the UAS runway on the south end of Wallops Island, between Pad 0-B and the open burn area, as well as the runways on the Main Base. The largest anticipated UAS that may be flown from the WFF Main Base runways will have engines and fuel capacity one-fifth those of a Boeing 757, though most are considerably smaller.

A new UAS airstrip is planned for construction on the north end of Wallops Island. When this airstrip is operational, the south Wallops Island airstrip will be decommissioned. UAS flown from the North Wallops Island UAS airstrip cannot exceed the noise generated by the Viking 300 or the size (in terms of physical size and quantities of onboard materials) of the Viking 400 (NASA 2012a). UAS operations are projected to occur at a frequency of 75 missions per week and will not exceed 1,040 sorties per year.

Piloted Aircraft Operations – Piloted aircraft use the runways on WFF Main Base. Aircraft using the runways range from small single propeller designs up to the Boeing 747, and include such military designs as the F-16 and F-18. Many of the airfield operations conducted at WFF include military pilot proficiency training that consists primarily of “touch-and-go” exercises in which the aircraft wheels touch down on the airstrip but the aircraft does not come to a complete stop. The U.S. Air Force, Air National Guard, U.S. Army, U.S. Coast Guard, and Navy conduct pilot proficiency training at WFF runways.

An airfield operation represents the single movement or individual portion of a flight in the WFF airfield airspace environment, such as 1 takeoff, 1 landing, or 1 transit of the airport traffic area. The baseline airfield operation level for WFF of 12,843 was established in 2004 using annual airfield operations data for that year with an envelope that included a 25 percent increase above the total. Since 2013, WFF’s piloted aircraft operating envelope was increased to include an additional 45,000 operations. The current operating envelope is limited to 61,000 operations per year. Air traffic from Wallops Main Base flies over Wallops Island.

Restricted Airspace Expansion – NASA has requested the Federal Aviation Administration (FAA) grant additional Restricted Airspace such that NASA can conduct experimental aircraft test profiles with a lower risk of encountering non-participating aircraft. No changes are proposed to either the types of aircraft or the types and number of operations conducted within the airspace adjacent to WFF. Consistent with existing practices, aircraft operating within the new restricted airspace will be required to maintain at least a 2,000 ft altitude when operating above the Service's Chincoteague National Wildlife Refuge (CNWR).

Range Surveillance/Facility Security – In general, UH-1 helicopter surveillance flights occur twice per launch countdown and range in altitude from 200 ft above ground level (AGL) to 5,000 ft AGL. Each flight is approximately 2.5 hours in duration, with the helicopter's primary surveillance responsibility being the lagoon area between Wallops Island and the mainland Eastern Shore of Virginia; however, flights can range up to 1.15 mi offshore.

Contracted fixed wing radar surveillance aircraft operate the majority of the time at 15,000 ft AGL and remain within the VACAPES OPAREA airspace. Fixed wing spotter aircraft operate in the same area but their altitude varies between 500 ft and 15,000 ft AGL. The spotters spend less than 10% of their flight time below 1,500 ft; only descending to low altitudes to visually obtain a call sign from an intruding boat or get the attention of the crew. Most of the spotters fly for around 4 hours total; the radar planes fly between 4 and 5.5 hours per mission. A typical ELV mission requires 1-2 fixed wing surveillance aircraft.

Surface surveillance and law enforcement vessels can include up to 8 inboard- or outboard-powered boats, up to approximately 43 ft in length. Generally, the larger inboard vessels range between 10 and 12 knots (kt) cruising speed, whereas the small inboard vessels cruise between approximately 25 and 30 kt.

Navy and NASA facilities on Wallops Island are equipped with exterior lights at ground level, along catwalks, and at FAA mandated heights for aircraft orienteering. Security of facilities on Wallops Island is maintained by a private contractor. Individuals on foot or in vehicles tour the perimeter of Wallops Island, including the beach areas on the north and south end of the island. These patrols may be performed as often as deemed necessary to maintain base security. Security may transition from the current system of frequent roving patrols to a closed circuit television system. If the closed circuit surveillance system is installed, security officer beach access will be reduced to the minimum required to augment the cameras in providing facility security.

Construction – NASA is currently relocating the Wallops Island fire station adjacent to Navy Building V-024. Consistent with the external lighting employed on the Horizontal Integration Facility and Pad 0-A, the new fire station will employ long wavelength exterior lighting to reduce potential effects on nesting loggerheads and their hatchlings (Witherington and Martin 2003).

Routine Facility Maintenance – The operation of WFF requires continuing routine repairs and ongoing maintenance of buildings, grounds, equipment, aircraft, vehicles, laboratory equipment, and instrumentation. Existing infrastructure, such as roads and utilities are maintained on a regular basis to ensure their safety and operational capacity. Existing buildings also require ongoing maintenance. Buildings or utility systems may be rehabilitated or upgraded to meet specific project needs. Brush and trees may be removed to construct a new building, keep the airfield's clear airspace free of intrusions, maintain the facility's perimeter fence, manage wildlife, maintain radar and tower line of sight, or enhance operation of other radio frequency equipment. Routine repairs are often required after hurricanes or intense storms. NASA contractors use heavy equipment to clear roads and stormwater systems.

The boat dock at the north end of Wallops Island receives equipment such as rocket components that cannot be delivered to the island by truck. The existing access channel and boat basin will be maintained via dredging to a depth of 4 ft at low tide to accommodate deliveries at any time of day.

Launch Pad Lighting – During orbital and suborbital launch operations, bright, broad-spectrum area lighting is required. Observations of operations at both Pads 0-A and 0-B have shown that broad spectrum night lighting can be required for up to several weeks on either side of the launch window, effectively resulting in up to 30 calendar days of night lighting per launch event. During non-critical operations, the launch pad area will be illuminated by a combination of amber light emitting diode and low pressure sodium fixtures.

Recreational/ORV Beach Use – WFF personnel and their families are allowed to use the north end of Wallops Island for recreation outside of NASA operations periods. Recreational use may involve operation of vehicles on the beach, in addition to foot traffic. Users access the beach by the north Wallops Island ORV access. Beach access is year-round and is not expected to increase in frequency from the level previously considered. The northernmost extent of Wallops Island beach is closed to all recreational use from March 16 through August 31, or until the last plover chicks fledge (see Figure 10). The south end of Wallops Island is closed to recreational use year-round.

Protected Species Management – In accordance with its Protected Species Management Plan (NASA 2015a), NASA will continue to monitor Wallops Island beach for beach nesting species activity. Protected species management activities involve conducting frequent monitoring surveys, implementing area closures and posting signage, placing plover nest exclosures, and similar actions. Additional protective measures, including employee education, seasonal closure of the northernmost extent of Wallops Island beach, nest exclosures, and predator management will continue.

Miscellaneous Shoreline Activities – Occasional shoreline debris (biotic and abiotic) removal is necessary within all areas of Wallops Island beach. For example, if a large tree limb is deposited on the shoreline during a storm, it will be removed. Likewise, following rocket launches from Launch Complex 0, particularly Pad 0-B, miscellaneous metallic and non-metallic debris is often deposited on the nearby shoreline. Similarly, these items will be removed. While in recent years such debris could be reasonably removed by hand, it is possible that in certain cases mechanized equipment will be required to extract a partially buried or heavy item. Finally, there could be instances where mechanized equipment will be necessary within this area to conduct miscellaneous activities that do not relate to typical beach debris removal or periodic renourishment activities. An example of such an instance occurred in July 2013, when a deceased juvenile humpback whale (*Megaptera novaeangliae*) was buried on the north Wallops Island beach; requiring use of a backhoe. Debris removal is only scheduled during off-season unless there is a rocket accident or some other emergency. For any operation that occurs during nesting season, whether debris removal or another operation, nest locations are always translated to the cognizant Program Manager and the WFF Safety Office.

Educational Use of Wallops Island Beach – Students affiliated with NASA and the Chincoteague Bay Field Station of the Marine Science Consortium education programs regularly use Wallops Island beach for field trips and related activities. Such use of the beach occurs year-round with activity levels peaking during the summer months. Groups range in size from 5-20 students. These groups access the beach by either the north Wallops Island ORV access or the path east of the Island helicopter pad. Groups may only access the beach on-foot and must be under the supervision of a trained faculty or staff member.

Proposed and Ongoing Shoreline Restoration and Beach Renourishment Activities

The SRIPP is intended to use a multi-tiered approach to reduce damages to Wallops Island facilities from ongoing beach erosion and storm wave damage incurred during normal coastal storms including tropical systems and nor'easters. NASA has identified the SRIPP's design target performance of providing significant defense against a 100-year return interval storm with respect to storm surge and waves. The performance is provided by a combination of the reconstruction of a beach, berm, and dune that will help to absorb and dissipate wave energy before it nears NASA infrastructure, and a rock seawall embedded within the dune that will protect against the most severe energy. For these features to provide reliable protection for the SRIPP's design lifetime of 50 years, the beach must be maintained routinely throughout 50 year lifetime. The shoreline on the southern end of Wallops Island has been retreating at a rate of approximately 10 ft per year as a result of erosion (U.S. Army Corps of Engineers [Corps] 2010).

Seawall Repair – A seawall composed of large rock is currently located along 15,900 ft of the Wallops Island shoreline. This seawall was built in 1992 and protects WFF infrastructure within the northern portion of the eroding shoreline from damage due to storms and large waves. The wall has prevented overwash and storm damage, but erosion of the shoreline seaward of the wall has continued, resulting in an increased risk of damage to the seawall. NASA may repair and extend the existing rock seawall up to an additional 4,600 ft. Additional maintenance of the existing seawall may include operation of heavy equipment and placing or replacing dirt and/or rock in previously disturbed areas behind the seawall to maintain and augment the function of the existing seawall and protection resulting from these features.

In conjunction with construction activities, qualified biologists will continue to regularly survey the beaches in the vicinity of the project for use by sea turtles, plovers, and other species. If nesting activity of protected species is recorded, NASA will avoid work in areas where nesting occurs and/or implement other appropriate mitigation measures.

Shoreline Reconstruction Monitoring – As part of the SRIPP, NASA is conducting a shoreline monitoring program to record and document changes in shoreline characteristics over time as the project is subjected to normal weathering and storm events. The monitoring effort began prior to construction of the seawall, beach, and dune to establish a baseline condition and record any changes that occur between design and implementation.

A monitoring survey of the shoreline in the vicinity of Wallops Island is conducted twice a year. The first monitoring event is conducted along the entire length of Wallops and Assawoman Islands, a distance of approximately 8.5 miles. The second monitoring event is limited to the length of shoreline from Chincoteague Inlet south to the former Assawoman Inlet, which defines the south end of Wallops Island. In the cross-shore direction, elevation data is collected from behind the dune line to seaward of the depth of closure (the eastern edge of the underwater fill profile), estimated to be at approximately -15 to -20 ft below MLW. Near Chincoteague Inlet the ebb shoal complex creates a large shallow offshore area; therefore, surveys in this area extend a maximum of 2 miles offshore if the depth of closure is not reached. These surveys will be repeated annually once at the end of summer (August to October) and once at the end of winter (March to May).

Cross-sections of the beach have been taken along new and/or previously established baselines on set stations every 500 ft from Chincoteague Inlet to Assawoman Inlet and every 1,000 ft from Assawoman Inlet to Gargathy Inlet. The beach surveys extend from the baseline to a depth of -4 ft below MLW offshore. An offshore hydrographic survey along the previously established baseline on set stations every 500 ft was conducted. The offshore survey extended from -3 ft below MLW to the depth of closure, anticipated to be between -15 to -20 ft below MLW. The hydrographic survey was conducted within 2 weeks of the beach survey. Light Detection and Ranging data will continue to be obtained for the monitoring area approximately once a year. Both horizontal and vertical survey datum will be obtained. The survey of the beach, surf zone, and offshore area, will document changes in the Wallops Island shoreline in addition to areas adjacent to Wallops Island. The results of these monitoring efforts are being used to measure shoreline changes to evaluate the performance of the project, potential impacts to resources, and to aid in planning renourishment when needed to ensure continued project function.

Beach Renourishment and Long-Term Project Maintenance – To maintain a beach and dune at a fixed location in a condition to effectively buffer wave energy, NASA plans beach renourishment cycles throughout the 50-year life of the SRIPP as determined by the proposed monitoring program. The location, extent, and magnitude of renourishment events may vary significantly as a result of the frequency and severity of storm activity and subsequent shoreline erosion. The availability of funding, logistical constraints, and other issues may also affect the implementation of renourishment. Even if renourishment is needed based on the modeled project performance and intent, NASA may choose to forego or delay renourishment because the project will retain most of its intended and designed storm protection function even if renourishment is not implemented as envisioned in the Programmatic Environmental Impact Statement (NASA 2010a).

The projected renourishment frequency and amounts are based on the modeled average rates of sand loss, with models based on the historic meteorological conditions recorded at and near the project area. Based on available modeling of project performance over time, the SRIPP identified an expected renourishment frequency of approximately every 5 years for the 50-year life of the project, but which may be as frequent as every 2 years or may be delayed to every 7 years. Based on the general characterization of function, the SRIPP estimates that each renourishment cycle will require approximately 806,000 cubic yards ($yd^{3)}$ of sand placed on the beach in each of the 9 renourishment events, for a total expected renourishment volume of 7,254,000 yd^3 of sand over the life of the project, excluding the amount required for the initial beach and dune reconstruction.

If future renourishments use sand of smaller grain size or reduced quality, more frequent renourishment or larger volumes of sand may be required. The last two sand renourishments were from the offshore shoal, and the grain size on the island is identical to those of the shoal. However, testing has shown variation in grain size based on sand source, so there is potential for differences in grain size during future renourishments (NASA 2010a, see table 6). If there are changes in the pattern of sand movement along the shoreline, such as reduced southerly transport over time, renourishment may be needed less frequently. In the Programmatic Environmental Impact Statement, NASA considers the addition of breakwaters or groins as the addition of these features may result in reduced sand requirements, however groins are not evaluated in the proposed action.

The Wallops Island shoreline will experience effects of future sea level rise, and this has been anticipated by providing an additional sediment volume during each renourishment event that will raise the level of the entire beach fill by an amount necessary to keep pace with the projected rise rate (Corps 2010). Applying the Corps' standard sea level rise equation based on local measurements to a 50-year project at Wallops Island yields sea level elevations between 0.84 ft and 2.53 ft above present levels. For project planning purposes, a target fill volume 85 percent of the upper estimates of the amount needed to match the 50-year projected sea level rise was selected, but the SRIPP includes adding that volume in constant increments over time instead of in a pattern that will match anticipated increases. This means that in the early years of the project the amount of fill being added will exceed the amount necessary to match the expected amount with the crossover point being in the 28th year (2038) of the project. This way, the sea level fill volume could be increased, if needed, during later renourishment events. The sea level rise volume, which is an additional amount added during each renourishment event (assuming a 5-year interval between events), is 112,000 yd^3. Deviations from existing modeled or projected sea level rise scenarios may change the amount of sand needed for renourishment.

The number of uncertainties included in the projections resulting from the modeling, model assumptions, limitations of the records of past meteorological and climatological measurements in the area, current understanding of meteorological and climatic patterns, and future decisions of NASA and other agencies are likely to result in deviations from the projected renourishment.

Sources of Sand for Renourishment – Three borrow sites have been identified as sources for potential future beach renourishment: the on-shore north Wallops Island borrow area, unnamed shoal A, and unnamed shoal B (located east of shoal A). All of these sites have been determined to be consistent with the project purpose and suitable, but all have different costs and concerns associated with their use that must be evaluated prior to use in each proposed future renourishment. The on-shore north Wallops Island borrow area was described earlier in the description of the action (also see Figure 1).

Unnamed shoal A, the source of sand for the initial reconstruction, may be used as the source for renourishment. The shoal covers an area of approximately 1,800 ac and the total predicted volume of shoal A is approximately 40 MCY. The sand grain size (0.46 millimeter [mm]) is the largest of the 3 sources.

Unnamed shoal B is located offshore approximately 12 mi east of the southern portion of Assateague Island. This shoal covers an area of approximately 3,900 ac. The total predicted sand volume of this shoal is approximately 70 MCY. The average sand grain size is 0.34 mm with a 19 mi transit distance from the shoal to the pump out location.

ACTION AREA

The Action Area is defined at (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." The Service has determined that the Action Area (Figure 4) is the same as that established in the Service's 2016 Opinion. However, for the purpose of discussion of the actions resulting in reinitiation, a subset of the Action Area has been identified as the area impacted by effects of these actions. This area extends from Gargathy Inlet northward to Beach Road on Assateague Island (Figure 5).

Figure 4. Action Area for proposed and ongoing activities.

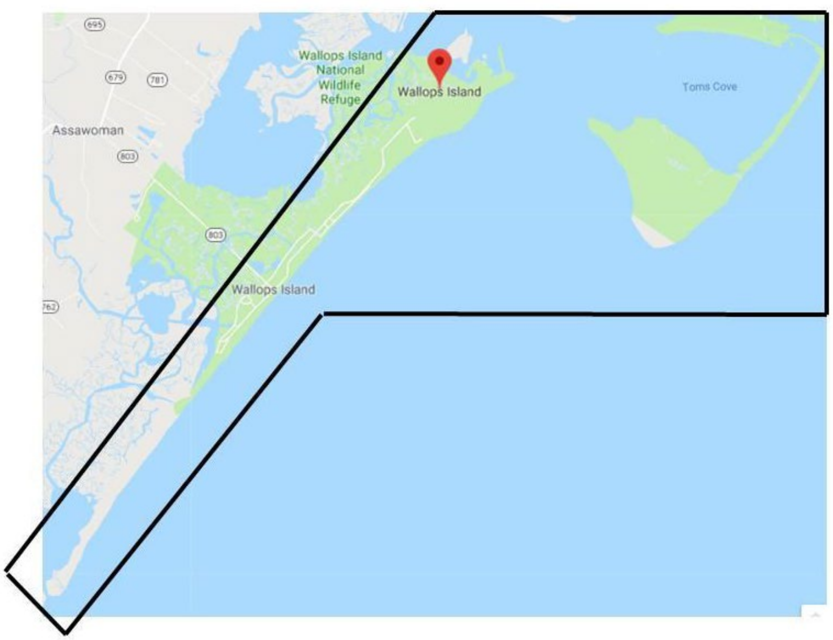

Figure 5. Subset of Action Area—Gargathy Inlet extending northward to Beach Road on Assateague Island.

STATUS OF THE SPECIES

Per ESA section 7 regulations (50 CFR 402.14(g)(2)), it is the Service's responsibility to "evaluate the current status of the listed species or critical habitat."

To assess the current status of the species, it is helpful to understand the species' conservation needs which are generally described in terms of reproduction, numbers, and distribution (RND). The Service frequently characterizes RND for a given species via the conservation principles of resiliency (ability of species/populations to withstand stochastic events which is measured in metrics such as numbers, growth rates), redundancy (ability of a species to withstand catastrophic events which is measured in metrics such as number of populations and their distribution), and representation (variation/ability of a species to adapt to changing conditions which may include behavioral, morphological, genetics, or other variation) (collectively known as the three Rs).

Plover – The Service listed the Atlantic Coast and Northern Great Plains populations of piping plover as threatened on December 11, 1985 (50 FR 50726-50734). The following is a summary of piping plover general life history drawn from the species revised recovery plan (Service 1996) and 5-year review (Service 2009a). For a more detailed account of the species description, life history, population dynamics, threats, and conservation needs, refer to https://ecos.fws.gov/ecp/species/6039.

Plover prey on infaunal invertebrate species such as crabs and worms, which inhabit the surface layer of sand. After they establish territories and conduct courtship rituals beginning in late March or early April, plover pairs form shallow depressions (nests) in the sand to lay eggs. Nests are situated above the high tide line on coastal beaches, sandflats at the ends of sand spits and barrier islands, gently sloping foredunes, blowout areas behind primary dunes, and washover areas cut into or between dunes and typically lay four eggs that hatch in about 27-30 days (Service 1996). The Atlantic Coast piping plover population breeds on coastal beaches from Newfoundland to North Carolina (and occasionally in South Carolina). Plovers then migrate to wintering beaches along the Atlantic Coast from North Carolina south, along the Gulf Coast, and in the Caribbean.

Sea level rise and more frequent, intense storms associated with climate change both pose threats to plovers. Sea level rise combined with coastal development and stabilization presents a considerable threat because the coastal ecosystem's natural ability to respond to sea level rise and generate newly available habitat will be lost. An increase in storm frequency and intensity will exacerbate coastal flooding that will already be increasing due to sea level rise. While climate change related effects on plovers remain a continuing concern (Service 2009a), effects of accelerating sea level rise on future availability of Atlantic Coast piping plover breeding habitats will largely depend on the response of barrier islands and barrier beaches.

The Atlantic Coast piping plover population is distributed among 4 recovery units (RUs) identified as: Atlantic Canada, New England, New York-New Jersey, and Southern (DE-MD-VA-NC) (Service 1996).

To meet the goal of recovery of the Atlantic Coast plover population, the following are recommended (Service 1996):

1. Increase and maintain for five years a total of 2,000 breeding pairs, distributed among four recovery units: Atlantic Canada, 400 pairs; New England, 625 pairs; New York-New Jersey, 575 pairs; Southern (DE-MD-VA-NC), 400 pairs.
2. Verify the adequacy of a 2,000-pair population of piping plovers to maintain heterozygosity and allelic diversity over the long term.
3. Achieve five-year average productivity of 1.5 fledged chicks per pair in each of the four recovery units, based on data from sites that collectively support at least 90% of the recovery unit's population.
4. Institute long-term agreements to assure protection and management sufficient to maintain population targets and average productivity in each recovery unit.
5. Ensure long-term maintenance of wintering habitat, sufficient in quantity, quality, and distribution to maintain survival rates for a 2,000-pair population.

The primary actions to address these criteria include (Service 2009a):

1. Increase efforts to restore and maintain natural coastal formation processes in the New York-New Jersey recovery unit.
2. Identify and secure reliable funding to support continuing management of threats from human disturbance and predation.
3. Accelerate development of agreements needed to assure long-term protection and management to maintain population targets and productivity.
4. Develop strategies to reduce threats from accelerating sea-level rise. Identify sites most likely to maintain (or increase) characteristics of suitable piping plover breeding and/or migration habitat. Identify human coastal stabilization practices that increase or decrease adverse effects of sea level rise on coastal piping plover habitats.
5. Conduct studies to understand potential effects of wind turbine generators that may be located or proposed for the Outer Continental Shelf, nearshore, and within or between nesting and foraging habitats.
6. Conduct studies, including meta-analyses of local studies, to understand factors that affect latitudinal variation in productivity needed to maintain stationary populations of Atlantic Coast piping plovers.
7. Conduct demographic modeling to explore effects of latitudinal variation in productivity, survival rates, and the carrying capacity of habitat on population viability within individual recovery units and the Atlantic Coast population as a whole.
8. Review state laws within the Atlantic Coast piping plover's breeding and wintering range to assess protections that would be afforded if the species were removed from ESA listing.

9. Support effective integrated predator management through studies of ecology and foraging behavior of key predators.

The primary factors influencing the status include habitat loss and degradation, predation, human disturbance, and inadequacy of regulatory mechanisms. Climate change and wind turbine generators have also emerged as threats since publication of the 1996 recovery plan. While 3 of the 4 recovery units have experienced net declines compared with the 2008 estimates that informed the 2009 5-Year review, reinforcing long-standing concerns about the uneven distribution of Atlantic Coast piping plovers, their rangewide status has improved since the 1986 listing (Service 2019a).

Knot – The Service listed the red knot as threatened on January 12, 2015 (79 FR 73705-74748). The following is a summary of red knot general life history drawn from the background information and threats assessment (Service 2014a) and the recovery outline (Service 2019b). For a more detailed account of the species description, life history, population dynamics, threats, and conservation needs, refer to https://ecos.fws.gov/ecp/species/1864.

The rufa red knot migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the Southeast U.S., the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. During both the northbound (spring) and southbound (fall) migrations, red knots use key staging and stopover areas to rest and feed and are highly dependent on the continued existence of quality habitat at these staging areas. Major spring stopover areas along the U.S. Atlantic coast include the Virginia barrier islands and Delaware Bay. In the Southeast U.S., red knots forage along sandy beaches, tidal mudflats, and peat banks during spring and fall migration from Maryland through Florida. The red knot eats hard-shelled mollusks, sometimes supplemented with easily accessed softer invertebrate prey, horseshoe crab (*Limulus polyphemus*) eggs and *Donax spp.* clams (Service 2014a).

Warming temperatures or changes in storm intensity and timing due to climate change may alter when horseshoe crabs lay eggs or invertebrate prey becomes available. This can change peak abundance of prey to occur at a time that does not coincide with arrival of red knots at spring and stopover sites and their Arctic breeding grounds (79 FR 73705-74748). A successful migration is dependent on the timing of these events, so deviations may negatively affect the knot. The availability of alternate prey species for the knot's predators, such as Arctic fox, is being disrupted by climate change. This may increase predation on knots during their breeding season on the Arctic. Additionally, loss of breeding and nonbreeding habitat due to arctic warming and sea level rise, respectively, are increasing extinction risk for the species (79 FR 73705-74748).

To meet the goal of recovery, the following preliminary criteria have been identified (Service 2019b):

1. Populations within all four wintering regions (Argentina/Chile, northern South American coast, northwestern Gulf of Mexico, and southeastern United States/Caribbean) are

sufficiently large and stable, based on adequate surveys and monitoring, and on scientific modeling such as a full-life-cycle population viability analysis;
2. Rates, trends, and trajectories of adult survival, juvenile survival, and reproduction are adequately understood (including consideration of Arctic ecosystem change), and are sufficient to support the resilient wintering populations described in (1) above;
3. The rufa subspecies breeding and nonbreeding distributions are well understood and delineated relative to other subspecies, and the rufa population structure is clarified (e.g., genetic relationships among subspecies, and among the rufa wintering regions);
4. A network of key wintering habitats and major spring and fall migration staging areas across North America and South America provides sufficient suitable food resources at the appropriate times in the annual cycle and is adequately managed and protected;
5. Migration stopover habitats across the range (in addition to the key staging areas) are sufficient to allow red knots to adapt to short-term (e.g., annual weather, food, predation, disturbance conditions) and long-term (e.g., climate change, sea level rise, habitat modification) changes in their migratory landscape and timing, and are adequately managed and protected.

A preliminary action plan identified the following near-term actions (Service 2019b):
1. Support, encourage, and if possible, fund the research priorities listed in U.S. Fish and Wildlife Service Rufa Red Knot Research Priorities, 2019 to 2022.
2. In Delaware Bay, continue the Service's active role in horseshoe crab management, in the management of intertidal aquaculture, and in supporting State-led efforts to monitor and protect red knots, with a goal of steadily increasing the percent of red knots that depart the bay at adequate weights even as numbers of knots using the bay also increases.
3. Avoid and minimize loss and degradation of nonbreeding habitat from coastal engineering and development
    a. Work through the Atlantic Flyway Shorebird Initiative's (AFSI) Coastal Engineering Committee (Habitat Work Group) to develop best practices.
    b. Work with the Corps and the States to adopt the best practices at the landscape- and project-level scales (e.g., through sections 7(a)(1) and 7(a)(2) of the ESA).
    c. Focus on documented red knot staging areas, as well as regularly used stopover and wintering habitats. When possible, pursue multispecies conservation opportunities that also benefit other State or federally listed species.
4. Work with partners to preserve, enhance, and restore nonbreeding habitat, both proactively and incidental to engineering and development projects. For example, carefully planned beach nourishment can increase of improve red knot habitat in some areas, such as parts of Delaware Bay.
5. Develop Service recommendations for managing recreation and other sources of human disturbance in red knot nonbreeding habitats. In developing the recommendations, build on related work being done by the National Wildlife Refuge System, through the AFSI's Human Activities Committee (Habitat Working Group), and in the piping plover wintering range. Work with land managers and project proponents to implement the

Service's recommendations. Also work with recreation user groups (e.g., fishermen) to enlist support for minimizing disturbance of red knots.

6. Work with partners to monitor and manage invasive vegetation in red knot nonbreeding habitats.
7. Work with land managers to evaluate gull and raptor management in the vicinity of red knot nonbreeding habitats on a case-by-case basis. In some instances, management adjustments may be warranted, such as relocating peregrine falcon (*Falco peregrinus*) nesting structures. Build on the AFSI's forthcoming shorebird predation best management practices.
8. Work with the U.S. Coast Guard and other partners to identify key red knot habitats in oil spill response planning, and prioritize these areas for protection in the event of a spill.
9. Work with wind energy developers and regulators to explore alternatives to siting new wind turbines in red knot concentration areas of along major migration pathways.
10. Work with all States, Service Regions, and the U.S. Geological Survey's Bird Banding Lab to ensure best practices are followed by all individuals and entities engaged in red knot trapping, marking, and other research.
11. Establish a Red Knot Information Partnership of interested species experts, researchers, and conservation practitioners from across the species' range. Facilitate the exchange of information by establishing an email listserve and perhaps other electronic tools/platforms. Hold and annual conference call or webinar to discuss collaborative research, new advances in red knot science, new information about threats, and new developments in conservation. Hold ad hoc conference calls of webinars to address less urgent issues as they arise.
12. Enhance and facilitate international cooperation on red knot research and conservation.

The primary threats to the knot are: habitat loss and degradation attributable to sea level rise, shoreline stabilization, and Arctic warming; and reduced food availability and asynchronies in the migration timing relative to food availability and favorable weather conditions. Secondary threats include hunting, predation, human disturbance, algal blooms, oil spills and wind energy development.

Sufficient reliable data to produce a rangewide population estimate is not available. However, the best available data indicate a sustained decline in the early 2000s and the possibility of stabilization at low levels in recent years. In summary, as a whole, the rangewide status of the species is stable (Service 2019b).

Loggerhead – The Service and National Marine Fisheries Service (NMFS) jointly listed the loggerhead sea turtle as threatened on July 28, 1978. The following is a summary of loggerhead sea turtle general life history drawn from the species' recovery plan (NMFS and Service 2008), 5-year review (NMFS and Service 2007), and 2009 status review (Conant et al. 2009). For a more detailed account of the species description, life history, population dynamics, threats, and conservation needs, refer to https://ecos.fws.gov/ecp/species/1110.

Loggerhead sea turtles inhabit temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Adult loggerheads are known to make long migrations between foraging areas and nesting beaches. The highly migratory behavior of loggerheads means that conservation efforts for loggerhead populations in one country may be jeopardized by activities in another (NMFS and Service 2008). Loggerheads nest on ocean beaches and occasionally on estuarine shorelines with suitable sand, typically between the high tide line and the dune front. Within the continental U.S., loggerheads nest from Texas to Virginia. Nesting is often highly variable from year to year due to a number of factors including environmental variability, ocean conditions, anthropogenic effects, and factors affecting survival, growth, and reproduction (NMFS and Service 2008). Hatchlings emerge from their nests en masse almost exclusively at night, and presumably use decreasing sand temperature as a cue. Hatchlings then use light cues to find the ocean; ambient light from the open sky creates a relatively bright horizon compared to the dark silhouette of the dune and vegetation landward of the nest (NMFS and Service 2008).

Climate change may impact loggerheads through sea level rise and rapidly increasing temperatures. Sea level rise may contribute to the loss of nesting habitat through inundation of nest sites and beach erosion, which will be compounded by increasing coastal development and stabilization. Given that sea turtles exhibit temperature-dependent sex determination, global increases in temperature may also increase sand temperatures and increases incubation temperatures resulting in female-biased sex ratios (NMFS and Service 2008).

Five RUs have been identified in the Northwest Atlantic Ocean DPS based on genetic differences and a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries. The first 4 RUs represent nesting assemblages in the southeast U.S. The boundaries of these 4 RUs were delineated based on geographic isolation and geopolitical boundaries. The fifth RU includes all other nesting assemblages within the Northwest Atlantic. While the Northern RU includes southern Virginia, the Eastern Shore is not part of any RU.

To meet the recovery goal of the loggerhead, the NMFS and Service (2008) recommended the following recovery criteria:

1. Number of Nests and Number of Nesting Females
    a. Specific nest numbers and rate of increase varies by recovery unit, but increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).
2. Trends in Abundance on Foraging Grounds
    a. A network of in-water sites, both oceanic and neritic across the foraging range is established and monitoring is implemented to measure abundance. There is statistical confidence (95 percent) that a composite estimate of relative abundance from these sites is increasing for at least one generation.
3. Trends in Neritic Strandings Relative to In-water Abundance
    a. Stranding trends are not increasing at a rate greater than the trends in in-water relative abundance for similar age classes for at least one generation.

To address these criteria for the Northwest Atlantic DPS the recovery plan (NMFS and Service 2008) lists the 208 primary actions, of which there are 34 Priority 1 actions.

The primary factors influencing the status include bottom trawl, pelagic and demersal longline, longline, and demersal large mesh gillnet fisheries; legal and illegal harvest; vessel strikes; beach armoring; beach erosion; marine debris ingestion; oil pollution; light pollution; and predation by native and exotic species. Numerous beaches in the Southeast U.S. are eroding due to both natural (e.g., storms, waves, shoreline geology) and anthropogenic (e.g., construction of armoring structures, groins, and jetties; coastal development; inlet dredging) factors. Such shoreline erosion leads to a loss of nesting habitat for sea turtles (Conant et al. 2009). In summary, as a whole, the rangewide status of the species is declining (NMFS and Service 2008).

STATUS OF CRITICAL HABITAT

Plover – Critical habitat for the wintering population of plover has been designated along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas; however, this action does not affect those areas.

Knot – No critical habitat has been designated for knot.

Loggerhead – Critical habitat for the loggerhead Northwest Atlantic Ocean DPS has been designated along approximately 685 mi of specific terrestrial environments along the U.S. Atlantic and Gulf of Mexico coasts; however, this action does not affect those areas.

ENVIRONMENTAL BASELINE

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the past and present impacts of all federal, state, or private actions and other human activities in the Action Area. Also included in the environmental baseline are the anticipated and/or ongoing impacts of all proposed federal projects in the Action Area that have undergone Section 7 consultation, and the impacts of state and private actions which are contemporaneous with the consultation in progress.

Status of the Species within the Action Area

Plover – The Action Area is within the Southern RU. Following low productivity in 2016 and 2017, the number of breeding pairs in Virginia and the Southern RU (for which Virginia is the largest contributor) declined sharply in 2018. While 2018 productivity estimates appear to have increased slightly from 2017, it was not sufficient to stabilize the breeding population (Service 2017; A. Hecht, Service, email to E. Argo, Service, October 30, 2018).
Within the Action Area, plovers use wide sandy beaches on Metompkin, Assawoman, Wallops, and Assateague Islands for courtship and nesting (Table 2 and 3). Suitable habitat has a variable distribution along the seaward edge of islands within the Action Area year-to-year due to the

competing effects of erosion and vegetation succession. Annual plover production within the Action Area indicates that all islands possess some nesting habitat, with the most extensive areas of suitable beach occurring on Assawoman Island and in the Hook, Overwash, and Public Beach portions of Assateague Island (Service 2009b). Metompkin Island also supports large numbers of plovers (Smith et al. 2009). Little potential habitat is available for plover nesting on the south end of Wallops Island, although 1-2 birds originating from nesting areas south of Wallops Island are known to forage near camera stand Z-100 (S. Miller, NASA, email to E. Argo, Service, May 8, 2019; S. Miller, NASA, email to E. Argo, Service, June 6, 2019; see Figure 9). The north end of Wallops Island has been rapidly accreting, offering increasing quantities of wide sandy beach on which plovers nest. Shoreline restoration created a substantial increase in beach habitat available on Wallops Island north of the reconstructed seawall and south of the north Wallops Island area (NASA 2015a).

Most plovers that nest farther north within the Atlantic population are likely to pass through the Action Area during migration between mid-February and mid-May in the spring and from mid-July to mid-October in the fall. This may involve birds passing through in flight, but many of these birds may stop and roost or feed on beaches, tidal flats, and overwash areas within the Action Area. While breeding plovers select a narrower range of micro-habitats in Virginia compared to other areas along the East Coast of the U.S. and outside of the Southern RU and changes in habitat suitability may be a factor in the recent decline, it seems unlikely that the habitat was completely saturated in 2018 (A. Hecht, Service, email to E. Argo, Service, October 30, 2018).

Table 2. Plover nest and fledgling numbers for islands in Action Area (Service 2009b, 2014b, 2018a, 2018b; Smith et al. 2009; NASA 2010b, 2011, 2012b, 2013, 2014a, 2015b, 2016, 2017, 2018)

Year	Island	Number of Nests	Number of Chicks Fledged
2009	Assateague (Hook, Overwash, and Public Beach)	32	26
	Wallops	4	10
	Assawoman	26	31
	Metompkin	46	51
2010	Assateague (Hook and Overwash)	32	54
	Wallops (first season of official monitoring program)	4	4
	Assawoman	24	35
	North Metompkin	3	4
2011	Assateague (Hook and Overwash)	27	41
	Wallops	3	9
	Assawoman	32	52
	North Metompkin	8	11
2012	Assateague (Hook and Overwash)	20	9
	Wallops	6	3
	Assawoman	39	78
	North Metompkin	11	15
2013	Assateague (Hook and Overwash)	31	29
	Wallops	3	8
	Assawoman	40	60
	North Metompkin	14	15
2014	Assateague (Hook and Overwash)	42	70
	Wallops	5	5
	Assawoman	40	71
	Metompkin	53	82
2015	Assateague (Hook and Overwash)	47	59
	Wallops	6	8

Year	Island	Number of Nests	Number of Chicks Fledged
	Assawoman	33	28
	Metompkin	61	78
2016	Assateague (Hook and Overwash)	61	36
	Wallops	9	9
	Assawoman	30	39
	North Metompkin	11	15
2017	Assateague (Hook and Overwash)	52	43
	Wallops	6	7
	Assawoman	38	14
	North Metompkin	12	5
2018	Assateague (Hook and Overwash)	34	--
	Wallops	3	3
	Assawoman	23	--
	North Metompkin	10	--

Table 3. Plover nest data for Wallops Island.

Year	Earliest Nest Date	Latest Fledge Date	Number of Nests
2010	May 3	n/a	3
2011	May 16	June 19	3
2012	May 24	Aug 16	5
2013	May 15	July 22	4
2014	May 20	July 20	5
2015	May 13	July 9	6
2016	May 31	July 5	9
2017	May 1	Aug 10	6
2018	May 21	July 13	3

<u>Knot</u> – Following migration from southern overwintering areas, the majority of knots arrive in the mid-Atlantic between late April and early June. The Delaware Bay has long been regarded as the final and most crucial stopover during the springtime northern migration. At this stopover, the birds gorge on eggs of spawning horseshoe crabs in preparation for their nonstop flight to the Arctic (Karpanty et al. 2006). Virginia's Eastern Shore also provides important stopover habitat, including Wallops Island (Watts and Truitt 2015).

The majority of knot activity on Wallops Island occurs on the north end of the island, well north of launch Complex 0 during the month of May (NASA 2012b, 2013, 2014a, 2015b, 2016, 2017, 2018). Flock sizes have varied year-to-year, with the smallest numbers observed in 2014 (Table 4 and Figure 6). Although the potential exists for knot foraging activity to occur within the renourished beach area adjacent to the launch pads, their presence on the regularly nourished beach is unlikely due to the suppressed forage base and resultant lower habitat value.
Knots have also been observed on Assawoman and Assateague Islands from May through September. Flock sizes have ranged from a single birds to over 100 individuals since 2014 (Service 2018c).

Along Virginia's Eastern Shore, knots make use of beach and peat bank habitats (Service 2015a). They have been documented feeding both day and night, which may be necessary to meet energy requirements from available prey species to complete migration (Cohen et al. 2011). During the 2006 and 2007 migration seasons, Virginia supported a knot population of over 7,000 individuals (Cohen et al. 2009). Counts during peak migration have documented both increases and decreases from 2007 through 2018 (Karpanty et al. 2018). Additionally, wintering knots are known to occur on Virginia's Eastern Shore (S. Karpanty and J. Fraser, Virginia Polytechnic Institute and State University, per. obs. March 13, 2019), but the Service is not aware of data identifying the Action Area as part of these wintering grounds.

Table 4. Knot migration data for Wallops Island (NASA 2010b, 2011, 2012b, 2013, 2014a, 2015b, 2016, 2017, 2018).

Year	Annual Maximum Number Observed	Annual Mean of Numbers Observed
2010	483	180
2011	407	100
2012	672	293
2013	1162	383
2014	34	9
2015	560	218
2016	383	179
2017	150	83
2018	223	98

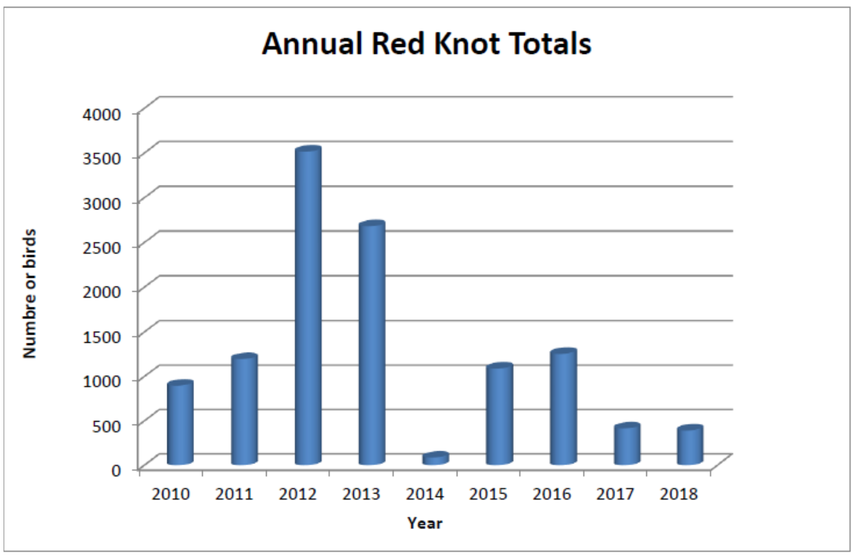

Figure 6. Total of numbers of knots observed on the north end of Wallops Island (NASA 2018).

Loggerhead – The loggerhead occurs in waters adjacent to and offshore of islands within the Action Area. The Action Area is at the northern extent of recorded nesting activity for the species. Loggerheads are known to occasionally nest within the Action Area, primarily on Assateague Island (Table 5 and 6). In Virginia, nesting has been documented from May through August (Virginia Department of Game and Inland Fisheries [VDGIF] 2017), with hatching occurring approximately 60 days later.

Nests on Wallops Island have been documented on the recreational beach and in front of the rock wall, but are not documented every year (Table 6 and Figure 7; NASA 2010b, 2011, 2012b, 2013, 2014a, 2015b, 2016, 2017, 2018). Results of DNA analysis indicated that nests in 2010 were all dug by a single female (NASA 2010b). There is no evidence of sea turtle nesting documented on Wallops Island since 2014 (NASA 2014a, 2015b, 2016, 2017, 2018). As more southern beaches warm and nests experience increased egg mortality, nesting activity may shift in a northerly direction. In addition, some southern nesting beaches have been producing highly female-skewed sex ratios for decades (e.g., Hanson et al. 1998), so northern beaches that produce more males may become more important to the species recovery.

Table 5. Loggerhead nest activity within the Action Area from 1974-2017 (Service 2009c, 2015b, 2018d; VDGIF 2017; NASA 2010b, 2011, 2012b, 2013, 2014a, 2015b, 2016, 2017, 2018).

Location	False Crawls	Nests	Total Activity
Metompkin Island	0	0	0
Assawoman Island	1	0	1
Wallops Island	22	13	21
Assateague Island – Hook and Overwash	72	38	141

Table 6. Loggerhead crawl and nest dates and numbers for Wallops Island (NASA 2010b, 2012b, 2013, 2014a).

Year	Latest Crawl Date	Latest Expected Hatch Date	Number of Crawls/Nests
1975	July 24	October 22	3/0
1979	July 21	October 19	1/1
1982	July 14	October 12	1/1
1989	June 5	September 3	1/1
2002	July 9	October 7	1/1
2008	August 3	November 1	2/1
2010	July 28	October 26	6/4
2012	July 12	October 10	4/2
2013	July 26	October 24	3/2

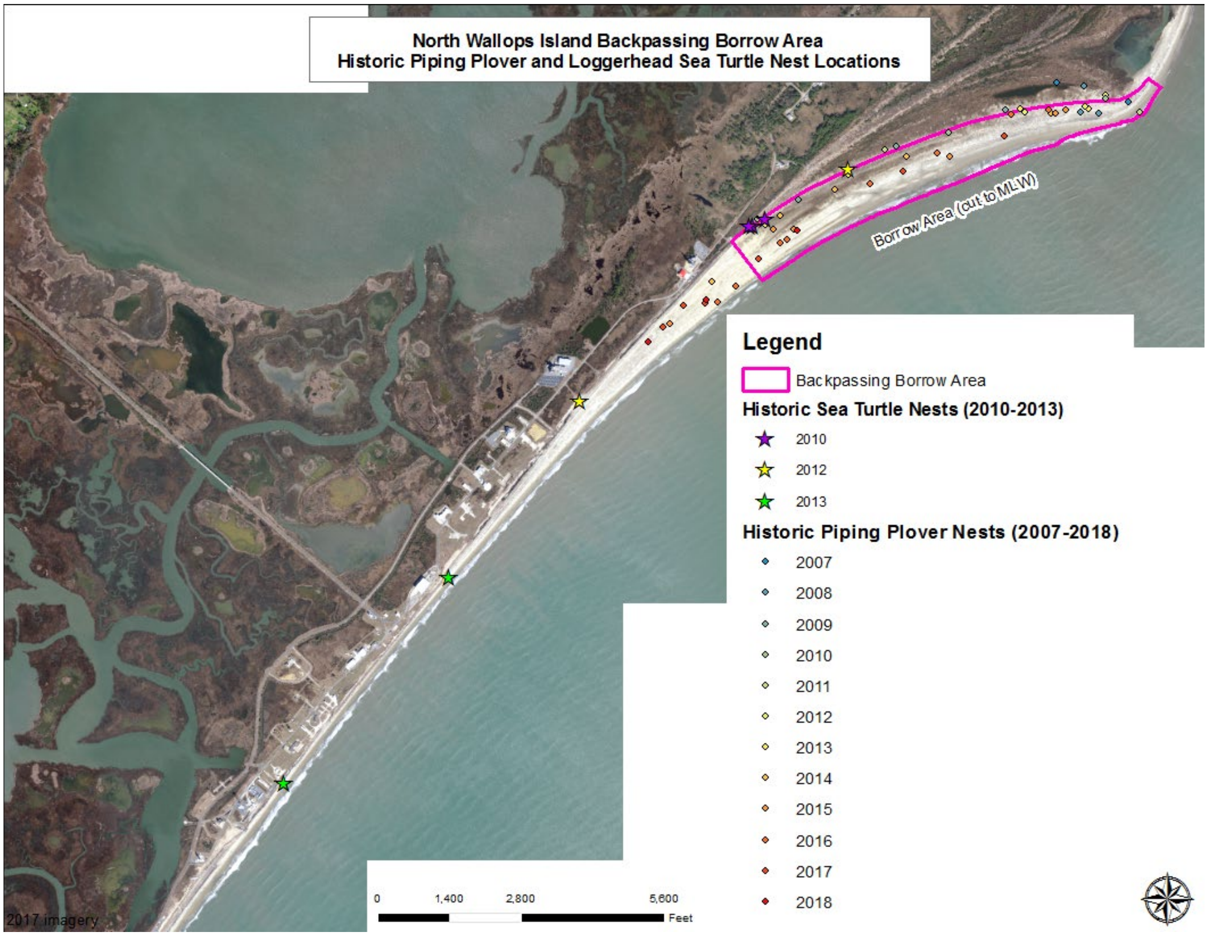

Figure 7. Historic plover and loggerhead nest locations. Image provided by NASA.

EFFECTS OF THE ACTION

Direct effects are the direct or immediate effects of the project on the species, its habitat, or designated/proposed critical habitat. Indirect effects are defined as those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. Direct and indirect effects of the proposed action along with the effects of interrelated/interdependent activities are all considered together as the "effects of the action." For the purposes of this Opinion, we are considering the effects of the action over the next 15 years.

The Corps' Chincoteague Inlet Inner Channel Federal Navigation Project was originally approved in 1972 (*https://www.nao.usace.army.mil/About/Projects/ChincoteagueNav.aspx*; accessed May 17, 2019) and has been taking place an average of twice a year (Corps 2019) in the waters adjacent to Wallops Island, within the Action Area (Figure 8). The Corps' permit expired on April 29, 2019 and the Corps submitted a Joint Permit Application on February 25, 2019 to continue the project (Corps 2019). In the model provided by NASA and conducted by the Corps, it was stated that the proposed beach nourishment activities should have no effect on the channel given that it has not needed to be dredged in 7 years, any dredging conducted will only be for maintenance, and sand material is not accumulating in the channel (Corps 2018a). While the Corps recognized it would be ideal to include the inlet in the numerical model, they elected not to include this information due to the need for a full sediment budget. As a result, NASA did not provide the Service with any information regarding potential effects to listed species from the interaction of the Navigation Project, backpassing, and beach nourishment. The Corps has not consulted with the Service on the Navigation Project nor do we have any sources of information available from which to assess effects on listed species.

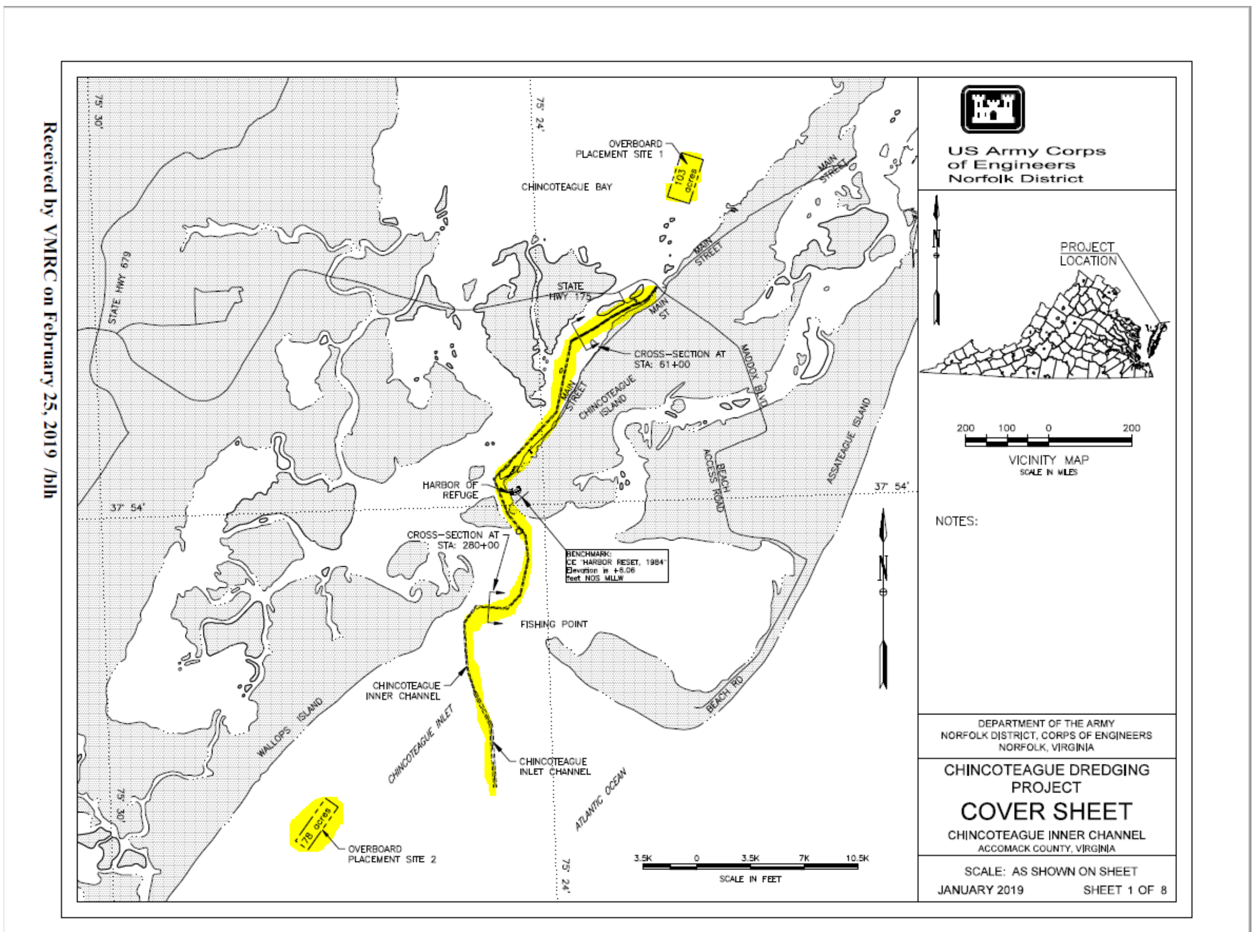

Figure 8. Dredging and sand placement sites highlighted in yellow (base image from Joint Permit Application).

The potential effects of the proposed activities are described in Table 7 (see Appendix A) and 8. Activities in Table 7 require reinitiation, while those in Table 8 remain unchanged from the Service's 2016 Opinion.

Those components of the proposed action requiring reinitiation determined to result in "no effect" or "not likely to adversely affect" are described in Table 7 and will not be further discussed in this Opinion. Multiple components of the project have been identified as having the potential to affect plovers, knots, and loggerheads (Table 7). These include:

- Operation of equipment (day)
- Operation of equipment (night)
- Presence of additional personnel
- Sand excavation
- Renourishment
- Breakwater construction
- Equipment staging
- Sand stockpile

Effects to federally listed species from the actions necessitating reinitiation were evaluated based on data in the shoreline change and transport model (GenCade) (Corps 2018a, 2018b) provided to the Service by NASA. Experts in the fields of coastal geomorphology and sediment transport have indicated that there will be impacts to Assateague and Assawoman Islands beyond the immediate Wallops Island area; however, the magnitude and extent of these impacts is unknown at this time (Varnell 2019). Information on the sediment transport dynamics in the area surrounding Wallops Island is incomplete, but the information necessary to develop additional models is not currently available (L. Varnell, Virginia Institute of Marine Science, pers. obs. November 26, 2018).

Given that backpassing, and the associated renourishment and equipment use, is anticipated to take place on a 10-year interval, the effects described below and in Table 7 are anticipated to occur following a second round of backpassing and renourishment in 2029-2030. Similarly, renourishment activities, using an offshore shoal as a sand source, are expected to continue on a 2-7 year interval and the effects described below and in Table 7 are anticipated to occur following each subsequent renourishment event. Because NASA is unable to more specifically predict the frequency of renourishment activities using the offshore shoal as a sand source, we are assuming that renourishment will occur every 2 years during the 15 year timeframe of this Opinion (2021, 2023, 2025, 2027, 2031, 2033) except during the years where backpassing and associated renourishment occurs.

Backpassing (sand excavation) and renourishment

Plover – Sand excavation will remove nesting habitat at the northern end of Wallops Island, resulting in a reduction in breeding carrying capacity, lack of nesting, and birds searching for suitable nesting habitat elsewhere. Searching for alternative suitable habitat leads to increased energy expenditure from additional search times and increases exposure to predators. Expending additional energy searching for and reaching suboptimal habitat that may have limited food resources does not allow plovers to maintain optimal body condition, resulting in decreased nest productivity or inability to nest. The use of suboptimal habitat may lead to nesting on less suitable habitat, such as on a narrower beach more vulnerable to flooding, and decreased nest or brood attendance by adults could increase predation of eggs and/or chicks. If the habitat is suboptimal, foraging opportunities may be limited and decrease chick survival. If birds seek nesting habitats elsewhere, they will also face competition for territories with birds already established there, leading to lower productivity and lower adult survival from reduced food availability. Optimal nesting habitat will be unavailable in the sand excavation area until sand accretes to the northern end of Wallops Island 4-6 years post-excavation (Corps 2018a, 2018b).

Renourishment (placement of backpassed sand) will reduce the quality of nesting habitat. Birds that have been nesting in the area proposed for renourishment may continue to return and attempt to nest, resulting in lower nest productivity (A. Hecht, Service, pers. obs. April 24, 2019). This will cause a loss in carrying capacity in the Action Area and the loss and degradation of this nesting area may cause long-term adverse impacts to population productivity and growth. Birds may seek nesting habitat elsewhere, resulting in the effects described above. Additionally, as compared to nesting plovers on beaches in the northeastern U.S, nesting plovers may abandon their nests since birds along the Eastern Shore of Virginia startle or flush easily (R. Boettcher, VGDIF, pers. obs. March 29, 2019).

Renourishment will also bury available prey. Recovery of invertebrate prey species varies based on time of year of renourishment and technique used (Corps 1982, Schlacher et al. 2012, Bishop et al. 2006). Over time, the characteristics of a natural beach are expected to return as the renourished area is recolonized by native fauna and plants, and as wave action, wind, rain, and other natural forces weather the beach (National Research Council 1995). Plovers will expend additional energy seeking available foraging habitat elsewhere, resulting in the effects described above. We expect that beach habitat will be unsuitable for plover foraging for 1 year following renourishment.

Plover and knot – Sand excavation will impair or kill invertebrate prey species and will remove or alter habitat making the site unavailable or less desirable for foraging for plovers and knots. Sand will be excavated to MLW, creating tidal pools. *Donax* spp., a primary knot food source, will likely be suppressed when material is systematically removed from the intertidal zone, as proposed. Additionally, wrack, another source of forage for knots and plovers, will be displaced. However, wrack is expected to more rapidly regenerate as compared to *Donax*. As a result, foraging habitat on the northern end of Wallops Island will be unavailable until sand accretes to the backpass area in 4-6 years (Corps 2018a, 2018b) and prey species recover. Knots and plovers are expected to search for alternative suitable habitat leading to increased energy expenditure from additional search times and increased exposure to predators. Suboptimal habitat may have more predators, thus increasing predation risk, resulting in harm or death. For knots, if the nearby islands that provide alternate habitat do not provide sufficient resources to fulfill their foraging needs, there is a risk that they will not reach an adequate weight, which will negatively affect their breeding success in the Arctic.

Loggerhead – Loggerheads have nested in both the areas slated for sand excavation and renourishment. The removal of sand will remove known nesting habitat, resulting in a lack of nesting or expenditure of additional energy to find a suitable nesting site. Beach habitat in the sand excavation area will be unavailable for sea turtles for at least 2 consecutive nesting seasons following sand mining. Return of previous beach topography that provided nesting habitat is expected to take 4-6 years.

Placement of sand may alter beach topography and result in sand compaction, reducing the quality of nesting habitat. If a female does attempt to nest, the sand may have been compacted by equipment, reducing the female's ability to dig a nest chamber. However, a portion of the area where nests have been documented (in front of the riprap protection) has eroded in recent years and the addition of sand to this area could increase available nesting habitat along this stretch of Wallops Island. On most beaches, nesting success typically declines for the first 1 to 2 years following sand placement, even though more nesting habitat is available for turtles (Conant et al. 2009). However, the effects of beach renourishment on nesting are not predictable and potential effects should be considered on a case-by-case basis (Crain et al. 1995). NASA has observed nesting on renourished areas on Wallops Island in both 2012 and 2013 (NASA 2012b, 2013). Nest failure and reduced rates of hatchling emergence are expected to occur for up to 2 years after sand placement.

Operation of heavy equipment (day and night) and presence of additional personnel

Plover – Operation of equipment and presence of additional personnel will discourage habitat use and cause plovers to expend additional energy seeking available habitat elsewhere. Searching for alternative suitable habitat leads to increased energy expenditure from additional search times and increases exposure to predators. Expending additional energy searching for and reaching suboptimal habitat that may have limited food resources does not allow plovers to maintain optimal body condition, resulting in decreased nest productivity or inability to nest. This may lead to nesting on less suitable habitat, such as on a narrower beach more vulnerable to flooding, and decreased nest or brood attendance by adults could increase predation of nests and/or chicks. If the habitat is less suitable foraging opportunities may be limited and decrease chick survival. If birds seek nesting habitats elsewhere, they will also face competition for territories with birds already established there, leading to lower productivity and possibly adult survival from reduced food availability. Additionally, nesting plovers may abandon their nests since birds along the Eastern Shore of Virginia flush easily (R. Boettcher, VDGIF, pers. obs. March 29, 2019).

Plover and knot – Operation of equipment will generate noise, disturbing foraging and roosting individuals. Individuals are likely to cease normal behaviors and alter their flight path, causing them to expend additional energy reaching habitat that may have limited food resources that does not allow them to maintain optimal body condition and cause them to spend a longer time foraging, thereby increasing their vulnerability to predators. The release of small amounts of fuel from the equipment may directly impact plovers and knots through ingestion or by getting on their feathers harming the birds. Fuel releases will also and negatively impact their prey species, reducing prey availability and quality causing the birds to spend additional time foraging, increasing the time they are available to predators. Additionally, sand compaction from equipment will cause burial or suffocation of invertebrate prey species and generally degrade the foraging habitat. The presence of additional personnel will also discourage the use of the habitat for foraging, causing the birds to seek suitable habitat elsewhere. Searching for alternative suitable habitat leads to increased energy expenditure from additional search times and increases exposure to predators. For knots, use of suboptimal foraging habitat may also result in lower weight when reaching the Arctic leading to reduced reproductive success.

Loggerhead – A nesting female may encounter operating equipment on the beach that could deter nesting attempts. If a female does attempt to nest, the sand may have been compacted by equipment, reducing the female's ability to dig a nest chamber, resulting in a reduction in nesting success. If hatchlings travel beyond the 1,000 ft buffer they may be crushed by operating equipment or encounter ruts and divots left by equipment that make it difficult to travel to the ocean and make them more vulnerable to predators while traversing the beach.

Breakwater construction

Plover and knot – Breakwater construction will generate noise, disturbing foraging plovers and knots. Individuals are likely to cease normal behaviors and alter their flight path, causing them to expend additional energy searching for available habitat elsewhere. Searching for alternative suitable habitat leads to increased energy expenditure from additional search times and increases exposure to predators. Suboptimal habitat may have limited food resources that does not allow plovers or knots to maintain optimal body condition and may also have a larger number of predators, thereby increasing their vulnerability to predators. For knots, use of suboptimal foraging habitat may result in lower weight when reaching the Arctic leading to reduced reproductive success.

Breakwaters would also change the beach topography, causing tombolos to form and reducing the rate of recovery of the foraging (plover and knots) and nesting (plovers) habitat. The effects of the reduced rate of habitat recovery on plovers and knots are the same as those discussed above.

Equipment staging

Loggerhead – Equipment staging areas may be modified daily and may not always be established in an upland area. Any equipment staged on the sand/beach may present an obstacle to nesting loggerheads causing them to return to the ocean instead of nesting or expend additional energy to find a suitable nesting site, resulting in a reduction in nesting success. Hatchlings may encounter equipment on the beach at night during hatching if they travel outside of the 1,000 ft buffer, causing them to spend more time reaching the ocean, leaving them vulnerable to predators, which increases the likelihood of harm or death.

Sand stockpile

Loggerhead – Any sand stockpiled on the beach may present an obstacle to nesting loggerheads causing them to return to the ocean instead of nesting or expend additional energy to find a suitable nesting site, resulting in a reduction in nesting success. Hatchlings may encounter the stockpile on the beach at night during hatching if they travel outside of the 1,000 ft buffer or a nest is laid after the stockpile has been established and, therefore, is within the 1,000 ft buffer. This will cause hatchlings to spend more time reaching the ocean, leaving them vulnerable to predators, which increases the likelihood of harm or death.

The effects of the actions remaining unchanged from the Service's 2016 Opinion are detailed below.

Table 8. Expected direct and indirect effects of the proposed actions.

Action	Direct and Indirect Effects					
	Noise	Vibration	Rocket Exhaust	Use Related Disturbance	Lighting	Habitat Loss/Suitability
Liquid Fueled ELV Launches	X	X	X		X	
Solid Fueled ELV Launches	X	X	X		X	
ELV Static Fires	X	X	X		X	
Sounding Rocket Launches	X	X	X		X	
Sounding Rocket Static Fires	X	X	X		X	
Disposal of Defective or Waste Rocket Motors	X		X			
Drone Target Launches	X	X	X		X	
UAS Flights	X	X			X	
Piloted Aircraft Flights	X	X			X	
Restricted Airspace Expansion	X					
Range Surveillance/Facility Security	X			X		
Construction	X				X	
Routine Facility Maintenance	X					
Launch Pad Lighting					X	
Recreational/ ORV Beach Use				X		
Protected Species Management				X		
Miscellaneous Activities on Wallops Island Beach				X		
Education Use of Wallops Island Beach				X		
Seawall Repair				X		
Shoreline Reconstruction Monitoring				X		
Beach Renourishment (from offshore shoal)				X		X

Noise

Effects on plover, knot, and loggerhead from liquid fueled ELV launches, solid fueled ELV launches, ELV static fires, sounding rocket launches, sounding rocket static fire testing, disposal of waste rocket motors, drone target launches

Support activities prior to a rocket launch include transportation of rocket parts between storage facilities and the launch complex and other associated activities. Support activities often result in an increase in noise and general activity due to additional presence of people in the vicinity of the rocket launch areas. Increased noise from support activities may disturb loggerheads attempting to nest and nesting plovers on the sound end of Wallops Island.

Ignition of rocket engines for orbital launches or static tests will produce instantaneous noise audible for a considerable distance from Launch Complex 0. In close proximity to the launch sites, the noise generated will be high intensity across a broad range of frequencies. Sound intensity may exceed 160 decibel (dB) on the beach and dune in close proximity to launch sites. The WFF Range Safety Office, using the NASA rocket size/noise equation (NASA 2009), estimated noise levels expected to occur during launches of envelope vehicles from each launch pad in the complex. An LMLV-3(8) rocket launched from pad 0-B will produce a noise level of 129 dB at 0.68 mi, attenuating to 108 dB up to 7.8 mi from pad 0-B. As many as 12 such launches could be performed per year at pad 0-B. Noise levels from static tests performed at pad 0-A will reach 124 dB within a 1 mi radius, attenuating to 108 dB at a distance of 6 mi from pad 0-A. As many as 6 launches and 2 static tests could be performed per year at pad 0-A. These noise levels are expected to be sustained for 30 to 60 seconds during a launch and for up to 52 seconds during a static test. Plover and loggerhead nests may occur within 328 ft of the launch sites, and when they occur between 328 ft and 1 mi of launches, they will be subjected to high intensity sound. The majority of knot activity on Wallops Island occurs on the north end of the island, more than 1.8 mi north of Pad 0-A (NASA 2012b, 2013, 2014a). Knot presence on the regularly nourished beach is unlikely due to the suppressed forage base. It is unlikely that knot will be subjected to high intensity sound on north Wallops Island.

Deafening of plovers, knots, and loggerheads is not expected at the decibel levels predicted at 0.7 to 0.9 mi from launches, but progressively closer to the rockets, the noise intensity may reach levels that could cause tissue damage. While not known in birds specifically, sound intensity of near 180 dB can result in nearly instantaneous tissue damage to the inner ear (McKinley Health Center 2007). Exposure to noises within these radii could deafen plovers or knots present during ignition if exposed to high intensity noise. Deafness will significantly impair the ability of a plover or knot to breed, shelter, and behave normally. In addition to deafening, low frequency and high intensity sound expected in very close proximity to the launch sites may be debilitating and cause disorientation or loss of balance, but these effects are not well established (Leventhall et al. 2003). Birds may be able to recover from sound-induced deafening over time (Adler et al. 1995), but some period of deafness may result from loud noises. Birds may recover from disorientation and other sound-induced effects, but the amount of time required is not known for plover or knot. Debilitated birds will be subject to increased vulnerability to predators and physiological stress, resulting from inability to detect and avoid predators, feed, care for eggs/young, and seek shelter.

Burger (1981) demonstrated startle effects in birds exposed to anthropogenic sound pressure of 108 dB. Within 6 mi of pad 0-A, such noise levels will occur as a result of rocket launches or static tests as many as 20 times per year. Several other sources of loud noises exist in the Action Area. Anthropogenic sources include: sounding rocket and drone target launches from Wallops Island, waste engine disposal at the open burn area on Wallops Island, and aircraft landing and taking off from Wallops Main Base and the UAS runway on Wallops Island. Collectively, several thousand such events take place within WFF annually (NASA 2005, 2015a). Some of these activities produce noise levels similar to the noise expected to be produced by the large rocket launches. While many of these sounds are of similar intensity, the frequency of the sounds varies, with noise generated from rocket launches generally in the low frequency range and aircraft noise generally in higher frequency ranges.

Plovers and knots not debilitated by high intensity noise are expected to be disturbed by launches and exhibit a startle response that interferes with normal behaviors, including breeding, feeding, and sheltering. It is not likely that plovers and knots will startle or flush from all of the relatively intense sound disturbances. Individual birds may become habituated to the noises. Some of the noises are likely below the disturbance threshold, will be attenuated by atmospheric conditions, or may occur during periods of elevated natural noise intensity (e.g., strong winds, large waves) so that the noises will be less intense relative to background noise levels.

In response to high intensity noises, plovers are not expected to permanently abandon nests, but may flush from nests. More significant effects result from exposure to predators as a result of flushing. This species relies largely on its cryptic coloration and concealment for protection from predators, and flushing from nests will alert predators to the location of the nest and leave eggs or chicks exposed. Startle responses to noises and associated visual stimuli are expected to result in an incremental reduction in nest success and/or chick survival. Knots are not expected to permanently abandon migratory stopover locations, but may flush from Wallops Island roosting or foraging locations, resulting in an expenditure of energy.

Atmospheric noise has been demonstrated to prevent loggerheads from entering an area (Manci et al. 1988). In the beach areas adjacent to rocket launch pads, the high intensity noise that occurs during rocket launches is expected to prevent loggerheads from coming ashore to nest. The intensity of noise close to launch pads is not expected to be sufficient to impair development of loggerhead eggs. Sand above the eggs is expected to attenuate the sound, but the degree of attenuation is not known. Noise is not expected to have an effect on loggerheads that come ashore to nest in habitat not located in the vicinity of the launch pads.

Effects on plover and knot from UAS flights, piloted aircraft operation, expansion of restricted airspace, range surveillance, and facility security

Jones et al. (2006) reported that wading birds were not disturbed by UAS overflights in excess of 328 ft above the birds. Similarly, Sarda-Parlomera et al. (2012) did not observe notable responses when they repeatedly overflew black-headed gull (*Chroicocephalus ridibundus*) colonies with small UAS at altitudes between 65 and 131 ft AGL. Most UAS flights originating from the north Wallops Island airstrip are expected to maintain at least 500 ft AGL except during landing and take-off (NASA 2012a). Therefore, UAS flights conducted from north Wallops Island airstrip have a minimal potential for disturbing plovers or knots to the level at which "take" would be expected.

Peak noise levels generated by aircraft at WFF range from 67 dB for a single-engine propeller airplane landing on Wallops Main Base to 155 dB for an F-18 conducting a touch and go maneuver at Wallops Main Base. Studies of the effects of helicopter overflight on waterbirds have shown (1) temporary behavioral response to low-altitude overflight, ranging from assuming an alert posture to taking flight; (2) responses decreasing in magnitude as overflight elevation increases; and (3) rapid resumption of the behaviors exhibited prior to the overflight (Komenda-Zehnder et al. 2003). Early research in Florida detected limited adverse effects when a helicopter overflew nesting waders (Kushland 1979). The majority of birds overflown did not exhibit any response to the stimulus and those that left their nests returned in less than 5 minutes. Smit and Visser (1993) found shorebirds and curlew to be particularly sensitive to helicopter overflights at less than 820 ft AGL, resulting in flushing of 33 – 75% of birds overflown, depending on the species. Flushing a bird from its nests can result in a range of adverse effects, from predation or abandonment of the chicks to energy expenditure of the parents.

Plovers may be disturbed by the operation of aircraft maneuvering or overflying the area where nesting occurs. Not all aircraft operation is likely to result in disturbance, and plovers are most likely to be disturbed by flights at low altitude down the beach or just offshore. Effects to plovers may include flushing from nests when incubating eggs, interruption of feeding or courtship, or similar responses. Effects to knots may include interruption of feeding or sheltering behaviors. Most noises are of short duration and plovers and knots are expected to return to normal behavior within a few minutes of the noise.

Effects on waterbirds can be reduced substantially if helicopters maintain minimum altitudes of at least 1,476 ft (Komenda-Zehnder et al. 2003). Birds may become habituated to aircraft overflight in an area of somewhat regular disturbance, such as the marshes between Wallops Main Base and Island or along the Wallops Island beach. Birds in more remote areas subject to surveillance flights, such as the barrier islands south of Wallops Island, could be more sensitive to overflights. NASA determined in their Biological Assessment that maintaining an altitude in excess of 1,476 ft will be possible for aircraft transiting from the Main Base airfield to an offshore surveillance area; however, aircraft conducting surveillance operations between Wallops Mainland and Island will be required to fly below 1,476 ft, which is expected to startle plovers and knots. Most noises are of short duration and plovers and knots are expected to return to normal behavior within a few minutes of the noise.

There is potential for a bird strike to occur (Washburn et al. 2014). Fifty-one percent of all bird strikes occur between September and February, during the months when plovers and knots are not expected to be present (Washburn et al. 2014). In addition, airfield activities conducted at Wallops Main Base are not expected to strike plovers or knots, as there is no suitable habitat present adjacent to the airfield. The new UAS airstrip is located in closer proximity to suitable habitat for plovers, although it will be located inland and away from nesting, foraging and roosting areas. The potential for plovers or knots to strike an aircraft is discountable.

The expansion of restricted airspace is likely to result in similar effects to those expected as a result of UAS and piloted aircraft operation, simply in an expanded area. There is no expected change to either the types of aircraft or the types and number of operations conducted within the airspace adjacent to WFF. As a result, the scale of overall impacts will not change, rather, they will be spread over a larger geographic area. Knots or plovers may be impacted by flights at low altitude or just offshore by disturbance to migrating behavior as described above.

Effects on plover, knot, and loggerhead from construction and routine facility maintenance

Construction will increase noise as a result of the presence of additional people and associated activities. Effects will be confined to the vicinity of the new fire station location adjacent to Navy Building V-024 and are not expected to result in more than minor behavioral responses from all 3 species.

Road resurfacing and infrastructure replacement will use heavy equipment and may elicit a startle response causing plovers and red knots to cease normal behaviors temporarily until noise has stopped in response to increased noise. Effects to loggerheads are unlikely as infrastructure projects are not located in proximity to areas used for nesting attempts.

Routine repairs are often required after hurricanes or intense storms. Heavy equipment is used to clear roads and stormwater systems. Activities conducted away from the beach are less likely to affect listed species. Maintenance activities on the beach are likely to create a startle response and may cause plovers or knots to temporarily cease foraging or resting and plovers may temporarily cease nesting. These activities are not expected to be intense or sustained enough to adversely affect plovers or knots.

Effects of noise from construction and routine maintenance to plovers may include flushing from nests when incubating eggs, interruption of feeding or courtship, or similar responses. Effects to knots may include interruption of feeding or sheltering behaviors. Most noises are of low intensity but long duration and plovers and knots are expected to habituate to the noise and return to normal behavior over time.

Vibration

Effects on plover, knot, and loggerhead from liquid fueled ELV launches, solid fueled ELV launches, ELV static fires, sounding rocket launches, sounding rocket static fire testing, drone target launches, UAS flights, piloted aircraft flights

Some energy from rocket launches, static tests, drone target launches, UAS flights, and piloted aircraft flight on Wallops Island will manifest as vibration in the ground near the launch pad or airstrip. Vibration may be significant from rocket launches, engine tests, and open burns. Effects from vibrations are likely to be confined to an additive disturbance to adult plovers, adult knots, and nesting loggerheads that may cause birds and turtles to temporarily cease normal behaviors. Due to the distance between rocket launch sites and nesting habitat for plovers and loggerheads, it is unlikely that vibrations will be significant enough to affect egg viability. Vibration at other NASA launch facilities has not been demonstrated to harm bird or sea turtle eggs (NASA 2009). Impacts from noise during launches can extend over 6 mi (NASA 2019), so vibration will likely radiate from the launch pads in a similar fashion and dissipate with increasing distance from the launch site. To aid with controlling vibrations from launch at liquid-fueled LV launch pad a deluge system is used. Given that loggerhead nesting has been documented less than 1 mi from the launch pads and plovers are known to nest and feed within 6 mi of the launch site, vibrations may affect egg viability for plovers and loggerheads nesting within the new beach. Knot activity in the vicinity of Launch Complex 0 is low; therefore effects to knots from vibration are unlikely.

Rocket Exhaust

Effects on plover, knot, and loggerhead from liquid fueled ELV launches, solid fueled ELV launches, ELV static fires, sounding rocket launches, sounding rocket static fire testing, disposal of waste rocket motors, drone target launches

Rocket exhaust from Pad 0-B is directed over the Atlantic Ocean by a vent located in the base of the gantry. Exhaust from launches and static tests at Pad 0-A is directed over the Atlantic Ocean through a flame trench in the launch pad. Wildlife within 656 to 984 ft of the exhaust ports during engine ignition may be harmed or killed. Plovers, knots, or loggerheads exposed directly to the exhaust could be killed by hot gas or by caustic combustion products. To be exposed, birds would need to be flying through the path of the exhaust plume at the time of ignition. Rockets leave the pad within seconds and the contrail stays with the launch vehicle. The solid-fueled LV launch pad has a flame trench that directs the flame over the ocean. The liquid-fueled LV launch pad has a deluge system that that suppresses flames and vibrations on the pad. Given the distribution of knot and plover habitat north and south of the launch complex and the likelihood that individual plovers will move around while establishing breeding territories or feeding and a plover or knot will likely pass through the area during migration, plovers and knots may be harmed due to rocket exhaust, but the likelihood of this occurring is low. In 2013, a loggerhead nest was located just north of Pad 0-A suggesting that loggerheads may nest in proximity to the launch pads in the future and hatchlings or adults may be harmed by hot exhaust.

The combustion of solid fuel rocket boosters creates aluminum oxide. Aluminum oxide particles in the atmosphere are efficient scavengers of water vapor and hydrogen chloride, and these particles produce hydrochloric acid. The combination of atmospheric and oceanic dilution, the buffering capacity of the ocean, and the presence of salt-laden soils in the adjacent areas will prevent hydrochloric acid from impacting pH of habitats within the Action Area. Hydrogen chloride vapor may exist in hazardous quantities in the immediate vicinity of launch pad 0-B at the completion of a launch. "The rapid dissolution of hydrogen chloride in the ambient air would result in a decline of this concentration within 60 minutes to a nonhazardous level (ATCA 2012)" (NASA 2019). A plover or knot flying through the area could be exposed to a caustic cloud of such vapor; however the disturbance of the launch event itself will likely repel birds from the immediate area for some time after engine ignition. Therefore, hydrochloric acid is not expected to adversely affect plovers, knots, or loggerheads (NASA 2005, 2009).

Estimates of carbon monoxide concentrations on the beach at the south end of Wallops Island following a launch or static test at either pad in Launch Complex 0 are between 0.9 and 1.1 parts per million, depending on weather conditions. These are below human exposure thresholds and believed to be below observable effects thresholds in wildlife. Atmospheric mixing and conversion of carbon monoxide to carbon dioxide will quickly diminish these concentrations; therefore, the concentration of carbon monoxide is not expected to adversely affect plovers, knots, or loggerheads (NASA 2005, 2009).

Lighting

Effects from liquid fueled ELV launches, solid fueled ELV launches, ELV static fires, sounding rocket launches, sounding rocket static fire testing, drone target launches, UAS flights, piloted aircraft flights, construction, launch pad lighting

Plover and knot – Rockets staged at Launch Complex 0 are up lit with metal halide lighting for up to several weeks prior to and up to 24 hours following a launch. Other structures within the launch complex, as well as Payload Fueling Facility, Payload Processing Facility, and Horizontal Integration Facility, use amber light emitting diodes or low pressure sodium bulbs for exterior night lighting. Additional lighting may also be used during construction of new facilities. Most of the existing and new facilities are not located immediately adjacent to the beach, which limits the potential effects on listed bird species; however, they do contribute to elevated levels of ambient lighting with the proximity of several facilities to the beach habitat.

Anthropogenic lighting attracts migrating birds, especially during times of reduced visibility. Effects can range in intensity from collision with structures resulting in injury or mortality, to lesser effects including expenditure of energy or delay in arrival at breeding or wintering grounds (Gauthreaux and Belser 2006). The majority of Atlantic Coast piping plover migratory movements are thought to take place along a narrow flight corridor, including the outer beaches of the coastline, with rare offshore and inland observations (Service 1996). Plover visual acuity and maneuverability are known to be good (Burger et al. 2011), including night vision (Staine and Burger 1994), suggesting that plovers may be able to identify and avoid structures in their flight paths. Plover collisions with fixed structures in the coastal zone are rarely documented (Service 2008); however, inclement weather could increase attraction to structures and collision risk (Richardson 2000).

Migrating knots may be exposed to similar risks. Burger et al. (2011) report knot migration flights occurring at altitudes between 0.6 and 1.8 mi AGL, well above the structures on Wallops Island. The most serious risk is likely to occur when northbound long-distance migrants make landfall at foraging areas. Wallops Island is a known stopover site for northerly migrating knots; however, the high-use areas are located well north of the Wallops Island infrastructure that may pose a risk to birds landing to rest or forage, resulting in a low likelihood of collision. Southbound migrants are at comparatively less risk due to their farther offshore flight paths. Although visual acuity and maneuverability of knots are known to be good (Burger et al. 2011, Cohen et al. 2011), inclement weather conditions could increase collision risk due to attraction to lighted structures (Richardson 2000).

Loggerhead – Anthropogenic light sources have documented negative effects on sea turtles. Unshielded lights can deter females from crawling onto a beach to nest. Bright full-spectrum or white lighting within view from the beach can cause female sea turtles to abandon nest attempts (Witherington 1992). At hatching, juveniles emerge and seek the nearest available light source, which on an undeveloped beach is the horizon over the ocean. Bright full-spectrum or white lighting shining in the vicinity of a nest can disorient emerging hatchlings, leading them away from the ocean and leaving them more vulnerable to predation, desiccation, or crushing by vehicles (Witherington and Bjorndal 1991). Hatchlings that reach the surf can become disoriented by lighting and leave the surf (Witherington 1991, NMFS and Service 2007).

This type of lighting is present at both the launch pads and airstrips, however, only the launch pads are in close proximity to nesting habitat. Therefore, any adults or hatchlings in this area during the approximately 4 weeks/launch that night-time lighting is being implemented would be affected by lighting.

UAS flights are occasionally conducted at night in response to special circumstances or for hurricane monitoring. Safety lighting at the airstrip will be minimal intensity and downward shielded, and over flying UAS will not use running lights. Therefore, UAS flights are not likely to adversely affect loggerheads.

Disturbance

Effects on plover, knot, and loggerhead from facility security, recreational/ORV beach use, and miscellaneous activities on and education use of Wallops Island beach

WFF personnel and their families are allowed to use the north end of Wallops Island for recreation outside of NASA operations periods. Recreational use, miscellaneous maintenance activities and security patrols conducted on the beach have similar effects on listed species because they may involve operation of vehicles or heavy equipment on the beach, in addition to people on foot in areas where plovers, knots, or loggerheads may occur. Security patrols have been ongoing at WFF for a number of years, and have likely presented some level of disturbance to plovers and nesting loggerheads.

Plover – Effects of foot traffic to nesting plovers can range from relatively minor disturbance that temporarily interferes with normal breeding, feeding, and sheltering behavior causing harm or death of chicks, or sustained disturbance resulting in nest abandonment. Vehicle use on the beach can crush chicks and create ruts capable of trapping plover chicks where they can die or be eaten by a predator.

Closure of a plover nesting area will avoid these effects to the extent that the closure is observed; however, plovers may nest outside of the established closure area. In these cases, monitoring, placing nest exclosures, and posting signage will minimize effects to the identified nests. After hatching, young plovers are likely to move away from nesting areas, making them vulnerable to these effects throughout a much larger area. Even with surveys and monitoring conducted at a high frequency, young plovers may be killed or harmed due to their coloration causing them to blend in with the sand and their tendency to freeze when frightened in order to rely on this camouflage. Plovers that migrate along the barrier islands between wintering grounds and breeding grounds may also be impacted by human activity and vehicle use interfering with their ability to forage. Vehicles and human activity may make prey difficult to access by blocking habitat or compacting the sand. Additionally, noise may also discourage the use of the habitat.

Loggerhead – Security patrols and recreational use may inadvertently disturb nesting females, crush eggs within the nest, or crush, entrap, or disturb hatchlings attempting to leave the nest. Vehicle use on the beaches may compact beach sand and/or disturb female turtles attempting to nest, however, monitoring for turtle activity followed by erecting exclosures to protect nests will avoid adverse impacts due to the low level of nesting activity exhibited at Wallops Island.

Plover and loggerhead – Effects to plovers and loggerheads are likely to include an increased predation rate due to human activity. Human activity may result in trash on the ground, which could both attract predators and increase the carrying capacity of the predators due to increased food availability. The increased numbers of predators may increase risk of disturbance, nest loss, and adult mortality of plovers and increase losses of loggerhead eggs and nests. Plovers may expend more energy in predator surveillance and avoidance and that energy expenditure could decrease overall fitness. However, use of these sites for recreation and security patrols is generally light and not continuous; therefore effects to plovers and loggerheads are expected to be minimal.

Knot – Both recreational and operational uses of Wallops Island beach have the potential to disturb foraging and resting knots. The presence of vehicles on the beach has been shown to result in fewer individuals as compared to an area without the disturbance, as affected shorebirds shift their preferred habitat (Pfister et al. 1992). A study in Massachusetts suggests that knots may be more susceptible to human disturbance (based on pedestrian induced flight-initiation distance) than other species commonly found on the beach during spring migration (Koch and Paton 2014). In Virginia, Watts and Truitt (2015) demonstrated that the majority of knots are only present on the barrier islands for an approximately 4 to 5 week period in late spring.

Therefore, although knots could be exposed to beach use-induced stressors in the Action Area, impacts will be for a short duration. In addition, the majority of north Wallops Island is closed to recreational use (NASA 2015b) during the plover nesting season (April 15 to August 31), corresponding to the location on Wallops Island where a majority of knots have been observed in recent years. Additionally, Schlacher et al. (2008) demonstrated *Donax* spp. mortality when exposed to vehicle traffic; however, vehicle use at Wallops Island is far less than the area studied and impacts are not expected to be significant. Therefore, the knot is not expected to be adversely affected by alterations to its foraging base from facility security, recreational/ ORV beach use or miscellaneous activities on or education use of Wallops Island beach.

Effects on plover, and knot from protected species management and shoreline reconstruction monitoring

Monitoring activities involve conducting frequent surveys, implementing area closures and posting signage, placing plover nest enclosures, and similar actions. The intent of monitoring activities is to reduce or avoid impacts to listed species by detecting them early. Movement by personnel through the habitat during monitoring efforts is not likely to adversely affect plovers and knots.

Effects on plover, knot, and loggerhead from seawall repair and post-renourishment work

The operation of heavy equipment and presence of personnel on the beach in conjunction with seawall repair will result in disturbance to plovers and knots using the area for foraging or passing through the area while moving among foraging areas. Any plovers or knots using these areas are expected to temporarily cease normal foraging, roosting, or flight behavior and fly to adjacent suitable areas where there is no disturbance, or alter their flight paths to avoid areas where activity is occurring. Similarly, during the nesting season loggerheads may be temporarily disturbed by onshore activities and move to other nearby areas where there is no disturbance. However, habitat quality for plovers and knots in degraded shoreline areas where seawall repair will be occurring is low, so these species are not expected and these effects are expected to be insignificant and discountable. Habitat quality for loggerheads is also expected to be low, but loggerheads may attempt to nest in these locations. See above for further discussion on effects of renourishment on loggerheads.

Operation of the dredge is limited to offshore areas and will not affect the shoreline beyond delivery of sand; therefore, it will not affect the species considered in this opinion under the Service's jurisdiction. Effects to loggerheads at sea are addressed separately through NASA's section 7 consultation with NMFS.

After each renourishment cycle, shortly after construction of the beach and dune, beachgrass planting (discussed above) and sand fence installation will be conducted on the seaward side of the dune adjacent to the new beach. Depending on timing of sand fence installation, the increased presence of people on the beach may result in disturbance to plovers and knots. This disturbance is expected to cause plovers and knots to flush and move to other areas. The installation of sand fencing is not expected to affect loggerheads because these activities will be conducted during the day and loggerheads are expected to be in close proximity to the beach during the night hours.

Once installed, the presence of sand fence may deter plover nesting close to the sand fence and may increase the risk of depredation by providing cover for predators in close proximity to plover nests. Migrating knots generally do not use the renourished beach for feeding and do not nest in Virginia; therefore, the presence of sand fence is not expected to affect knots. The sand fence is expected to allow movement of adult loggerheads above the berm and into the dune area and will not prevent them from returning to sea. If nests are located landward of the sand fence a small fraction of hatchling turtles may become trapped, particularly if the sand fence is not maintained or if debris entangled in the sand fence prevents hatchling movements.

Habitat Loss/Suitability

Effects from beach renourishment by offshore shoal

<u>Plover</u> – The addition of sand dredged from offshore shoal A or B may result in a beach similar in appearance to a natural beach, but significantly different in sand density and compaction, grain size and assortment, and beach-associated fauna, including invertebrates, and nutrients and chemical characteristics of the sand. Immediately following sand placement, the suitability of the renourished beach for plovers is expected to be significantly less than a natural beach of similar size and configuration due to loss of invertebrate prey.

Over time, the faunal characteristics of a natural beach are expected to return as the created beach is recolonized by beach-associated fauna and plants, and as wave action, wind, rain, and other natural forces weather the beach (National Research Council 1995). After recolonization of the beach by invertebrates, the beach may become higher quality foraging habitat for plovers than surrounding natural beaches because the beach will remain free from vegetation for a period of time (Melvin et al. 1991) and may be higher and wider than nearby eroding beaches.
NASA monitoring data (NASA 2012b, 2013, 2014a, 2015b, 2016, 2017, 2018) shows that the number of plover nests is fairly consistent from year-to-year, suggesting that beach renourishment from an offshore shoal does not cause a decrease in the number of plover breeding territories on Wallops Island but that plovers may preferentially nest on north Wallops Island. Monitoring data shows that plovers nested on the renourished beach after 2 years (NASA 2014a, 2015b). Beach renourishment using sand excavated from an offshore shoal is expected to occur approximately once every 2 – 7 years. Due to nesting habitat on north Wallops Island no

longer being available due to backpassing, renourishment in the template identified in Figure 3 will result in a reduction in nesting success and survival on Wallops Island.

Knot – The area of Wallops Island beach that historically hosted the greatest number of knots during the northern migration – the north "curve" – is rapidly accreting but overlaps the beach renourishment area (King et al. 2011). If sand is obtained from offshore shoal A or B and placed in the renourishment area outlined in the reinitiated action, then impacts are expected to be the same as those addressed in Table 7.

Loggerhead – Based on the large grain size of the sand from shoals A and B, the relatively long distance from the water line to the berm/dune interface where turtles would be expected to nest, and the placement of sand over and around the rock seawall for most of the project area, desiccation of the beach is expected because the sand will likely drain quickly, the rock seawall will interfere with maintaining a natural moisture gradient, and the area may be infrequently affected by waves inundating any nests impacting nest success. The sand color is expected to be similar to that which occurs on the beaches of the area because the material that occurs in the offshore shoals is eventually transported to the beaches and likely originates from the same material as that which occurs on the beach.

The gender of sea turtles is determined by temperature during the middle third of the incubation period, with only a few degrees separating the production of male and female hatchlings (Conant et al. 2009). Therefore, even slight differences in sand color, grain size, and moisture that affect sand temperatures and alter the ratio of males to females produced. The sand is expected to show less cohesiveness and lower shear strength than sand found on natural beaches, which may reduce the ability of nestlings to dig themselves out of the nest (egg chamber).

Plover, knot, and loggerhead – Following placement of sand from an offshore shoal on the beach and dune, some portion of this material will be transported onto natural beaches adjacent to the project area. Natural wind and current patterns are likely to transport sand to the north and deposit it on north Wallops Island and portions of CNWR, and also to the south, where it will be deposited on Assawoman Island. The amount and degree of deposition on these islands is dependent on environmental conditions (e.g., storms, wave action), effects of breakwaters, and other factors that may affect littoral sand transport. Over time, the deposition of the relatively large sand grains will affect mean sand grain size and other physical characteristics of these beaches. While the grain size of the two most recent renourishment matched the grain size on Wallops Island, there is potential for this to differ for future renourishments. These changes may either improve or reduce the suitability of unnourished beaches for plover nesting and foraging, knot foraging, and loggerhead nesting. The impacts of mismatched grain sizes were shown on Assateague Island, when sediment with a higher proportion of coarse grained sediment was used. The coarse sediment prevented the mobilization of the finer sediments, degrading habitat suitability for plovers (Schupp et al. 2013). These changes may shift the areas that plovers and knots use for foraging, or that plovers and loggerheads use for nesting but total area used by these species is not likely to change.

The sand placed on the renourished beach from the offshore shoal will initially be unsuitable for use by invertebrates and plants characteristic of natural beaches and much of the fauna on the beach will be killed or negatively impacted by the renourishment. The beach conditions are expected to be completely unsuitable for use by nesting plovers and loggerheads during the first year following sand placement, with limited amounts of suitable habitat available 1 year following placement, and returning to conditions similar to those that existed prior to placement by 3 years following placement.

Additive Effects of Proposed Activities

In addition to the effects of the proposed actions considered and described above, the additive effects of the different types of activities result in greater impacts than each activity conducted independently. For example, operations of UAS within the parameters described may result in infrequent disturbance and some launch operations, rocket tests, and monitoring may have similar effects. The combination of all of these activities, when considered together, results in more frequent disturbance and as a result we expect plovers and loggerheads to experience low levels of disturbance in the Action Area on a regular basis.

Frequent disturbance to plovers, knots, and loggerheads resulting from mission preparation and support may disturb the species to the extent that they avoid use of the south end of Wallops Island where mission-related activities are concentrated. If they avoid use of the area, listed species may not be subjected to the most intense and severe effects expected to occur during rocket launches. In addition, because the suitability of the newly created beaches is expected to be relatively low for a period following sand placement, use by plovers and loggerheads may be reduced and as a result some of the most severe effects resulting from launches may be reduced. However, because some nesting loggerheads and migrant plovers and knots use the beach only for limited periods of time, frequent disturbance and/or low habitat suitability is not expected to completely prevent the most severe effects from occurring.

CUMULATIVE EFFECTS

Cumulative effects are those “effects of future State or private activities, not involving federal activities, that are reasonably certain to occur within the action area” considered in this Opinion (50 CFR 402.02). The Service is not aware of any future state, tribal, local, or private actions that are reasonably certain to occur within the Action Area at this time; therefore, no cumulative effects are anticipated.

JEOPARDY AND ADVERSE MODIFICATION ANALYSIS

Section 7(a)(2) of the ESA requires that federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

Jeopardy Analysis Framework

"Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). The following analysis relies on 4 components: (1) Status of the Species, (2) Environmental Baseline, (3) Effects of the Action, and (4) Cumulative Effects. The jeopardy analysis in this Opinion emphasizes the rangewide survival and recovery needs of the listed species and the role of the Action Area in providing for those needs. It is within this context that we evaluate the significance of the proposed federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Analysis for Jeopardy

<u>Plover</u>
Impacts to Individuals – The proposed action includes impacts to nesting, foraging, and roosting habitat from the proposed SERP and activities described in the 2016 Wallops Flight Facility Update and Consolidation of Existing Biological Opinions that have not have changed, evaluated over a 15 year timeframe. As discussed in the Effects of the Action, potential effects of the action include effects to plovers present within the Action Area during spring migration and nesting season with some of the actions affecting plovers for subsequent migration and nesting seasons following initial construction. Effects generally include loss of nesting and foraging habitat, disturbance, habitat degradation, increased human activity, reduction in prey populations, and physical impacts such as crushing individuals. We anticipate that all individuals attempting to nest or forage on Wallops Island will be impacted -- ranging from 3-9 nesting pairs per year from 2010-2018 and 1-2 additional birds that nest in areas south of Wallops Island and forage on the south end of Wallops Island in the area near camera stand Z-100. The loss of habitat may cause individuals to seek out habitat elsewhere, resulting in additional competition for territories, and/or use of suboptimal habitat, resulting in decreased productivity and survival. While backpassing and renourishment activities will not begin prior to fledging of the 2019 season's chicks, effects will impact individuals returning to the area during the 2020 migration and nesting season and subsequent seasons depending on recovery time of the habitat. The habitat may remain suboptimal until the benthic community has recovered and sediment dynamics stabilize available nesting habitat on the island, which could take up to 6 years based on current models (Corps 2018a, 2018b). In summary, we anticipate impacts to individual plovers in either their annual survival or reproductive rates.

Impacts to Populations – As we have concluded that individual plovers are likely to experience impacts in their annual survival or reproductive rates, we need to assess the aggregated consequences of the anticipated impacts on the population to which these individuals belong. The nesting plover population on Wallops Island made up an average of 2.3% of nesting pairs, as of 2016, within the Southern RU. Loss of carrying capacity of breeding habitat on Wallops Island and loss of potential for growth in the abundance of breeding pairs from Wallops Island needed to attain recovery in this RU will continue for the life of the project. During this time, nesting will continue, but at a reduced frequency and at a lower number of nests in some years. Because the Wallops Island nesting population will not be permanently lost and represents a relatively minor (2.3%) portion of the nesting pairs in the Southern RU, we conclude that the effects from the proposed action will not result in permanent population declines in this RU.

Impacts to Species – To understand the consequences of population-level effects at the species level, we need to understand the RND needs of the species. Because recovery units have been designated for the plover, we first will assess the consequences of these impacts at the recovery unit level. As discussed in the Status of the Species, there are 4 recovery units – each with an overall productivity target and their own breeding pair target to either achieve or maintain over a 5 year period: Atlantic Canada, 400 pairs; New England, 625 pairs; New York-New Jersey, 575 pairs; Southern (DE-MD-VA-NC), 400 pairs (Service 1996). While the Southern RU status is classified as improving (Service 2017), declining productivity was observed in the 2016 and 2017 nesting seasons with a small increase in 2018 (Service 2019a). This project is not anticipated to change the Southern RU status as the nesting population on Wallops Island accounted for approximately 2.3% of nesting pairs within the RU, as of 2016. Wallops Island will continue to contribute to the Southern RU at a reduced amount that is not expected to impact the rangewide status of the species.

CONCLUSION

We considered the current overall improving rangewide status of the plover and the stable condition of the species within the Action Area (environmental baseline). We then assessed the effects of the proposed action and the potential for cumulative effects in the Action Area on individuals, populations, and the species as a whole. As stated in the Jeopardy Analysis, we do not anticipate any reductions in the overall RND of the plover. It is the Service's Opinion that the actions addressed in the Wallops Flight Facility Update and Consolidation of Existing Biological Opinions, as proposed, are not likely to jeopardize the continued existence of the plover.

<u>Knot</u>
Impacts to Individuals – The proposed action includes impacts to foraging and roosting habitat from the proposed SERP and activities described in the 2016 Wallops Flight Facility Update and Consolidation of Existing Biological Opinions that have not have changed, evaluated over a 15 year timeframe. As discussed in the Effects of the Action, potential effects of the action include effects to knots present within the Action Area during spring migration with some of the actions affecting knots for subsequent seasons following initial construction. Effects generally include loss of foraging and roosting habitat, disturbance, habitat degradation, and loss of prey species. Flocks of knots ranging in size from 34-1,162 individuals have been documented on Wallops Island (NASA 2010b, 2011, 2012b, 2013, 2014a, 2015b, 2016, 2017, 2018). During some years of the 15-year Opinion timeframe, we anticipate that all individuals attempting to forage and

roost on Wallops Island will be impacted and attempt to seek habitat elsewhere. Searching for alternative suitable habitat leads to increased energy expenditure from additional search times and increases exposure to predators. Additionally, suboptimal habitat may have more predators, thus increasing predation risk. Use of suboptimal habitat may also result in lower weight when reaching the Arctic leading to reduced reproductive success. While construction will not begin until after the 2019 spring knot migration, the effects stated above will impact individuals returning to the area during the 2020 spring migration and subsequent migration seasons. Following construction, the habitat may remain suboptimal until the benthic community returns and sediment dynamics stabilize, which could take up to 6 years based on current models (Corps 2018a, 2018b). In summary, we anticipate impacts to individual knots in either their annual survival or reproductive rates.

Impacts to Populations – As we have concluded that individual knots are likely to experience impacts in their annual survival or reproductive rates, we need to assess the aggregated consequences of the anticipated impacts on the population to which these individuals belong. While a rangewide population estimate is not available (Service 2019b), the Eastern Shore of Virginia has been known to support a population of approximately 7,000 knots with variation in numbers of individuals (Cohen et al. 2009, Karpanty et al. 2018). The knot flocks documented at Wallops Island of 34-1,162 individuals indicate that a maximum of 16.6% of migratory knots along the Eastern Shore are utilizing Wallops Island. It is unlikely that all 16.6% of knots will be affected every year from harm and decreased reproduction on their Arctic breeding grounds because knots are not foraging and roosting exclusively on Wallops Island during their spring migration and habitat will be available on Wallops Island, although not during all years and at a reduced level of quality, in some years during the Opinion timeframe. While the proposed action affects a single active foraging area along Virginia's Eastern Shore and impacts will be felt over multiple years, we conclude that the effects will not result in permanent population declines.

Impacts to Species – As we have concluded that knot populations are unlikely to experience reductions in fitness, there will be no harmful effects (i.e., there will be no reduction in RND) on the species as a whole.

CONCLUSION

We considered the current overall stable rangewide status of the knot and the variable condition of the species within the Action Area (environmental baseline). We then assessed the effects of the proposed action and the potential for cumulative effects in the Action Area on individuals, populations, and the species as a whole. As stated in the Jeopardy Analysis, we do not anticipate any reductions in the overall RND of the knot. It is the Service's Opinion that the actions addressed in the Wallops Flight Facility Update and Consolidation of Existing Biological Opinions, as proposed, are not likely to jeopardize the continued existence of the knot.

<u>Loggerhead</u>

Impacts to Individuals – The proposed action includes impacts to nesting habitat from equipment staging, sand stockping, operation of equipment both day and night, sand mining, and renourishment from the proposed SERP and activities described in the 2016 Wallops Flight Facility Update and Consolidation of Existing Biological Opinions that have not have changed, evaluated over a 15-year timeframe. As discussed in the Effects of the Action, potential effects of the action include effects to loggerheads present within the Action Area during nesting season with some of the actions affecting loggerheads for subsequent nesting seasons following initial construction. Effects generally include loss of nesting habitat, disturbance, habitat degradation, and physical impacts such as crushing individuals. We anticipate that all individuals attempting to nest on Wallops Island will be impacted during some years of the 15-year Opinion timeframe. While construction will not begin prior to hatching of the 2019 seasons nests, the effects stated above will impact individuals returning to the area during the 2020 nesting season and subsequent seasons. Following construction, the habitat may remain suboptimal until sediment dynamics stabilize, which could take up to 6 years based on current models. In summary, we anticipate impacts to individual loggerheads in either their annual survival or reproductive rates.

Impacts to Populations – As we have concluded that individual loggerheads are likely to experience impacts in their annual survival or reproductive rates, we need to assess the aggregated consequences of the anticipated impacts on the population to which these individuals belong. From 1974-2017, 13 loggerhead nests and 22 false crawls were documented on Wallops Island. Nesting does not occur every year on Wallops Island and in 2010 all nests were laid by 1 female (NASA 2010b). Given that limited nesting occurs and that in some years nesting habitat will be available, we expect that the population level impacts from decreased reproduction, harm, and death will be relatively minor and will not occur every year. We conclude that the effects will not result in permanent population declines.

Impacts to Species – As we have concluded that loggerhead populations are unlikely to experience reductions in fitness, there will be no harmful effects (i.e., there will be no reduction in RND) on the species as a whole.

CONCLUSION

We considered the current overall declining rangewide status of the loggerhead and the stable condition of the species within the Action Area (environmental baseline). We then assessed the effects of the proposed action and the potential for cumulative effects in the Action Area on individuals, populations, and the species as a whole. As stated in the Jeopardy Analysis, we do not anticipate any reductions in the overall RND of the loggerhead. It is the Service’s Opinion that the actions addressed in the Wallops Flight Facility Update and Consolidation of Existing Biological Opinions, as proposed, are not likely to jeopardize the continued existence of the loggerhead.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined in section 3 of the ESA as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering (50 CFR § 17.3). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by NASA so that they become binding conditions of any grant or permit issued to any applicant, as appropriate, for the exemption in section 7(o)(2) to apply. NASA has a continuing duty to regulate the activity covered by this incidental take statement. If NASA (1) fails to assume and implement the terms and conditions or (2) fails to require NASA to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of Section 7(o)(2) may lapse. To monitor the impact of incidental take, NASA must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE ANTICIPATED

Numeric Estimate of Anticipated Incidental Take/Use of Surrogate for Monitoring Take

The Service has used available data to quantify and numerically express anticipated incidental take of plovers, knots, and loggerheads. This numerical estimate provides a clear limit on the incidental take anticipated and authorized in this Opinion. However, based on the difficulties associated with monitoring take in terms of affected individuals, the Service also provides an additional, alternative means of monitoring take of plovers, knots, and loggerheads. This approach is most protective of plovers, knots, and loggerheads in that reinitiation is triggered if the incidental take from the project exceeds the number of plovers, knots, or loggerheads specified below or exceeds, in any amount or manner, the surrogates specified below.

50 CFR 402.14(i)(1)(i) states that surrogates may be used to express the amount or extent of anticipated take provided the Opinion or incidental take statement: (1) describes the causal link between the surrogate and take of the listed species; (2) describes why it is not practical to express the amount of anticipated take or to monitor take-related impacts in terms of individuals of the listed species; and (3) sets a clear standard for determining when the amount or extent of the taking has been exceeded.

In situations where some data exists that may be used to calculate a numerical estimate of take for a species but there are challenges associated with measuring take in terms of individuals, the Service has used surrogates as an additional means of monitoring take. In those instances, project effects outside of a specifically defined amount of affected surrogate serves as a trigger indicating that the numerical take estimate may have been exceeded and reinitiation is required.

Plover – Numeric Estimate of Anticipated Incidental Take

The numerical estimates of incidental take below were calculated using plover productivity data from Wallops Island. From 2012-2018 average productivity, represented by the number of chicks fledged per pair each year, was 1.05 chicks fledged/pair. The number of nests each year ranged from 3 to 9 with an average of 5.4 nests/year.

Backpassing and Renourishment – Plovers have been documented using 3.1 linear mi of beach habitat on Wallops Island for nesting and foraging. Of these 3.1 linear mi of habitat, 1.8 linear mi will be removed via sand mining, which includes operation of heavy equipment (day and night) and presence of additional personnel, and will take up to 6 years to return to its current habitat quality and quantity. The remaining 1.3 linear mi of habitat will be renourished, rendering it unusable during renourishment due to operation of heavy equipment (day and night) and presence of additional personnel or suboptimal post-renourishment due to burial and loss of benthic organisms for approximately 1 year.

Since the 3.1 linear mi of habitat will be unusable or suboptimal for 1 year, we expect that all adults and chicks will be incidentally taken (5 nests/year x 2 adults/nest = 10 adults) + (5 pairs x 1.05 chicks fledged/pair = 5.25 = 5 chicks) + (2 foraging adults), for a total of 17 birds (12 adults and 5 chicks). Additionally, on average 71% of nests (71% of 5 nests = 3.55 = 4 nests) are laid each year in the 1.8 linear mi where sand is to be excavated. To account for the additional 5 years needed for this area to recover to current habitat quality and quantity, take of 50% of all adults and chicks is anticipated in the first 2 years after backpassing as birds return to the area and no nesting or foraging habitat is available (4 nests x 2 adults/nest = 8 adults) + (4 pairs x 1.05 chicks fledged/pair = 4.20 = 4 chicks) and (8 adults + 4 chicks x 50% = 6 birds x 2 years = 12 birds). No take is anticipated in the last 3 years due to gradual return of habitat.

As backpassing and renourishment, which includes operation of heavy equipment (day and night) and presence of additional personnel, are expected to occur again in 10 years, 20 adults (12 adults in year 1 + 4 adults in year 2 + 4 adults in year 3) and 9 chicks (5 chicks in year 1 + 2 chicks in year 2 + 2 chicks in year 3) are expected to be taken when this action occurs again. Over the 15-year Opinion timeframe, the Service expects a total of 58 plovers (40 adults and 18 chicks) to be incidentally taken due to backpassing and renourishment.

Renourishment using an offshore shoal will take place every 2-7 years between backpassing events. We are assuming that renourishment will occur in 2-year intervals during the 15-year Opinion timeframe. Twenty-nine percent of nests are laid each year in the 1.2 linear mi section of the north end of the renourishment area. We expect that all adults and chicks in this area will be incidentally taken with each renourishment event (29% of 5 nests = 1.45 = 1 nests) (1 nests x 2 adults/nest = 2 adults) (1 pair x 1.05 chicks fledged/pair = 1.05 = 1 chick) + (2 foraging adults).

Using a 2-year interval, we are assuming 6 renourishment events during the 15-year Opinion timeframe (6 renourishment events x 4 adults per event = 24 adults) (6 renourishment events x 1 chick per event = 6 chicks). Over the 15-year Opinion timeframe, the Service expects a total of 30 plovers (24 adults and 6 chicks) to be incidentally taken due to renourishment using an offshore shoal. The anticipated take is described in Table 9.

Recreational Beach Use – Recreational beach use, including foot traffic and vehicle use, occurs each year. Incidental take of 1 pair (2 adults) and 1 nest (1 pair x 1.05 chicks fledged/pair = 1.05 = 1 chick) is anticipated each year. Over the 15-year Opinion timeframe, the Service expects 30 adults and 15 chicks to be incidentally taken due to recreational beach use. The anticipated take is described in Table 9.

Rocket Launches and Flights – From 2012-2018, nesting plovers on Wallops Island laid an average of 3.58 eggs/pair. Incidental take of 1 pair (2 adults) and 1 nest (1 pair x 1.05 chicks fledged/pair = 1.05 = 1 chick or 1 pair x 3.58 eggs/pair = 3.58 = 4 eggs) is anticipated each year from the effects of launch-related activities immediately adjacent to the beach, resulting from intense sound, exposure to rocket exhaust and contaminants, collision with aircraft, and similar launch activities. Over the 15-year Opinion timeframe, the Service expects 30 adults and 15 chicks or 60 eggs to be incidentally taken due to rocket launches and flights. The anticipated take is described in Table 9.

Plover – Surrogate for Monitoring Take

It is not practical to monitor take-related impacts in terms of individual plovers for the following reasons: the species has a small body size making it difficult to locate, which makes encountering dead or harmed individuals unlikely; species losses may be masked by annual fluctuations in numbers; take may occur offsite; failure to reproduce or a decrease in nesting productivity may not be detected if an individual moves to a neighboring island; some forms of take are non-lethal harm that is not detectable. Detecting mortality or harm of plovers (especially chicks), particularly on beaches where vehicles are being operated, is extremely difficult. Cryptic coloration is the species' primary defense mechanism, evolved to cope with natural predators, and nests, adults, and chicks blend with beach surroundings. Newly hatched chicks stand 2.5 inches high, weigh less than a quarter ounce, blend with the beach substrate, and often respond to approaching vehicles, pedestrians, and perceived predators by "freezing" in place to take advantage of their natural camouflage. Dead chicks may be covered by wind-blown sand, ground into the sand by other passing vehicles, washed away by high tides, or consumed by scavengers.

Backpassing and Renourishment – Linear miles of beach habitat where plovers nest and forage is being used as a surrogate to express the extent of authorized take for the plover related to backpassing and renourishment activities, which includes operation of heavy equipment (day and night) and presence of additional personnel, because it is not practical to monitor take-related impacts in terms of individuals. Beach habitat alteration that occurs through excavation and placement of 1.3 MCY of sand, and the associated equipment and personnel needed to complete this activity, will directly and indirectly cause the anticipated incidental take of plovers within the bounds of the identified 3.1 linear mi of beach habitat.

The 3.1 linear mi of beach habitat includes the 1.2 mi section of the renourishment area and the 1.8 mi sand excavation area from building V-10 to the northern extent of the sand excavation area and a 0.1 linear mi section of the renourishment area in front of camera stand Z-100, all areas are bordered on the east and west by MLW and the secondary dune, respectively (Figure 9). The 3.1 linear mi of beach habitat sets a clear, enforceable standard, and beach habitat alteration related to backpassing and renourishment activities outside of that specific area exceeds take. The anticipated take is described in Table 9.

<u>Recreational Beach Use</u> – Linear miles of beach habitat where plovers nest and forage is being used as a surrogate to express the extent of authorized take for the plover related to recreational use activities, particularly operation of ORVs, because it is not practical to monitor take-related impacts in terms of individuals. Beach habitat alteration that occurs through foot traffic and vehicle use recreational beach use will directly and indirectly cause the anticipated incidental take of plovers within the bounds of the identified 1 linear mi of beach habitat.

The 1 linear mi of beach habitat is bounded to the south by the northern extent of the sea wall and extends 1 mi north to the plover closure area bordered on the east and west by MLW and the secondary dune, respectively (Figure 10). The 1 linear mi of beach habitat sets a clear, enforceable standard, and beach habitat alteration related to recreational use activities outside of that specific area exceeds take. The anticipated take is described in Table 9.

<u>Rocket Launches and Flights</u> – The number of launches and flights per year is being used as a surrogate to express the extent of authorized take for the plover related to ongoing operations, including rocket launches, UAVs, piloted aircraft, and launch-related activities immediately adjacent to the beach, because it is not practical to monitor take-related impacts in terms of individuals. The noise, vibration, and exhaust that occurs as a result of the launches or flights will directly and indirectly cause the anticipated incidental take of plovers because the effects, although short-term, can be severe enough to kill individuals.

The 121 launches per year includes liquid fueled ELVs, solid fueled ELVs, sounding rockets, sounding rocket static fires, and drone target launches and incorporates a 10% buffer. The 71,500 flights per year includes UAS and piloted aircraft flights with a 10% buffer. Launches take place at Pads 0-A, 0-B, 1, 2, and the south UAS airstrip flat pad. Flights take place at Wallops Main Base, South Wallops Island, North Wallops Island, and adjacent air space. The locations for each specific action and frequency of each launch are detailed in Table 1. The 121 launches per year and 71,500 flights per year (as detailed in Table 1) set a clear, enforceable standard, and additional launches or flights exceeds take. The anticipated take is described in Table 9.

Knot – Numeric Estimate of Anticipated Incidental Take

Backpassing – Incidental take was calculated using average knot flock size estimates from 2012-2018 on Wallops Island. From 2012-2018 average flock size was 180 adults. Knots have been documented using 1.5 linear mi on Wallops Island for foraging. All of this habitat will be completely removed by sand excavation, which includes operation of heavy equipment (day and night) and presence of additional personnel, and will not return to its current habitat quality and quantity for 6 years, rendering the habitat unavailable or suboptimal. The Service expects all knots in an average flock will be incidentally taken for 1 year following sand excavation (180 adults x 1 year = 180 adults), the following 2 years 50% of an average flock will be incidentally taken due to suboptimal habitat conditions ([180 adults/2] x 2 years = 180 adults). No take is anticipated in the last 3 years due to gradual return of habitat. As backpassing, which includes operation of heavy equipment (day and night) and presence of additional personnel, is anticipated to occur again in 10 years the Service expects a total of 720 knots ([180 adults + 180 adults] x 2 = 720) to be incidentally taken during the 15-year Opinion timeframe. The anticipated take is described in Table 9.

Rocket Launches and Flights – Incidental take of 2 adult knots per year is anticipated from the effects of launch-related activities immediately adjacent to the beach, resulting from intense sound, exposure to rocket exhaust and contaminants, collision with aircraft, and similar launch activities. Over the 15-year Opinion timeframe, the Service expects 30 adult knots to be incidentally taken due to rocket launches and flights. The anticipated take is described in Table 9.

Knot – Surrogate for Monitoring Take

It is not practical to monitor take-related impacts in terms of individual knots for the following reasons: the species has a small body size making it difficult to locate, which makes encountering dead or harmed individuals unlikely; species losses may be masked by annual fluctuations in numbers; take may occur offsite; failure to reproduce or a decrease in nesting productivity may not be detected; the form of take is a non-lethal harm that is not detectable; finding a dead or impaired individual or quantifying a decrease in nesting productivity in the Arctic breeding area attributable to the action is unlikely; since individuals may move to other locations in an attempt to forage, quantifying exactly how many individuals have been impacted is not realistic.

Backpassing – Linear miles of beach habitat where knots forage is being used as a surrogate to express the extent of authorized take for the knot related to backpassing activities, which includes operation of heavy equipment (day and night) and presence of additional personnel, because it is not practical to monitor take-related impacts in terms of individuals. Beach habitat alteration that occurs through excavation of 1.3 MCY of sand, and the associated equipment and personnel needed to complete this activity, will directly and indirectly cause the anticipated incidental take of knots within the bounds of the identified 1.5 linear mi of beach habitat.

The 1.5 linear mi of beach habitat includes the portion of Wallops Island that will be excavated from building V-100 to the northern extent of the sand excavation area bordered on the east and west by MLW and the secondary dune (Figure 9). The 1.5 linear mi of beach habitat sets a clear, enforceable standard, and beach habitat alteration related to backpassing activities outside of that specific area exceeds take. The anticipated take is described in Table 9.

Rocket Launches and Flights – The number of launches and flights per year is being used as a surrogate to express the extent of authorized take for the knot related to ongoing operations, including rocket launches, UAVs, piloted aircraft, and launch-related activities immediately adjacent to the beach, because it is not practical to monitor take-related impacts in terms of individuals. The noise, vibration, and exhaust that occurs as a result of the launches or flights will directly and indirectly cause the anticipated incidental take of knots because the effects, although short-term, can be severe enough to kill individuals.

The 121 launches per year includes liquid fueled ELVs, solid fueled ELVs, sounding rockets, sounding rocket static fires, and drone target launches and incorporates a 10% buffer. The 71,500 flights per year includes UAS and piloted aircraft flights with a 10% buffer. Launches take place at Pads 0-A, 0-B, 1, 2, and the south UAS airstrip flat pad. Flights take place at Wallops Main Base, South Wallops Island, North Wallops Island, and adjacent air space. The locations for each specific action and frequency of each launch are detailed in Table 1. The 121 launches per year and 71,500 flights per year (as detailed in Table 1) set a clear, enforceable standard, and additional launches or flights exceeds take. The anticipated take is described in Table 9.

Loggerhead – Numeric Estimate of Anticipated Incidental Take

Backpassing and Renourishment – Incidental take was calculated using loggerhead nesting activity within the Action Area from 1974-2017 (Table 5). The interval of 5 years was selected based on the infrequent nesting exhibited on Wallops Island (Table 6). Incidental take of 1 adult loggerhead and 1 nest (128 hatchling turtles or eggs) is anticipated every 5 years from the effects of backpassing and renourishment activities, resulting from habitat removal and alteration, equipment staging, sand stockpiling, and operation of heavy equipment (day and night). Over the 15-year Opinion timeframe, the Service expects 3 adults and 384 hatchlings or eggs to be incidentally taken due to backpassing and renourishment activities. The anticipated take is described in Table 9.

Rocket Launches – Incidental take of 1 adult loggerhead and 1 nest (128 hatchling turtles or eggs) is anticipated every 5 years from the effects of launches and launch-related activities immediately adjacent to the beach, resulting from lighting, vibration, intense sound, and exposure to rocket exhaust and contaminants. Over the 15-year Opinion timeframe, the Service expects 3 adults and 384 hatchlings or eggs to be incidentally taken due to rocket launches. The anticipated take is described in Table 9.

Loggerhead – Surrogate for Monitoring Take

It is not practical to monitor take-related impacts in terms of individual loggerheads for the following reasons: harmed females may return to the water which makes encountering dead or harmed individuals unlikely; species losses may be masked by annual fluctuations in numbers; take may occur offsite; failure to reproduce or a decrease in nesting productivity may not be detected if an individual moves to a neighboring island to nest or fails to nest; the form of take is a non-lethal harm that is not detectable; vulnerable hatchlings may be eaten by predators before detection.

Backpassing and Renourishment – Linear miles of beach habitat where loggerheads nests is being used as a surrogate to express the extent of authorized take for the loggerhead related to backpassing and renourishment activities, including operation of heavy equipment (day and night), because it is not practical to monitor take-related impacts in terms of individuals. Beach habitat alteration that occurs through excavation and placement of 1.3 MCY of sand, and the associated equipment and personnel needed to complete this activity, will directly and indirectly cause the anticipated incidental take of loggerheads within the bounds of the identified 5.5 linear mi of beach habitat.

The 5.5 linear mi of beach habitat includes the 1.8 mi sand excavation area and the 3.7 mi of beach habitat where sand will be placed. This beach habitat begins 1,500 ft north of the Wallops Island-Assawoman Island property boundary and extends north to the northern extent of the sand mining area bordered on the east and west by MLW and the secondary dune, respectively (Figure 9). The 5.5 linear mi of beach habitat sets a clear, enforceable standard, and beach habitat alteration related to backpassing and renourishment activities outside of that specific area exceeds take. The anticipated take is described in Table 9.

Rocket Launches – The number of launches per year is being used as a surrogate to express the extent of authorized take for the loggerhead related to ongoing operations, including rocket launches, and launch-related activities immediately adjacent to the beach, because it is not practical to monitor take-related impacts in terms of individuals. The noise, vibration, and exhaust that occurs as a result of the launches will directly and indirectly cause the anticipated incidental take of loggerheads because the effects, although short-term, can be severe enough to kill individuals.

The 121 launches per year includes liquid fueled ELVs, solid fueled ELVs, sounding rockets, sounding rocket static fires, and drone target launches and incorporates a 10% buffer. Launches take place at Pads 0-A, 0-B, 1, 2, and the south UAS airstrip flat pad. The locations for each specific action and frequency of each launch are detailed in Table 1. The 121 launches per year (as detailed in Table 1) set a clear, enforceable standard, and additional launches exceeds take. The anticipated take is described in Table 9.

Table 9. Amount and type of anticipated incidental take.

Species	Amount of Take Anticipated (surrogate)	Initial Amount of Take Anticipated (individuals)	Frequency of Take	Duration of Biological Opinion	Total Amount of Anticipated Take (individuals)	Life Stage when Take is Anticipated	Type of Take	Take is Anticipated as a Result of
Plover	3.1 linear miles of beach habitat alteration (backpassing and renourishment; renourishment from offshore shoal)	20 adults and 9 chicks (backpassing and renourishment)	2 times during Opinion term	15 years	40 adults and 18 chicks	Adults, Chicks	Harm, Kill	• Loss of nesting and foraging habitat due to sand mining. • Reduced reproduction and feeding associated with noise, loss of prey species, and loss or alteration of habitat due to compaction and removal. • Direct effects to individuals and loss of prey species due to contaminants. • Increased vulnerability to predators. • Additional energy expenditure seeking available habitat elsewhere.
		4 adults and 1 chick (renourishment from offshore shoal)	6 times during Opinion term	15 years	24 adults and 6 chicks	Adults, Chicks	Harm, Kill	• Reduced reproduction and feeding associated with noise, loss of prey species, and loss or alteration of habitat due to compaction and removal. • Direct effects to individuals and loss of prey species due to contaminants. • Increased vulnerability to predators. • Additional energy expenditure seeking available habitat elsewhere.
Plover	121 launches/year and 71,500 flights/year (rocket launches and flights)	2 adults and 1 chick or 4 eggs	every year	15 years	30 adults and 15 chicks or 60 eggs	Adults, Chicks, Eggs	Harm, Kill	• Deafening of individuals due to noise generation, causing disorientation, impairment of normal behaviors, increased vulnerability to predators, and physiological stress. • Collision with aircraft. • Noise generation interrupting feeding and sheltering, causing birds to flush from nest resulting in predation or abandonment of eggs/chicks and additional energy expenditure by adults. • Vibration disturbing individuals causing normal behavior to temporarily cease and decreasing egg viability. • Direct exhaust exposure, causing death. • Lighting attracting migrating individuals, causing diversion of flight and increased collision risk.
Plover	1 linear mile of beach habitat alteration (recreational beach use)	2 adults and 1 chick	every year	15 years	30 adults and 15 chicks	Adults, Chicks	Harm, Kill	• Vehicle use on recreational beach can crush chicks and young plovers outside of closed plover nesting area and cause adults to abandon nests.
Knot	1.5 linear miles of beach habitat alteration	360 adults	2 times during Opinion term	15 years	720 adults	Adults	Harm	• Loss of foraging habitat due to sand mining. • Reduced reproduction (due to lack of weight gain) and feeding associated with noise, loss of prey

	(backpassing)							species, and loss or alteration of habitat due to compaction and removal. ● Direct effects to individuals and loss of prey species due to contaminants. ● Increased vulnerability to predators. ● Additional energy expenditure seeking available habitat elsewhere.
Knot	121 launches/year and 71,500 flights/year (rocket launches and flights)	2 adults	every year	15 years	30 adults	Adults	Harm, Kill	● Deafening of individuals due to noise generation, causing disorientation, impairment of normal behaviors, increased vulnerability to predators, and physiological stress. ● Collision with aircraft. ● Noise generation interrupting feeding and sheltering. ● Lighting attracting migrating individuals, causing diversion of flight and increased collision risk.
Loggerhead	5.5 linear miles of beach habitat alteration (backpassing and renourishment; renourishment from offshore shoal)	1 adult and 128 hatchlings or eggs	every 5 years	15 years	3 adults and 384 hatchlings or eggs	Adults, Hatchlings, Eggs	Harm, Kill	● Compaction of sand by equipment. ● Injure or crush nesting females and hatchlings. ● Loss of nesting habitat due to sand excavation and renourishment. ● Females deterred from nesting by staged equipment and sand stockpile.
Loggerhead	121 launches/year (rocket launches)	1 adult and 128 hatchlings or eggs	every 5 years	15 years	3 adults and 384 eggs or hatchlings	Adults, Hatchlings, Eggs	Harm, Kill	● Deafening of individuals due to noise generation, causing disorientation, impairment of normal behaviors, increased vulnerability to predators, and physiological stress. ● Vibration disturbing individuals causing normal behavior to temporarily cease and decreasing egg viability. ● Lighting causing disorientation of hatchlings and behavioral effects on nesting adults.

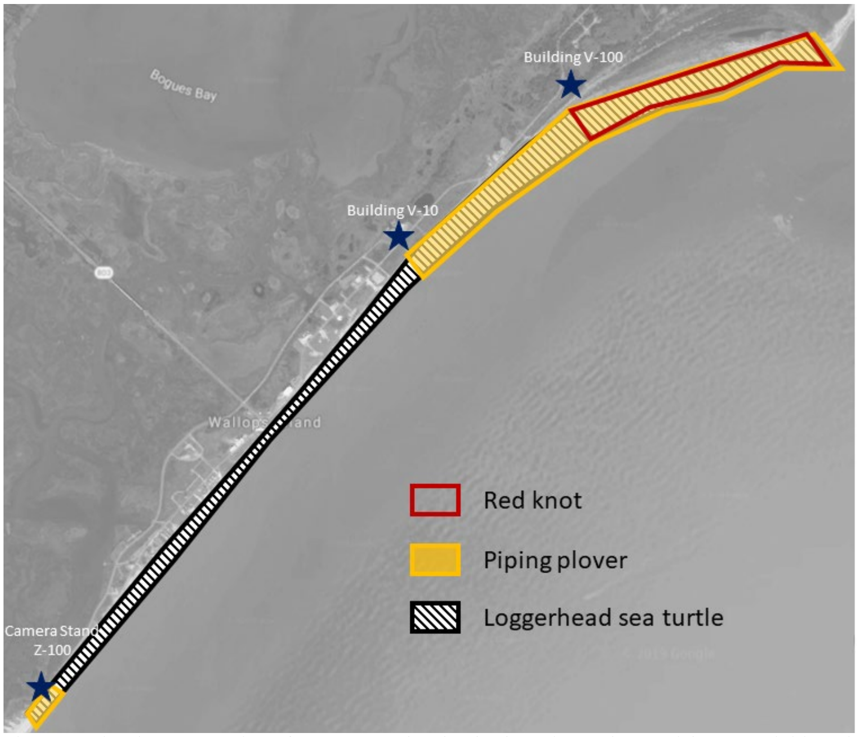

Figure 9. Visual representation of surrogates related to backpassing and renourishment activities with building and camera stand locations represented by blue stars.

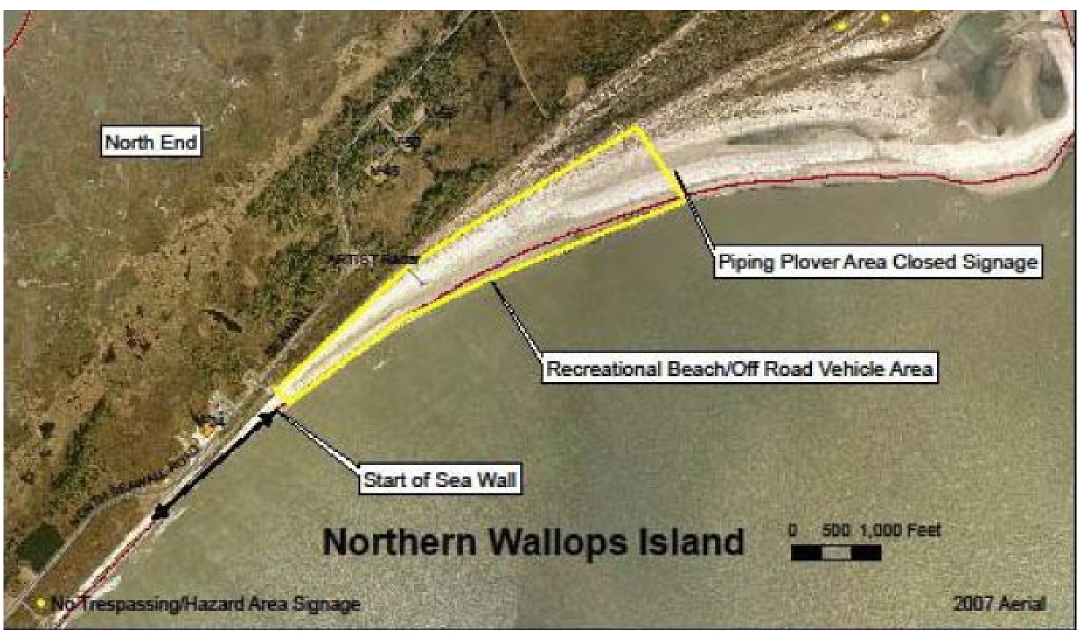

Figure 10. Visual representation of recreational beach surrogate area. Map provided in 2019 Protected Species Monitoring Plan (NASA 2019).

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of plovers, knots, and loggerheads.

1. Provide information to individuals involved in project construction on how to avoid and minimize effects to plovers, knots, and loggerheads.

2. Actively manage habitats and human activity to avoid and minimize impacts to plovers, knots, and loggerheads.

3. Monitor the effects of the proposed action on plovers, knots, and loggerheads.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of Section 9 of the ESA, NASA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

1. Prior to initiation of on-site work, notify all prospective employees, operators, and contractors about the presence and biology of the plover, knot, and loggerhead; special provisions necessary to protect these species; activities that may affect these species; and ways to avoid and minimize these effects. This information can be obtained by reading species-related information in this Opinion or a fact sheet containing this information can be created and provided by NASA.

2. Minimize foot traffic throughout beach habitat during construction.

3. Inspect all vehicles for leaks immediately prior to work in beach habitat. Repair any leaks and clean construction vehicles thoroughly to remove any residual dirt, mud, debris, grease, motor oil, hydraulic fluid, coolant, or other hazardous substances from construction vehicles. Inspections, repairs, cleaning, and/or servicing will be conducted either before the vehicle, equipment, or machinery is transported into the field or at the work site within the staging area. All wash-water runoff and/or harmful materials will be appropriately controlled to prevent entry into the beach habitat, including the dune area.

4. Develop a training and familiarization program for all security personnel conducting patrols in areas where listed species may occur. This training program shall include basic biological information about all listed species and be sufficient to allow personnel to tentatively identify the species and its likely habitat to allow them to incorporate appropriate avoidance and minimization measures into their activities.

MONITORING AND REPORTING REQUIREMENTS

1. Notify the Service regarding the projected and actual start dates, progress, and completion of the project and verify that the 5.4 miles of beach habitat alteration was not exceeded and all conservation measures were followed. Provide a report containing this information by December 31 of each year throughout the 15-year duration of this Opinion to the Virginia Field Office at emily_argo@fws.gov.

2. Provide an annual report summarizing the survey and monitoring efforts, location and status of all occurrences of listed species recorded, and any additional relevant information to the Service in digital format, at the email address provided below by December 31 of each year throughout the 15-year duration of this Opinion.

3. Following launches of rockets, conduct surveys for injured, dead, or impaired plovers, knots, and loggerheads. These surveys must be conducted as soon as safety permits following launches. The survey protocols are outlined in the WFF protected Species Management Plan. Post-launch beach surveys will be conducted between March 15 and November 30 of every year to coincide with plover and loggerhead nesting seasons. The survey area will include the beach within 1,000 ft, to the north and south, of the respective launch pad for sounding and orbital-class ELV rocket launches. Provide reports of survey results to the Service in digital format, at the email address below, within 15 business days of each launch event.

4. Care must be taken in handling any dead specimens of proposed or listed species to preserve biological material in the best possible state. In conjunction with the preservation of any dead specimens, the finder has the responsibility to ensure that evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. The finding of dead specimens does not imply enforcement proceedings pursuant to the ESA. The reporting of dead specimens is required to enable the Service to determine if take is reached or exceeded and to ensure that the terms and conditions are appropriate and effective. Upon locating a dead specimen, notify the Service's Virginia Law Enforcement Office at 804-771-2883 and the Service's Virginia Field Office at the phone number provided below or at 804-693-6694.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Fund demographic studies to evaluate project impacts to plovers and knots on Wallops Island and surrounding islands along Virginia's Eastern Shore.

2. Invest in habitat mapping to better understand changes in available nesting and foraging habitat to plovers and knots along Virginia's Eastern Shore.

3. Support habitat restoration efforts for plovers and knots.

4. Work with resource managers in the surrounding area by participating in monitoring and data collection efforts as well as partnerships to ensure species and habitats on Wallops Island are actively incorporated in efforts to improve our understanding of the dynamics of nesting shorebirds and other species along Virginia's Eastern Shore.

5. Develop an integrated habitat conservation and management plan for Wallops Island. Due to the significance of the area for the conservation of migratory birds and other species, nearly all habitats that occur on WFF provide value to these species. Active efforts to manage habitat, including activities such as control of non-native invasive plants, may significantly improve the value of these areas as habitat.

6. Collect data on the characteristics of beaches and habitat where sea turtle nests and plover nests occur and share this information with the Service, VDGIF and area resource managers, and work with other interested parties to develop protocols for data collection and analysis throughout Virginia to improve our understanding of plover and sea turtle habitat characteristics.

7. Transition security from frequent roving patrols to a closed circuit television system to minimize beach access to the maximum extent practicable.

For the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the reinitiation request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

If you have any questions regarding this Opinion, or our shared responsibilities under the ESA, please contact Emily Argo of this office at (804) 824-2405, or via email at emily_argo@fws.gov.

Sincerely,

Cindy Schulz
Field Supervisor
Virginia Ecological Services

Enclosures

cc: Corps, Norfolk, VA (Attn: Tom Walker)
Corps, Norfolk, VA (Attn: Teri Nadal)
FAA, Washington, D.C. (Attn: Daniel Czelusniak)
Service, Chincoteague Island, VA (Attn: Kevin Holcomb)
Service, Chincoteague Island, VA (Attn: Nancy Finley)
VDGIF, Richmond, VA (Attn: Ernie Aschenbach)
VDGIF, Machipongo, VA (Attn: Ruth Boettcher)
VDNH, Richmond, VA (Attn: Rene Hypes)

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CONSULTATION HISTORY

05-10-2010	The Service issued NASA a non-jeopardy 2010 Opinion for expansion of WFF and ongoing operations (Service 2010a).
07-30-2010	The Service issued NASA a non-jeopardy programmatic 2010 Opinion on the SRIPP (Service 2010b).
09-22-2011	The Service provided concurrence on NASA's no effect determination for construction of a UAS airstrip at the northern portion of the island. The Service provided a not likely to adversely affect determination for several species associated with the operation of the new airstrip.
9-11-2014	The Service provided concurrence on the Navy's not likely to adversely affect determinations for installation and operation of a 5-inch powder gun and electromagnetic railgun at WFF.
11-20-2014	The Service provided concurrence on NASA's not likely to adversely affect determination for relocation of the 50k sounding rocket launcher and construction of a new flat pad to support sounding rocket launches.
08-18-2015	The Service received NASA's request to reinitiate formal consultation on the 2010 Opinions (Service 2010a, 2010b).
09-28-2015	The Service acknowledged receipt of NASA's request to initiate formal consultation.
10-16-2015	A Service biologist conducted a site visit of the project areas.
12-22-2015	The Service provided NASA our non-jeopardy 2015 Opinion (Service 2015c).
01-20-2016	The Service received NASA's request for revisions to the 2015 Opinion.
06-22-2016	The Service provided NASA our revised non-jeopardy 2016 Opinion (Service 2016).
12-12-2017	The Service received an email from NASA indicating the addition of breakwaters in the nearshore environment.
09-28-2018	The Service received a request for concurrence from NASA that increasing the volume of sand to be excavated from Wallops Island and the addition of nearshore breakwaters were covered by the 2016 Opinion.

10-02-2018 to
12-13-2018 The Service and NASA exchanged emails and phone calls regarding scope of work, information needs, and reinitiation.

12-14-2018 The Service received NASA's request for reinitiation of the 2016 Opinion.

12-22-2018 to
01-25-2019 Due to a lapse in appropriations Service employees were furloughed and not authorized to work on this consultation.

12-17-2018 to
03-19-2019 The Service and NASA exchange emails and phone calls regarding project details, timeframe of consultation, and monitoring requests.

03-20-2019 The Service acknowledged receipt of NASA's request to reinitiate formal consultation.

03-29-2019 The Service attended a stakeholder meeting at NASA WFF with representatives from the Virginia Department of Conservation and Recreation, VDGIF, CNWR, and Corps.

04-03-2019 to
05-08-2019 The Service and NASA exchanged emails regarding project details.

APPENDIX A

Table 7. Analysis of effects of reinitiated actions on plover, knot, and loggerhead.

Construction Activity	Environmental Impact or Threat	Stressors	Stressor Pathway	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Avoidance and Minimization Measures	Comments
Piping Plover										
dune plantings in renourishment area	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	Plants will be installed between October 1 and March 31 of any given year.	Planting will occur along newly created dunes.
equipment staging	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	Establish upland areas for equipment and material staging – to be discussed with contractor (potentially daily).	Equipment will not be staged in areas used by plovers/plover habitat.
sand stockpile	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	none	Sand will not be stockpiled in areas used by plovers/plover habitat.
operation of equipment (day and night)	habitat degradation; reduction in prey population; disturbance	compaction of habitat; chemical contaminants; loss of prey; altered flight path; nest abandonment; increased predation; increased vehicular traffic on adjacent roadway	driving through habitat; release of small amounts of fuel, oil, lubricants, and other contaminants; equipment noise	nesting and foraging habitats; prey; population; individuals (adults and chicks)	decreased reproduction; harm	breeding; feeding; sheltering	reproduction, numbers	LAA	Sand harvesting will not begin until after the last plover chick has fledged, and will continue until 1.3 MCY of sand has been harvested. Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting plovers. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status.	Even with the application of avoidance and minimization measures, sand compaction by equipment may cause burial and suffocation of invertebrate prey species, resulting in loss of available prey. The habitat may be degraded due to sand compaction, making it difficult for birds to access prey and/or causing a loss of available prey. Individuals are expected to cease normal foraging and seek available habitat elsewhere. Searching for alternative suitable habitat leads to increased energy expenditure from additional search times and increased exposure to predators. Expending additional energy searching for and reaching suboptimal habitat that may have limited food resources does not allow plovers to maintain

									Work activities will be suspended within 1,000 ft of the nest until plover chicks have fledged.	optimal body condition, resulting in decreased nest productivity or inability to nest. The use of suboptimal habitat may lead to nesting on less suitable habitat, such as on a narrower beach more vulnerable to flooding, and decreased nest or brood attendance by adults could increase predation of nests and/or chicks. If the habitat is less suitable foraging opportunities may be limited and decrease chick survival. If birds seek nesting habitats elsewhere, they will also face competition for territories with birds already established there, potentially leading to lower productivity and possibly adult survival from reduced food availability. Operation of equipment may result in releases of small amounts of fuel, oil, lubricants, and other contaminants. While we do not expect contaminant releases to occur frequently, these substances may adhere to feathers, which would impact the bird's ability to move or result in contaminant ingestion from preening, harming the birds. Contaminant releases could also result in impairment or death of prey species reducing prey availability and quality, causing the birds to spend additional time foraging increasing the time they are vulnerable to predators. Both nesting and migratory plovers occur in the Action Area and would be impacted as described above. A 1,000 ft buffer will be placed around each known nest location, likely

										encompassing the foraging area of any adults and chicks from the buffered nest. Plovers foraging outside the 1,000 ft buffer will be disturbed by equipment noise. Individuals are expected to cease normal foraging, nesting, or flight behavior. They may alter their flight path, seek available habitat elsewhere and/or abandon nesting attempts, all of which expends additional energy and increases their vulnerability to predators as discussed above.
presence of additional personnel	increased human activity/disturbance	nest abandonment; increased predation	human presence and noise	population; individual	decreased reproduction; harm	feeding; breeding; sheltering	reproduction; numbers	LAA	Work activities will be suspended within 1,000 ft of the nest until plover chicks have fledged.	A 1,000 ft buffer will be placed around each known nest location, likely encompassing the foraging area of any adults and chicks from the buffered nest. Plovers foraging outside the 1,000 ft buffer will be disturbed by noise. Noise may discourage use of habitat causing adults to abandon nesting attempts or migratory plovers to leave the area. This will cause plovers to expend additional energy seeking available habitat elsewhere. The effects of this have been discussed in the operation of equipment row.
sand excavation	habitat degradation	altered habitat; loss of prey; increased predation	removal of occupied nesting habitat; removal of occupied foraging habitat; prey removal	prey, habitat, population, individuals	harm; kill	breeding; feeding; sheltering	reproduction; numbers; distribution	LAA	Sand harvesting will not begin until after the last plover chick has fledged and will continue until 1.3 MCY of sand has been harvested. Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting plovers. Any nests	Sand excavation will not begin until after chicks from 2019 nests have fledged. However, removal of nesting habitat will result in lack of nesting and/or adults expending additional energy seeking available habitat elsewhere. The effects of this have been discussed in the operation of equipment row. After sand excavation, the remaining beach would be much narrower, have

									discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until plover chicks have fledged.	a steeper initial profile, be more vegetated, and have different physical properties (e.g., sand grain characteristics, drainage). This profile would be unsuitable for plover foraging, reducing overall carrying capacity for breeding plovers. Sand removal would result in impairment or death of prey species and these invertebrate food sources may take multiple seasons to recover to pre sand excavation levels. We expect that beach habitat will be unsuitable for plovers for at least 2 consecutive nesting seasons following sand excavation. Return of previous beach topography that provided foraging and nesting habitat is expected to take up to 6 years to return to its current habitat quality and quantity.
renourishment	temporary loss of nesting habitat, temporary loss of foraging habitat	altered habitat; loss of prey	change in nesting habitat quality; burial of prey species	prey; habitat; individuals	harm	breeding; feeding	reproduction; numbers; distribution	LAA	Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting plovers. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft	The northernmost portion of the renourishment area provides nesting and foraging habitat, while a small section at the southern end provides foraging habitat. Placement of sand would result in the burial of prey species. Following sand placement, the suitability of the renourished beach as foraging habitat for migrating plovers is expected to be reduced due to loss of invertebrate prey. The reduced habitat suitability will result in plovers expending additional energy seeking available habitat elsewhere. The effects of additional energy expenditure have been discussed in the operation of equipment row.

									of the nest until plover chicks have fledged.	Compaction of the sand is expected to occur as a result of the use of heavy equipment during renourishment. The amount of equipment use and the associated degree of compaction is unknown, but due to the need to contour the beach to design specifications, compaction is expected to occur. This would result in changes in beach topography that reduce habitat quality for nesting plovers. Loss of nesting habitat will result in lack of nesting and/or adults expending additional energy seeking available habitat elsewhere, the effects of which have been discussed in the operation of equipment row. We expect that beach habitat will be unsuitable for plover foraging for 1 year following renourishment.
breakwater construction	disturbance	nest abandonment ; increased predation	noise	population; individual (all life stages)	annoyed to decreased reproduction; harm	breeding; feeding; sheltering	reproduction; numbers; distribution	LAA	none	Breakwaters will be constructed in the nearshore environment and the associated noise would discourage use of habitat causing adults to abandon nests or nesting attempts. This will result in lack of nesting and/or adults expending additional energy seeking available habitat elsewhere, the effects of which have been discussed in the operation of equipment row. The breakwaters would change the beach topography, causing tombolos to form and reducing the rate of recovery of the nesting and foraging habitat. The effects of the reduced rate of recovery on plovers has been discussed in the sand excavation row.

Red Knot										
Construction Activity	Environmental Impact or Threat	Stressors	Stressor Pathway	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Avoidance and Minimization Measures	Comments
dune plantings in renourishment area	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	Plants will be installed between October 1 and March 31 of any given year.	Planting will not take place in areas used by knots/knot habitat.
equipment staging	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	Establish upland areas for equipment and material staging – to be discussed with contractor (potentially daily).	Equipment will not be staged in areas used by knot/knot habitats.
sand stockpile	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	none	Sand will not be stockpiled in areas used by knots/knot habitat.
renourishment	temporary loss of foraging habitat	altered habitat; loss of prey	change in nesting habitat quality; burial of prey species	prey; habitat; individuals	harm	breeding; feeding	reproduction; numbers; distribution	NLAA	Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting plovers and loggerheads. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until plover	Since sand will not be placed in habitat used for knot foraging, this activity is not likely to adversely affect foraging knots.

									chicks have fledged and/or loggerheads have hatched.	
operation of equipment (day and night)	habitat degradation; physical impacts to individuals; reduction in prey population; disturbance	compaction of habitat; chemical contaminants; loss of prey; altered flight path; increased predation; increased vehicular traffic on adjacent roadway	release of small amounts of fuel, oil, lubricants, and other contaminants; equipment noise	foraging habitats; prey; population; individuals (all life stages)	harm	feeding; sheltering	numbers	LAA	Sand harvesting will not begin until after the last plover chick has fledged or the last loggerhead has hatched, whichever is later, and will continue until 1.3 MCY of sand has been harvested. Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting plovers and loggerheads. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until plover chicks have fledged and/or loggerheads have hatched.	While activities will not be conducted within 1,000 ft of documented plover or turtle nests, which may overlap with areas used by knots, knots foraging outside the 1,000 ft buffer will be disturbed by equipment noise. Individuals are expected to cease normal foraging or flight behavior. They may alter their flight path or seek available habitat elsewhere. Searching for alternative suitable habitat leads to increased energy expenditure from additional search times and increases exposure to predators. Use of suboptimal habitat may also result in lower weight when reaching the Arctic leading to reduced reproductive success. Even with the application of avoidance and minimization measures, sand compaction by equipment may cause burial and suffocation of invertebrate prey species, resulting in loss of available prey. The habitat may be degraded due to sand compaction, making it difficult for birds to access prey and/or causing a loss of available prey. Individuals are expected to cease normal foraging and seek available habitat elsewhere, the effects of which are discussed above. Operation of equipment may result in releases of small amounts of fuel, oil, lubricants, and other contaminants. While we do not expect contaminant

										releases to occur frequently, these substances may adhere to feathers, which would impact the bird's ability to move or result in contaminant ingestion from preening, harming the birds. Contaminant releases could also result in impairment or death of prey species reducing prey availability and quality, causing the birds to spend additional time foraging increasing the time they are vulnerable to predators.
presence of additional personnel	increased human activity/disturbance	altered flight path; increased predation	human presence and noise	population; individuals	harm	feeding; breeding; sheltering	reproduction; numbers	LAA	Work activities will be suspended within 1,000 ft of the nest until chicks have fledged and/or loggerheads have hatched.	While activities will not be conducted within 1,000 ft of documented plover or turtle nests, which may overlap with areas used my knots, knots foraging outside the 1,000 ft buffer will be disturbed by noise. Noise may discourage use of habitat causing adults to abandon foraging or migratory knots to leave the area. This will cause knots to expend additional energy seeking available habitat elsewhere. The effects of additional energy expenditure on knots has been discussed in the operation of equipment row.
sand excavation	habitat degradation	altered habitat; loss of prey; increased predation	removal of occupied foraging habitat; prey removal	prey, habitat, population, individuals	harm	feeding; sheltering	numbers; distribution	LAA	Sand harvesting will not begin until after the last plover chick has fledged or the last loggerhead has hatched, whichever is later, and will continue until 1.3 MCY of sand has been harvested. Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops	After sand excavation, the remaining beach would have a steeper initial profile, be more vegetated, and have different physical properties (e.g., sand grain characteristics, drainage). This profile would be unsuitable for knot foraging. Sand excavation would result in impairment or death of prey species and these invertebrate food sources may take multiple seasons to recover to pre sand harvesting levels.

									Island beach for nesting plovers and loggerheads. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until plover chicks have fledged and/or loggerheads have hatched.	We expect that beach habitat will be unsuitable for knots for at least 2 consecutive seasons following sand excavation. Return of previous beach topography that provided foraging habitat is expected to take up to 6 years to return to its current habitat quality and quantity.
breakwater construction	disturbance	increased predation	noise	population; individual	harm	feeding; sheltering	numbers; distribution	LAA	none	Breakwaters would be constructed in the nearshore environment and the associated noise would discourage use of habitat causing adults expending additional energy seeking available habitat elsewhere. The breakwaters would also change the beach topography, causing tombolos to form and reducing the rate of recovery of the foraging habitat. The reduced habitat suitability will result in knots expending additional energy seeking available habitat elsewhere. The effects of the reduced rate of habitat recovery and additional energy expenditure have been discussed above.
Loggerhead Sea Turtle										

Construction Activity	Environmental Impact or Threat	Stressors	Stressor Pathway	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Avoidance and Minimization Measures	Comments
dune plantings in renourishment area	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	Plants will be installed between October 1 and March 31 of any given year.	Plants will not be installed when habitat is actively used by sea turtles and presence of plants will not impact sea turtle during subsequent nesting seasons.
presence of additional personnel	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	Work activities will be suspended within 1,000 ft of the nest until sea turtles have hatched.	Work activities will be taking place a sufficient distance from documented nests to avoid impacts related to foot traffic.
breakwater construction	habitat degradation	change in habitat quality	habitat alteration	population; individual	harm	breeding	reproduction; numbers; distribution	NLAA	none	The breakwaters would change the beach topography, causing tombolos to form and reducing the rate of recovery of the nesting habitat. Little information is available about the impacts of tombolos on nesting sea turtles, but stabilization of beach topography (if not significantly different from the natural topography) may support maintenance of loggerhead nesting habitat following renourishment activities.
equipment staging	habitat degradation	prevention of habitat access; increased predation	equipment blocking access to habitat	individuals (adults, hatchlings)	harm; kill	breeding	reproduction; numbers	LAA	Establish upland areas for equipment and material staging – to be discussed with contractor (potentially daily). Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting plovers and loggerheads.	Equipment staging areas may be modified daily and may not always be established in an upland area. Any equipment staged on the sand/beach may present an obstacle to nesting loggerheads causing them to return to the ocean instead of nesting or expend additional energy to find a suitable nesting site, resulting in a reduction in nesting success.

									Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until loggerheads have hatched.	Hatchlings may encounter equipment on the beach at night during hatching if they travel outside of the 1,000 ft buffer, causing them to spend more time reaching the ocean, leaving them vulnerable to predators, which increases the likelihood of harm or death.
sand stockpile	habitat degradation	prevention of habitat access; increased predation	equipment blocking access to habitat	individuals (adults, hatchlings)	harm; kill	breeding	reproduction; numbers	LAA	Work activities will be suspended within 1,000 ft of the nest until loggerheads have hatched	Any sand stockpiled on the beach may present an obstacle to nesting loggerheads causing them to return to the ocean instead of nesting or expend additional energy to find a suitable nesting site, resulting in a reduction in nesting success. Hatchlings may encounter the stockpile on the beach at night during hatching if they travel outside of the 1,000 ft buffer or a nest is laid after the stockpile has been established and, therefore, is within the 1,000 ft buffer. This will cause hatchlings to spend more time reaching the ocean, leaving them vulnerable to predators, which increases the likelihood of harm or death.
operation of equipment (day)	habitat degradation	altered habitat	compaction of habitat	nesting habitats; population; individuals	harm	breeding	reproduction, numbers	LAA	Sand harvesting will not begin until after the last loggerhead has hatched and	Equipment will compact sand, making sand less desirable for nesting loggerheads. Compaction can reduce the ability of females to excavate an

									will continue until 1.3 MCY of sand has been harvested. Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting loggerheads. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until loggerheads have hatched.	egg chamber, resulting in a reduction in nesting success.
operation of equipment (night)	habitat degradation; physical impacts to individuals	prevention of habitat access; compaction of habitat; direct physical impacts; crushing of individuals	blocking access to nesting habitat; compaction of habitat; driving over sea turtles adults and hatchlings	nesting habitats; individuals (hatchlings and adults)	harm; kill	breeding	reproduction; numbers	LAA	Sand harvesting will not begin until after the last loggerhead has hatched and will continue until 1.3 MCY of sand has been harvested. Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting loggerheads. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project	During nesting season, any equipment on the beach may present an obstacle to nesting loggerheads causing them to return to the ocean instead of nesting or to expend additional energy to find an alternate suitable nesting site, resulting in a reduction in nesting success. Hatchlings may be crushed by equipment if they travel beyond the 1,000 ft buffer or encounter ruts left by equipment, causing them to spend more time reaching the ocean, leaving them vulnerable to predators, which increases the likelihood of harm or death. Equipment will compact sand, making sand less desirable for nesting sea turtles by reducing the ability of

									personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until loggerheads have hatched.	females to excavate an egg chamber, resulting in a reduction in nesting success.
sand excavation	habitat degradation	altered habitat	removal of occupied nesting habitat	habitat, population, individuals	harm	breeding	reproduction; numbers; distribution	LAA	Sand harvesting will not begin until after the last loggerhead has hatched and will continue until 1.3 MCY of sand has been harvested. Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting loggerheads. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until loggerheads have hatched.	Removal of nesting habitat may result in lack of nesting or expenditure of additional energy to find a suitable nesting site. We expect that beach habitat in the sand excavation area will be unavailable for loggerheads for at least 2 consecutive nesting seasons following sand excavation. Return of previous beach topography that provided nesting habitat is expected to take up to 6 years to return to its current habitat quality and quantity.
renourishment	temporary loss of nesting habitat	altered habitat	change in nesting habitat quality	habitat; individuals	harm	breeding	reproduction; numbers; distribution	LAA	Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting loggerheads. Any nests discovered would be immediately exclosed and	Nesting has been documented in the renourishment area and changes in beach topography and sand compaction may reduce habitat quality. The amount of equipment use and the associated degree of compaction is unknown, but due to the need to contour the beach to design

									geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until loggerheads have hatched.	specifications, compaction is expected to occur. This would result in changes in beach topography that reduce habitat quality for nesting loggerheads by reducing the ability of females to excavate an egg chamber. Nest failure and reduced rates of hatchling emergence are expected to occur for up to 2 years after sand placement. Directly in front of the riprap protecting the launch pads nesting habitat is not available and renourishment will increase available nesting habitat along this stretch of Wallops Island where nesting has been documented historically.

From: Brian D Hopper - NOAA Federal
To: Miller, Shari A. (WFF-2500)
Cc: David O"Brien - NOAA Federal; Christine Vaccaro - NOAA Federal
Subject: Re: FW: Request for Concurrence
Date: Tuesday, November 20, 2018 12:54:50 PM

Hi Shari,

Thank you for providing us with the documentation describing the proposed shoreline enhancement and restoration project at Wallops Island, Virginia. I've reviewed the information attached to your email requesting a determination from us regarding re-initiation of consultation and, based on the effect analysis from the previous consultation on the project, the information that you have provided regarding changes to the project description, and the fact that no new listed species or designated critical habitat overlap with the action area, it is not necessary to re-initiate the consultation on the August 3, 2012 Biological Opinion on the Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Program (as amended, September 26, 2014). Please let me know if you have any questions.

Regards,
-Brian

On Tue, Nov 13, 2018 at 3:41 PM NMFS.GAR ESA.Section7 - NOAA Service Account <nmfs.gar.esa.section7@noaa.gov> wrote:

> ---------- Forwarded message ---------
> From: **Miller, Shari A. (WFF-2500)** <shari.a.miller@nasa.gov>
> Date: Tue, Nov 13, 2018 at 2:11 PM
> Subject: FW: Request for Concurrence
> To: nmfs.gar.esa.section7@noaa.gov <nmfs.gar.esa.section7@noaa.gov>, Brian D Hopper - NOAA Federal <brian.d.hopper@noaa.gov>
> Cc: Piatkowski, Douglas <douglas.piatkowski@boem.gov>
>
> Good afternoon, Brian,
>
> Could you please tell me if NMFS had any comments or questions regarding our consultation letter for NASA's proposed shoreline restoration project?
>
> Thank you.
>
> ---

Shari A. Miller

Center NEPA Manager

Environmental Planning Lead
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov

SIPRnet: Shari.Miller@nss.sgov.gov

https://code200-external.gsfc.nasa.gov/250-wff/

"When I was a boy and I would see scary things in the news, my mother would say to me, 'Look for the helpers. You will always find people who are helping.' " – Fred Rogers

---

From: Mitchell, Joel T. (WFF-2500)
Sent: Thursday, September 27, 2018 2:15 PM
To: Kim.Damon-Randall@noaa.gov
Cc: brian.d.hopper@noaa.gov; Meyer, T J (WFF-2500) <theodore.j.meyer@nasa.gov>; Finch, Kimberly (GSFC-2500) <kimberly.s.finch@nasa.gov>; Saecker, John R. (WFF-2280) <john.r.saecker@nasa.gov>; Megan.A.Wood@usace.army.mil; douglas.piatkowski@boem.gov; mailto:leighann.brandt@boem.gov <leighann.brandt@boem.gov>; mailto:Julio.F.Altuna@usace.army.mil <Julio.F.Altuna@usace.army.mil>; Bull, Paul C. (WFF-2200) <paul.c.bull@nasa.gov>; mailto:Elizabeth.Burak@cardno-gs.com <Elizabeth.Burak@cardno-gs.com>; Miller, Shari A. (WFF-2500) <shari.a.miller@nasa.gov>
Subject: Request for Concurrence

Dear Ms. Damon-Randall,

NASA is proposing to continue the Shoreline Restoration and Infrastructure Protection Program initiated in 2010. The current proposal includes renourishing the beach along the Wallops Island shoreline infrastructure protection area with sand recycled, or "backpassed", from the north end of Wallops Island. Before the renourishment, NASA would construct a series of parallel nearshore breakwater structures that would reduce the intensity of wave action and slow sediment transport. Though obtaining fill material from the north end of Wallops Island is the preferred alternative for this nourishment event, the use of offshore sand resources are still considered as alternatives for this and future nourishment events.

The attached letter is to request concurrence from your office under Section 7 of the Endangered Species Act (ESA) for the Shoreline Enhancement and Restoration Project. Based on the analysis that all effects of the proposed action will be insignificant and/or discountable, we have made the determination that the proposed activity may affect, but is not likely to adversely affect, any species listed as threatened or endangered by the National Marine Fisheries Service under the ESA of 1973, as amended. Our supporting analysis is provided in the attached Biological Evaluation.

We certify that we have used the best scientific and commercial data available to complete this analysis. We request your concurrence with this determination.

If you have any questions, please contact me at (757) 824-2327 or Shari.A.Miller@nasa.gov.

Shari A. Miller

Environmental Planning Lead
NASA Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov

SIPRnet: Shari.Miller@nss.sgov.gov

https://code200-external.gsfc.nasa.gov/250-wff/

---------- Forwarded message ----------
From: "Mitchell, Joel T. (WFF-8200)" <joel.t.mitchell@nasa.gov>
To: "Miller, Shari A. (WFF-2500)" <shari.a.miller@nasa.gov>

Cc:
Bcc:
Date: Fri, 28 Sep 2018 12:34:33 +0000
Subject: FW: Ms. Damon-Randall's email address

OK, Fish and Wildlife letter out. Sent a new email to Jennifer Andersen at the address Brian supplied.

From: Brian D Hopper - NOAA Federal [mailto:brian.d.hopper@noaa.gov]
Sent: Friday, September 28, 2018 7:59 AM
To: Mitchell, Joel T. (WFF-2500) <joel.t.mitchell@nasa.gov>
Subject: Re: Ms. Damon-Randall's email address

Hi Joel,

Thanks for contacting us with your request for consultation. Kim is on a detail and our current division chief is Jennifer Anderson. We have an email address specifically set up to receive consultation requests. Here it is: nmfs.gar.esa.section7@noaa.gov

Please let me know if you have any questions.

Regards,

-Brian

On Fri, Sep 28, 2018 at 7:51 AM Mitchell, Joel T. (WFF-2500) <joel.t.mitchell@nasa.gov> wrote:

> Dear Mr. Hopper,
>
> I was trying to the email to Kim.Damon-Randall regarding consultation concerning the Wallops Island Beach Renourishment and Breakwater project for Shari Miller. However it keeps getting reflected back to me as undeliverable. Would you happen to have her email address?
>
> Thank you,
>
> Joel Mitchell
>
> Natural Resources Manager

Wallops Flight Facility

757-824-1127

--

Brian D. Hopper
Protected Resources Division
NOAA Fisheries
Greater Atlantic Regional Fisheries Office

177 Admiral Cochrane Dr.

Annapolis, MD 21401
(410) 573-4592
Brian.D.Hopper@noaa.gov
http://www.greateratlantic.fisheries.noaa.gov/

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APPENDIX H
CULTURAL RESOURCES CONSULTATION

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Miller, Shari A. (WFF-2500)

From:	Laura Lavernia <Laura.Lavernia@dhr.virginia.gov>
Sent:	Tuesday, August 14, 2018 11:43 AM
To:	Miller, Shari A. (WFF-2500)
Subject:	Shoreline Enhancement and Restoration Project (DHR File No. 2018-3863) | e-Mail # 03512

Dear Ms. Shari Miller,

Thank you for requesting comments from the Department of Historic Resources on the referenced project. Based upon the documentation provided, it is our opinion that no historic properties will be affected by the proposed undertaking.

Implementation of the undertaking in accordance with the finding of No Historic Properties Affected as documented fulfills the Federal agency's responsibilities under Section 106 of the National Historic Preservation Act. If for any reason the undertaking is not or cannot be conducted as proposed in the finding, consultation under Section 106 must be reopened.

If you have any questions or if we may provide any further assistance at this time, please do not hesitate to contact me.

Sincerely,

Laura Lavernia, Architectural Historian
Division of Review and Compliance
Phone: (804) 482-8097
Laura.Lavernia@dhr.virginia.gov

From:	Brian D Hopper - NOAA Federal
To:	Miller, Shari A. (WFF-2500)
Cc:	David O"Brien - NOAA Federal; Christine Vaccaro - NOAA Federal
Subject:	Re: FW: Request for Concurrence
Date:	Tuesday, November 20, 2018 12:54:50 PM

Hi Shari,

Thank you for providing us with the documentation describing the proposed shoreline enhancement and restoration project at Wallops Island, Virginia. I've reviewed the information attached to your email requesting a determination from us regarding re-initiation of consultation and, based on the effect analysis from the previous consultation on the project, the information that you have provided regarding changes to the project description, and the fact that no new listed species or designated critical habitat overlap with the action area, it is not necessary to re-initiate the consultation on the August 3, 2012 Biological Opinion on the Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Program (as amended, September 26, 2014). Please let me know if you have any questions.

Regards,
-Brian

On Tue, Nov 13, 2018 at 3:41 PM NMFS.GAR ESA.Section7 - NOAA Service Account <nmfs.gar.esa.section7@noaa.gov> wrote:

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> From: **Miller, Shari A. (WFF-2500)** <shari.a.miller@nasa.gov>
> Date: Tue, Nov 13, 2018 at 2:11 PM
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> To: nmfs.gar.esa.section7@noaa.gov <nmfs.gar.esa.section7@noaa.gov>, Brian D Hopper - NOAA Federal <brian.d.hopper@noaa.gov>
> Cc: Piatkowski, Douglas <douglas.piatkowski@boem.gov>
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> Could you please tell me if NMFS had any comments or questions regarding our consultation letter for NASA's proposed shoreline restoration project?
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> Thank you.
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> ______________

Shari A. Miller

Center NEPA Manager

Environmental Planning Lead
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov

SIPRnet: Shari.Miller@nss.sgov.gov

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"When I was a boy and I would see scary things in the news, my mother would say to me, 'Look for the helpers. You will always find people who are helping.' " – Fred Rogers

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Sent: Thursday, September 27, 2018 2:15 PM
To: Kim.Damon-Randall@noaa.gov
Cc: brian.d.hopper@noaa.gov; Meyer, T J (WFF-2500) <theodore.j.meyer@nasa.gov>; Finch, Kimberly (GSFC-2500) <kimberly.s.finch@nasa.gov>; Saecker, John R. (WFF-2280) <john.r.saecker@nasa.gov>; Megan.A.Wood@usace.army.mil; douglas.piatkowski@boem.gov; mailto:leighann.brandt@boem.gov <leighann.brandt@boem.gov>; mailto:Julio.F.Altuna@usace.army.mil <Julio.F.Altuna@usace.army.mil>; Bull, Paul C. (WFF-2200) <paul.c.bull@nasa.gov>; mailto:Elizabeth.Burak@cardno-gs.com <Elizabeth.Burak@cardno-gs.com>; Miller, Shari A. (WFF-2500) <shari.a.miller@nasa.gov>
Subject: Request for Concurrence

Dear Ms. Damon-Randall,

NASA is proposing to continue the Shoreline Restoration and Infrastructure Protection Program initiated in 2010. The current proposal includes renourishing the beach along the Wallops Island shoreline infrastructure protection area with sand recycled, or "backpassed", from the north end of Wallops Island. Before the renourishment, NASA would construct a series of parallel nearshore breakwater structures that would reduce the intensity of wave action and slow sediment transport. Though obtaining fill material from the north end of Wallops Island is the preferred alternative for this nourishment event, the use of offshore sand resources are still considered as alternatives for this and future nourishment events.

The attached letter is to request concurrence from your office under Section 7 of the Endangered Species Act (ESA) for the Shoreline Enhancement and Restoration Project. Based on the analysis that all effects of the proposed action will be insignificant and/or discountable, we have made the determination that the proposed activity may affect, but is not likely to adversely affect, any species listed as threatened or endangered by the National Marine Fisheries Service under the ESA of 1973, as amended. Our supporting analysis is provided in the attached Biological Evaluation.

We certify that we have used the best scientific and commercial data available to complete this analysis. We request your concurrence with this determination.

If you have any questions, please contact me at (757) 824-2327 or Shari.A.Miller@nasa.gov.

____

Shari A. Miller

Environmental Planning Lead
NASA Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov

SIPRnet: Shari.Miller@nss.sgov.gov

https://code200-external.gsfc.nasa.gov/250-wff/

---------- Forwarded message ----------
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To: "Miller, Shari A. (WFF-2500)" <shari.a.miller@nasa.gov>

Cc:
Bcc:
Date: Fri, 28 Sep 2018 12:34:33 +0000
Subject: FW: Ms. Damon-Randall's email address

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Regards,

-Brian

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> Joel Mitchell
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> Natural Resources Manager

Wallops Flight Facility

757-824-1127

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Brian D. Hopper
Protected Resources Division
NOAA Fisheries
Greater Atlantic Regional Fisheries Office

177 Admiral Cochrane Dr.

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APPENDIX I
U.S. ARMY CORPS OF ENGINEERS INDIVIDUAL PERMIT

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DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NORFOLK DISTRICT
FORT NORFOLK
803 FRONT STREET
NORFOLK VA 23510-1011

July 2, 2019

Eastern Virginia Regulatory Section
NAO-1992-1455/18-1950 (Atlantic Ocean)

National Aeronautics and Space Administration
Attn: Mr. Paul Bull
NASA Wallops Island Flight Facility
Building N-161, Code 228
Wallops Island, Virginia 23337

Dear Mr. Bull:

Enclosed are two copies of a Department of the Army permit authorizing you to perform certain work in waters of the United States. Please sign both copies in the space provided for the permittee's signature and return them to this office (803 Front Street, Norfolk Virginia 23510). Upon receipt, the district engineer or his authorized representative will sign both copies and return an original to you. The permit is not valid until signed by both parties.

This letter contains an initial proffered permit for your proposed project. If you object to this decision, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this decision you must submit a completed RFA form to the Norfolk District Office at the following address:

United States Army Corps of Engineers
CENAO-WR-R
William T. Walker, Regulatory Branch Chief
803 Front Street
Norfolk, VA 23510

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the District Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by August 16, 2019 It is not necessary to submit an RFA form to the District office if you do not object to the decision in this letter.

Please take note of project specific special conditions and general conditions incorporated in this permit. Enclosed is a "compliance certification" form, which must be signed and returned within 30 days of completion of the project, including any required mitigation. Your signature on this form certifies that you have completed the work in accordance with the permit terms and conditions.

Please note that you cannot begin work until you have obtained a Section 401 Water Quality Certificate/Virginia Water Protection Permit or a waiver. All the conditions in the 401 certificate/Water Protection Permit automatically are conditions of your Department of the Army Permit. In addition, you should obtain a permit from the Virginia Marine Resources Commission and/or the local wetlands board.

If any material change in the plan of the work is found necessary, revised plans must be submitted and approved before any work is begun.

If you have any questions, you may call Dan Bacon at (757) 201-7060.

Sincerely,

Pete Kube
Chief, Eastern Virginia
Regulatory Section

Enclosure(s)

Cc:

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NORFOLK DISTRICT
FORT NORFOLK
803 FRONT STREET
NORFOLK VA 23510-1011

July 2, 2019

SUBJECT: Department of the Army Permit Application Number NAO-1992-1455, Wallops Island NSA Flight Facility Beach Nourishment, Accomack County, Virginia

National Aeronautics and Space Administration
Attn: Mr. Paul Bull
NASA Wallops Island Flight Facility
Building N-161, Code 228
Wallops Island, Virginia 23337

Dear Bull:

Enclosed is a fully executed copy of Department of the Army Permit Number NA0-1992-1455 (VMRC #18-1590) issued to National Aeronautics and Space Administration NASA Wallops Island Flight Facility for the Beach nourishment and breakwater construction in Accomack County, Virginia.

If you have any questions, you may contact me at (757) 201-7060 or danny.r.bacon@usace.army.mil.

Sincerely,

Pete Kube
Chief, Eastern Virginia
Regulatory Section

Enclosure

Copies Furnished (w/o encl.):
Virginia Department of Environmental Quality
Virginia Marine Resources Commission

U.S. Army Corps
Of Engineers
Norfolk District

Fort Norfolk, 803 Front Street
Norfolk, Virginia 23510-1096

DEPARTMENT OF THE ARMY PERMIT

Permittee: NASA/Goddard Space Flight Center/Wallops Flight Facility
Permit No.: NAO-1992-1455 / VMRC# 18-1590
Issuing Office: U.S. Army Corps of Engineers Norfolk District Regulatory Branch (CENAO-WR-R)

Note: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below pursuant to:

☒ Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).
☒ Section 404 of the Clean Water Act (33 U.S.C. 1344).
☐ Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

Project Description:

The applicant is authorized to excavate 1.3 million cubic yards of sand from the north Wallops Island Beach, in an area where sand is accreting, and placed over 19,850 linear feet of shoreline on the southern portion of the beach in front of the mission critical infrastructure. The placement of the sand will go from subaqueous bottom (channelward of Mean Low Water) beyond the High Tide Line. The sand will come from the northern part of Wallops Island beach which has accreted sand and will be placed on southern beaches that are eroded. This "backpassing" would involve removing sand from a 200 acre area to the MLW line using a pan excavator and trucking it to the shoreline infrastructure protection area where it would be spread using heavy equipment. Additionally, a series of up to six (6) 130-foot by 10-foot wide breakwaters spaced 100-feet apart at an average distance of 380 feet channelward of Mean High Water will be placed parallel to the shore are authorized under this permit.

American beach grass (Ammophila breviligulata, cultivar "Cape") will be planted at 18-inch intervals over the re-established dune. The planting area will be approximately 150 feet wide along the entire length of the newly created dune in the beach nourishment area. See permit drawings for a typical profile of the planting area (100% Design Plans and specifications, USACE 2018).

Project Location: NASA/Goddard Space Flight Center/Wallops Flight Facility

Project Specific Special Conditions:

1. Prior to the commencement of any work authorized by this permit, you shall advise the project manager, Dan Bacon, in writing at: Norfolk District, Corps of Engineers, 803 Front Street, Norfolk, Virgina 23464, at least two weeks in advance of starting work authorized by this permit. Alert the project manager of the anticipated start date of the authorized activity and the name and telephone number of all contractors or other persons performing the work. A copy of this permit and drawings must be provided to the contractor and kept on site at all times, available to any regulatory representative during an inspection of the project site.

2. The time limit for completing the work authorized ends on **June 17, 2024**. Should you be unable to complete the authorized activity in the time limit provided, you must submit your request for a time extension to this office for consideration at least one month before the permit expiration date.

3. Enclosed is a "compliance certification" form, which must be signed and returned within 30 days of completion of the project, including any required mitigation. Your signature on this form certifies that you have completed the work in accordance with the permit terms and conditions.

4. Final Plans and specifications for authorized activities shall be submitted and approved by the Corps prior to initiation of the permitted activities.

5. **Pre-Construction Meeting**
You are not authorized to begin clearing or construction activities in waters of the U.S. (including wetlands) associated with this permit until an on-site preconstruction conference is held to ensure that all affected parties fully understand the requirements of this permit. This meeting must be held prior to the start of land disturbance in wetlands and must be attended by you or a designated representative, your agent/consultant, the contractor, the contractor's foreman, and **Dan Bacon**, the Corps project manager for your permit. To arrange this meeting, contact **Dan Bacon at 757-201-7060.**

6. **Restoration of Temporary Access areas**

1) The soils of any temporary construction access areas located in wetlands that are cleared, grubbed, and/or filled, must be loosened by ripping or chisel plowing the soil surface to a depth of 8-12" once each access is no longer needed. The resulting grade shall be replanted with bare root native woody plants at a rate of 200 plants per acre. Acceptable woody plants include but are not limited to 2-4 of the following native species: wax myrtle (*Myrica cerifera*), red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), black willow (*Salix nigra*), black gum (*Nyssa sylvatica*), spicebush (*Lindera benzoin)* tag alder (*Alnus serrulata*), and green ash (*Fraxinus pennsylvanica*). Substitution of other native woody species is subject to Corps review and approval. This restoration work must be completed by June 17 2022.

2) If a project specific condition of this permit cannot be met, then you must apply for a permit modification. Any proposed permit modification will be coordinated with DEQ, USFWS, **locality**, and EPA Region III.

7. **Erosion and Sedimentation**:

1) Strict sediment and erosion control measures consistent with those contained in the standards and criteria of the current Virginia Sediment and Erosion Control handbook shall be used. The disposal site for any excavated material as part of the project shall be located in a non-wetland area and shall be retained using silt fences and staked hay bales and/or other measures consistent with the Virginia Sediment and Erosion Control handbook.

8. **Time of Year Restrictions**

1) You have completed Section 7 formal consultation for the Piping plover (Charadrius melodus), Red knot (Calidris canutus rufa), and Loggerhead sea turtle (Caretta caretta) with the U.S. Fish and Wildlife Service (Service). In order to meet requirements for Endangered Species Act for this permit, you have agreed to adhere to the Terms and Conditions found in the Service's Biological Opinion dated June 7, 2019 (attached).

9. **Beach Nourishment**

a) When the work authorized herein includes periodic maintenance beach nourishment, it may be performed under this permit for **five** years from the date of issuance of this permit. You must advise this office in writing, at least two weeks before you start maintenance beach nourishment activities under the authority of this permit.

b) This permit does not authorize any double handling of material in waters and/or wetlands.

c) No beach nourishment may begin until an on-site pre-beach nourishment conference is held to ensure all affected parties fully understand the requirements of the permit, and to inspect the disposal site(s). This meeting will be held prior to the start of beach nourishment, but after the disposal site(s) have been prepared and all erosion and sedimentation controls are in place. The meeting must be attended by you or your representative, the contractor, the contractor's foreman, DEQ, and Dan Bacon, the Corps project manager for your permit. To arrange this meeting, contact at **(757) 201-7060** at least 15 days prior to the proposed meeting date. The dewatering area, disposal site, and erosion and sedimentation controls must be in compliance with the permitted plans prior to the commencement of beach nourishment.

d) Within 30 days of completion of the beach nourishment, a post hydrographic survey, prepared by a state-certified engineer or surveyor, must be provided to the Corps. Within 30 days of completion of the beach nourishment, an as-built survey, prepared by a state-certified engineer or surveyor, must be provided to the Corps. The hydrographic survey should reference a local tidal or geodetic datum.

General Conditions:

1. If you discover any previously unknown historic or archaeological remains while accomplishing the activity authorized by this permit, you must immediately stop work and notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

2. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit.

3. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

4. No discharge of dredged or fill material may consist of unsuitable material (e.g.: trash, debris, car bodies, asphalt etc.) and material discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

5. Any temporary fills must be removed in their entirety and the affected areas returned to their preexisting elevation.

6. Appropriate erosion and siltation controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well

as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date.

7. The construction or work authorized by this permit will be conducted in a manner so as to minimize any degradation of water quality and/or damage to aquatic life. Also, you will employ measures to prevent or control spills of fuels or lubricants from entering the waterway.

8. Any heavy equipment working in wetlands other than those permitted for permanent impact must be placed on mats or other measures must be taken to minimize soil disturbance.

9. Failure to comply with the terms and conditions of this permit can result in enforcement actions against the permittee and/or contractor.

10. In granting an authorization pursuant to this permit, the Norfolk District has relied on the information and data provided by the permittee. If, subsequent to notification by the Corps that a project qualifies for this permit, such information and data prove to be materially false or materially incomplete, the authorization may be suspended or revoked, in whole or in part, and/or the Government may institute appropriate legal proceedings.

11. All dredging and/or filling will be done so as to minimize disturbance of the bottom or turbidity increases in the water which tend to degrade water quality and damage aquatic life.

12. Your use of the permitted activity must not interfere with the public's right to reasonable navigation on all navigable waters of the United States.

13. The permittee understands and agrees that if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army of his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required upon due notice from the Corps of Engineers to remove, relocate, or alter the structural work or obstructions caused thereby without expense to the United States. No claim shall be made against the United States on account of any such removal or alternation.

14. The following condition should be used for every permit where residual wetlands remain in the project site in order to put a subsequent purchaser or owner of property on notice of permit conditions: You must take the actions required to record this permit (and the associated project drawings, showing any residual wetlands) with the Registrar of Deeds or other appropriate official charged with the responsibility for maintaining records of title to or interest in real property.. A copy of the recorded permit with deed book and page number stamped on it shall be

provided to this office within 30 days of the countersignature of the permit by the Corps.

Further Information:

1. Limits of this authorization:
   a. This permit does not obviate the need to obtain other Federal, state or local authorizations required by law.
   b. This permit does not grant any property rights or exclusive privileges.
   c. This permit does not authorize any injury to the property or rights of others.
   d. This permit does not authorize interference with any existing or proposed Federal projects.

2. Limits of Federal Liability: In issuing this permit, the Federal Government does not assume any liability for the following:
   a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.
   b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.
   c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.
   d. Design or construction deficiencies associated with the permitted work.
   e. Damage claims associated with any future modification, suspension, or revocation of this permit.

3. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

4. Reevaluation of Permit Decision: This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:
   a. You fail to comply with the terms and conditions of this permit.
   b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 3 above).
   c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

   Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

5. Extensions: Project Specific Condition #2 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as a permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

(Permittee)

7/8/19

(Date)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Patrick V. Kinsman, PE
Colonel, U.S. Army
Commanding

(Date)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(Transferee)

(Date)

U.S. Army Corps
Of Engineers
Norfolk District

Fort Norfolk, 803 Front Street
Norfolk, Virginia 23510-1096

DEPARTMENT OF THE ARMY PERMIT

Permittee: **NASA/Goddard Space Flight Center/Wallops Flight Facility**
Permit No.: **NAO-1992-1455 / VMRC# 18-1590**
Issuing Office: **U.S. Army Corps of Engineers Norfolk District Regulatory Branch (CENAO-WR-R)**

Note: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below pursuant to:

- ☒ Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).
- ☒ Section 404 of the Clean Water Act (33 U.S.C. 1344).
- ☐ Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

Project Description:

The applicant is authorized to excavate 1.3 million cubic yards of sand from the north Wallops Island Beach, in an area where sand is accreting, and placed over 19,850 linear feet of shoreline on the southern portion of the beach in front of the mission critical infrastructure. The placement of the sand will go from subaqueous bottom (channelward of Mean Low Water) beyond the High Tide Line. The sand will come from the northern part of Wallops Island beach which has accreted sand and will be placed on southern beaches that are eroded. This "backpassing" would involve removing sand from a 200 acre area to the MLW line using a pan excavator and trucking it to the shoreline infrastructure protection area where it would be spread using heavy equipment. Additionally, a series of up to six (6) 130-foot by 10-foot wide breakwaters spaced 100-feet apart at an average distance of 380 feet channelward of Mean High Water will be placed parallel to the shore are authorized under this permit.

American beach grass (Ammophila breviligulata, cultivar "Cape") will be planted at 18-inch intervals over the re-established dune. The planting area will be approximately 150 feet wide along the entire length of the newly created dune in the beach nourishment area. See permit drawings for a typical profile of the planting area (100% Design Plans and specifications, USACE 2018).

Project Location: NASA/Goddard Space Flight Center/Wallops Flight Facility

Project Specific Special Conditions:

1. Prior to the commencement of any work authorized by this permit, you shall advise the project manager, Dan Bacon, in writing at: Norfolk District, Corps of Engineers, 803 Front Street, Norfolk, Virgina 23464, at least two weeks in advance of starting work authorized by this permit. Alert the project manager of the anticipated start date of the authorized activity and the name and telephone number of all contractors or other persons performing the work. A copy of this permit and drawings must be provided to the contractor and kept on site at all times, available to any regulatory representative during an inspection of the project site.

2. The time limit for completing the work authorized ends on **June 17, 2024**. Should you be unable to complete the authorized activity in the time limit provided, you must submit your request for a time extension to this office for consideration at least one month before the permit expiration date.

3. Enclosed is a "compliance certification" form, which must be signed and returned within 30 days of completion of the project, including any required mitigation. Your signature on this form certifies that you have completed the work in accordance with the permit terms and conditions.

4. Final Plans and specifications for authorized activities shall be submitted and approved by the Corps prior to initiation of the permitted activities.

5. **Pre-Construction Meeting**
   You are not authorized to begin clearing or construction activities in waters of the U.S. (including wetlands) associated with this permit until an on-site preconstruction conference is held to ensure that all affected parties fully understand the requirements of this permit. This meeting must be held prior to the start of land disturbance in wetlands and must be attended by you or a designated representative, your agent/consultant, the contractor, the contractor's foreman, and **Dan Bacon**, the Corps project manager for your permit. To arrange this meeting, contact **Dan Bacon at 757-201-7060.**

6. **Restoration of Temporary Access areas**

1) The soils of any temporary construction access areas located in wetlands that are cleared, grubbed, and/or filled, must be loosened by ripping or chisel plowing the soil surface to a depth of 8-12" once each access is no longer needed. The resulting grade shall be replanted with bare root native woody plants at a rate of 200 plants per acre. Acceptable woody plants include but are not limited to 2-4 of the following native species: wax myrtle (*Myrica cerifera*), red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), black willow (*Salix nigra*), black gum (*Nyssa sylvatica*), spicebush (*Lindera benzoin)* tag alder (*Alnus serrulata*), and green ash (*Fraxinus pennsylvanica*). Substitution of other native woody species is subject to Corps review and approval. This restoration work must be completed by June 17 2022.

2) If a project specific condition of this permit cannot be met, then you must apply for a permit modification. Any proposed permit modification will be coordinated with DEQ, USFWS, **locality**, and EPA Region III.

7. **Erosion and Sedimentation**:

1) Strict sediment and erosion control measures consistent with those contained in the standards and criteria of the current Virginia Sediment and Erosion Control handbook shall be used. The disposal site for any excavated material as part of the project shall be located in a non-wetland area and shall be retained using silt fences and staked hay bales and/or other measures consistent with the Virginia Sediment and Erosion Control handbook.

8. **Time of Year Restrictions**

1) You have completed Section 7 formal consultation for the Piping plover (Charadrius melodus), Red knot (Calidris canutus rufa), and Loggerhead sea turtle (Caretta caretta) with the U.S. Fish and Wildlife Service (Service). In order to meet requirements for Endangered Species Act for this permit, you have agreed to adhere to the Terms and Conditions found in the Service's Biological Opinion dated June 7, 2019 (attached).

9. **Beach Nourishment**

a) When the work authorized herein includes periodic maintenance beach nourishment, it may be performed under this permit for **five** years from the date of issuance of this permit. You must advise this office in writing, at least two weeks before you start maintenance beach nourishment activities under the authority of this permit.

b) This permit does not authorize any double handling of material in waters and/or wetlands.

c) No beach nourishment may begin until an on-site pre-beach nourishment conference is held to ensure all affected parties fully understand the requirements of the permit, and to inspect the disposal site(s). This meeting will be held prior to the start of beach nourishment, but after the disposal site(s) have been prepared and all erosion and sedimentation controls are in place. The meeting must be attended by you or your representative, the contractor, the contractor's foreman, DEQ, and Dan Bacon, the Corps project manager for your permit. To arrange this meeting, contact at **(757) 201-7060** at least 15 days prior to the proposed meeting date. The dewatering area, disposal site, and erosion and sedimentation controls must be in compliance with the permitted plans prior to the commencement of beach nourishment.

d) Within 30 days of completion of the beach nourishment, a post hydrographic survey, prepared by a state-certified engineer or surveyor, must be provided to the Corps. Within 30 days of completion of the beach nourishment, an as-built survey, prepared by a state-certified engineer or surveyor, must be provided to the Corps. The hydrographic survey should reference a local tidal or geodetic datum.

General Conditions:

1. If you discover any previously unknown historic or archaeological remains while accomplishing the activity authorized by this permit, you must immediately stop work and notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

2. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit.

3. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

4. No discharge of dredged or fill material may consist of unsuitable material (e.g.: trash, debris, car bodies, asphalt etc.) and material discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

5. Any temporary fills must be removed in their entirety and the affected areas returned to their preexisting elevation.

6. Appropriate erosion and siltation controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well

as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date.

7. The construction or work authorized by this permit will be conducted in a manner so as to minimize any degradation of water quality and/or damage to aquatic life. Also, you will employ measures to prevent or control spills of fuels or lubricants from entering the waterway.

8. Any heavy equipment working in wetlands other than those permitted for permanent impact must be placed on mats or other measures must be taken to minimize soil disturbance.

9. Failure to comply with the terms and conditions of this permit can result in enforcement actions against the permittee and/or contractor.

10. In granting an authorization pursuant to this permit, the Norfolk District has relied on the information and data provided by the permittee. If, subsequent to notification by the Corps that a project qualifies for this permit, such information and data prove to be materially false or materially incomplete, the authorization may be suspended or revoked, in whole or in part, and/or the Government may institute appropriate legal proceedings.

11. All dredging and/or filling will be done so as to minimize disturbance of the bottom or turbidity increases in the water which tend to degrade water quality and damage aquatic life.

12. Your use of the permitted activity must not interfere with the public's right to reasonable navigation on all navigable waters of the United States.

13. The permittee understands and agrees that if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army of his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required upon due notice from the Corps of Engineers to remove, relocate, or alter the structural work or obstructions caused thereby without expense to the United States. No claim shall be made against the United States on account of any such removal or alternation.

14. The following condition should be used for every permit where residual wetlands remain in the project site in order to put a subsequent purchaser or owner of property on notice of permit conditions: You must take the actions required to record this permit (and the associated project drawings, showing any residual wetlands) with the Registrar of Deeds or other appropriate official charged with the responsibility for maintaining records of title to or interest in real property.. A copy of the recorded permit with deed book and page number stamped on it shall be

provided to this office within 30 days of the countersignature of the permit by the Corps.

Further Information:

1. Limits of this authorization:
   a. This permit does not obviate the need to obtain other Federal, state or local authorizations required by law.
   b. This permit does not grant any property rights or exclusive privileges.
   c. This permit does not authorize any injury to the property or rights of others.
   d. This permit does not authorize interference with any existing or proposed Federal projects.

2. Limits of Federal Liability: In issuing this permit, the Federal Government does not assume any liability for the following:
   a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.
   b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.
   c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.
   d. Design or construction deficiencies associated with the permitted work.
   e. Damage claims associated with any future modification, suspension, or revocation of this permit.

3. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

4. Reevaluation of Permit Decision: This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:
   a. You fail to comply with the terms and conditions of this permit.
   b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 3 above).
   c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

   Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

5. Extensions: Project Specific Condition #2 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as a permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

(Permittee)

7/8/19
(Date)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Patrick V. Kinsman, PE
Colonel, U.S. Army
Commanding

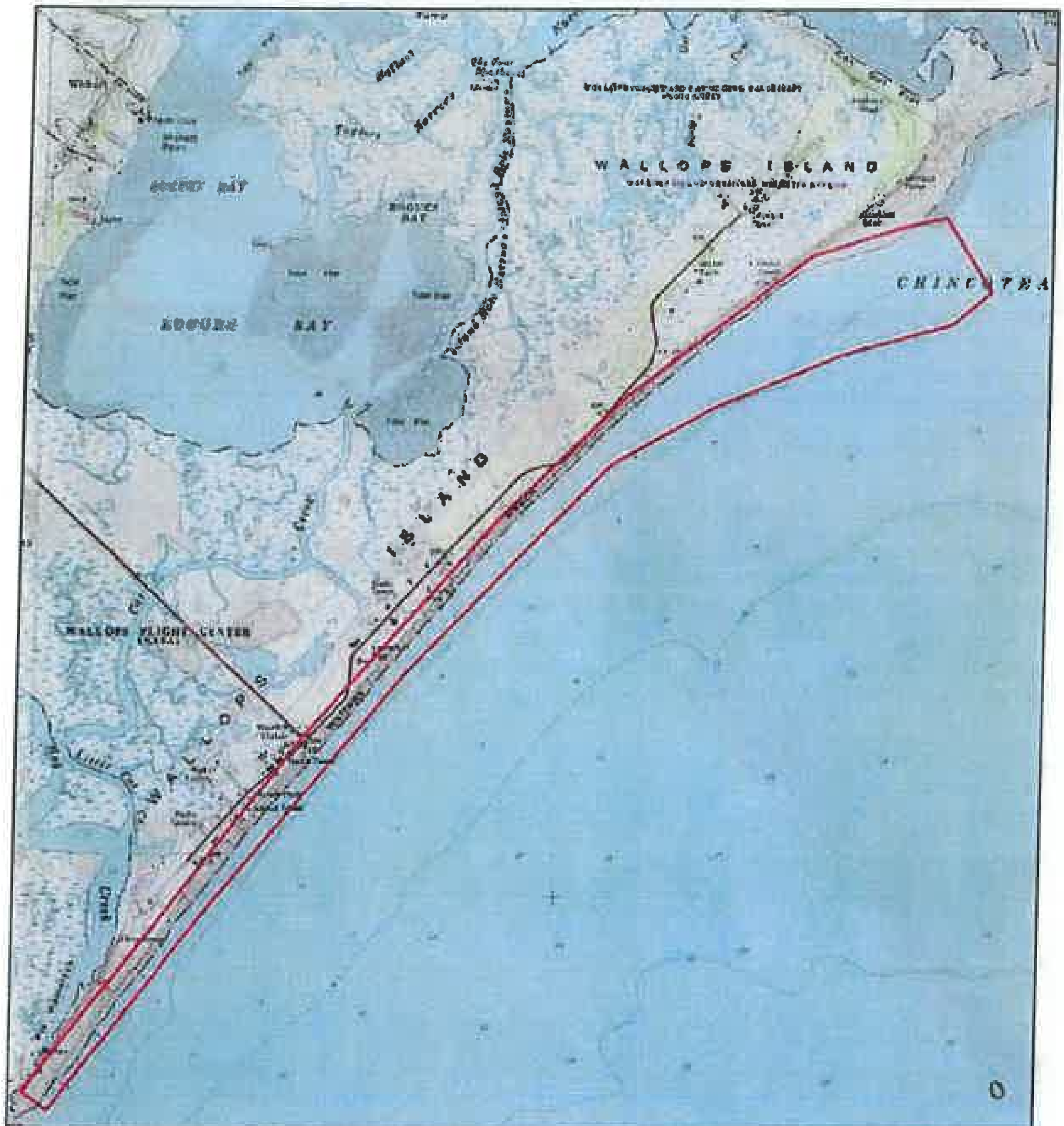
(Date)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

____
(Transferee)

____
(Date)

USACE Norfolk District Regulatory
October 9, 2018 - Recd by DGM



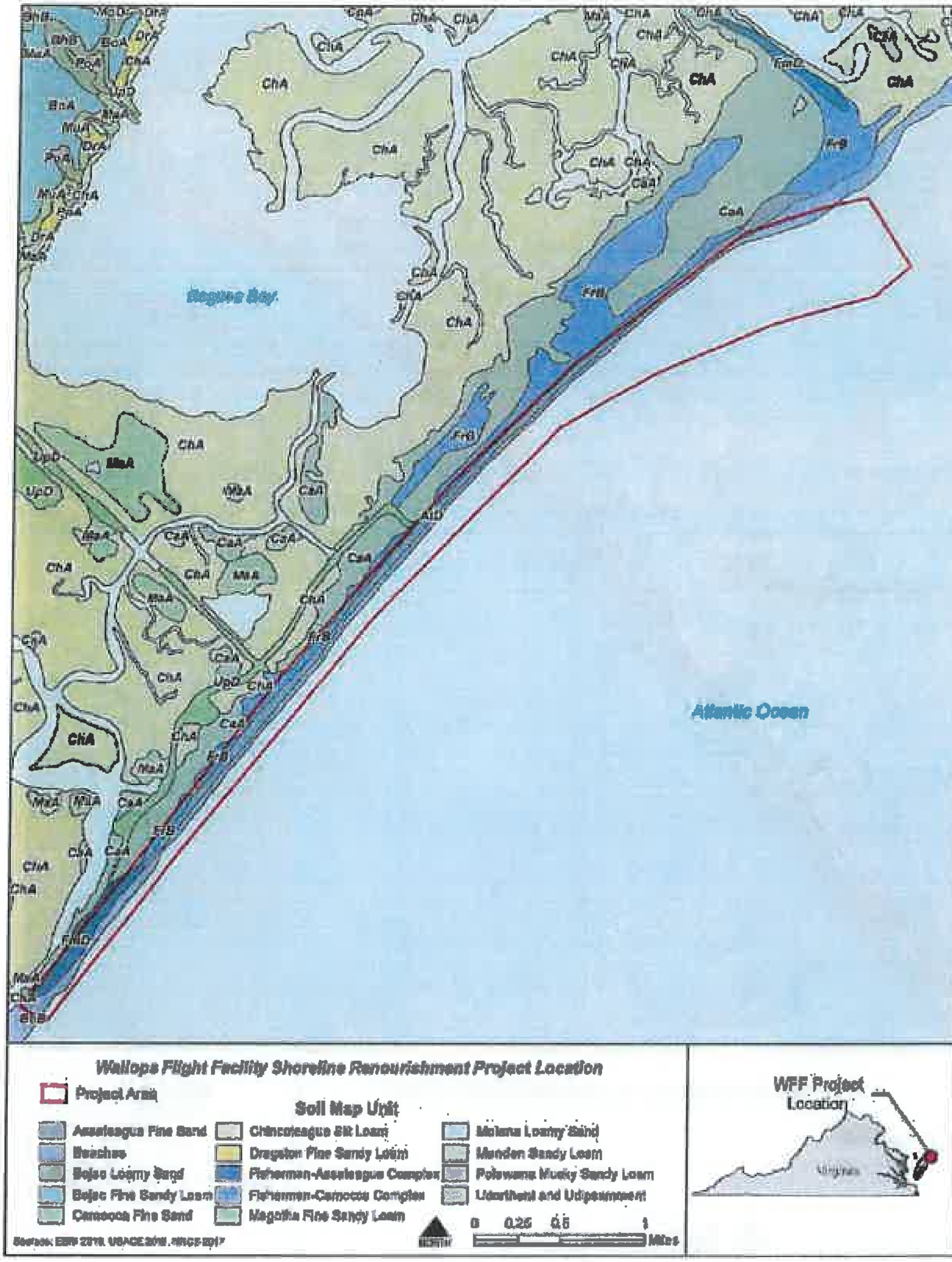
Wallops Flight Facility Shoreline Renourishment Project Location

Project Area

0 0.25 0.5 1 Miles

NORTH

USACE Norfolk District Regulatory
October 9, 2018 - Recd by DGM

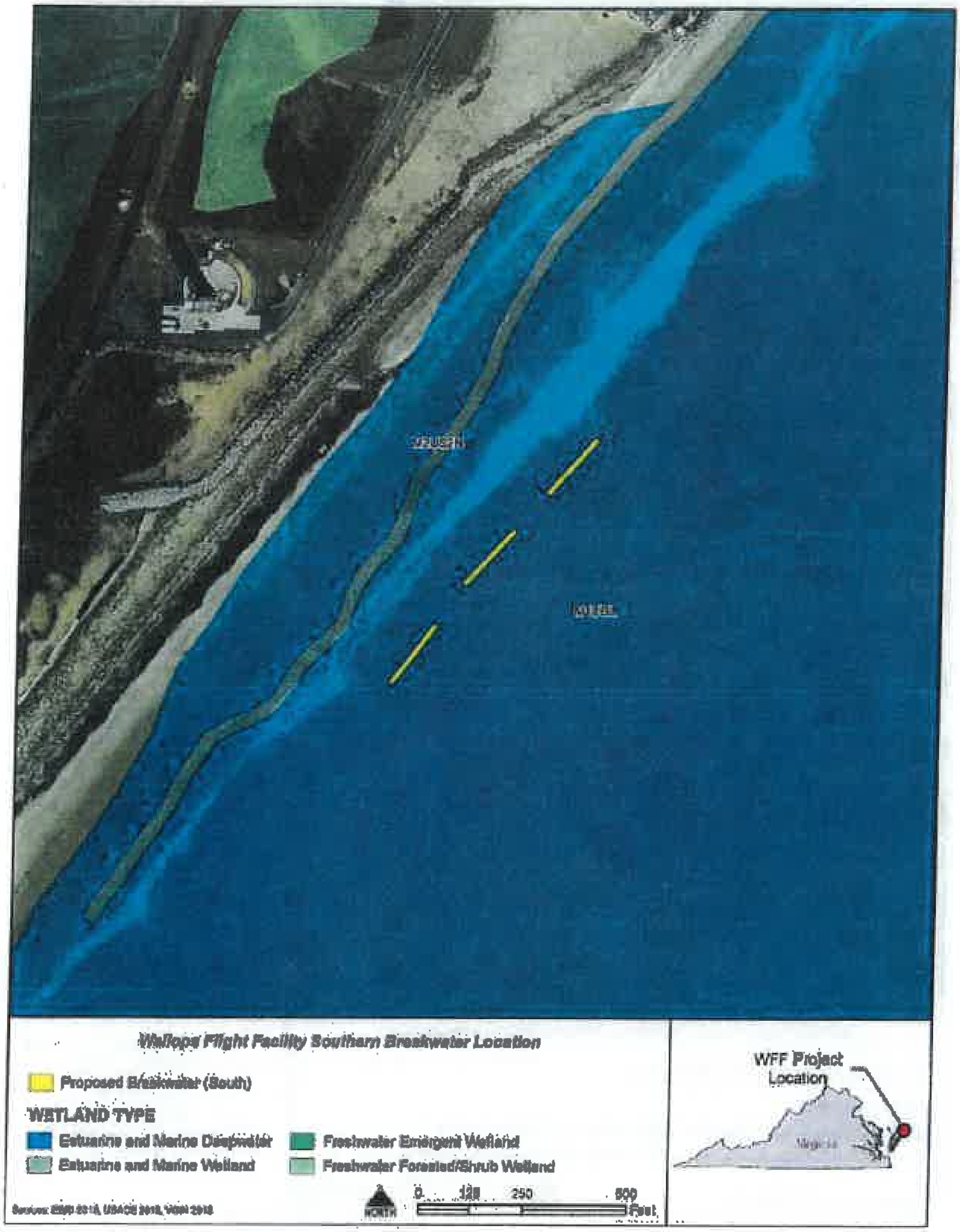


NASA WFF Shoreline Enhancement & Restoration Project 3 of 19

USACE Norfolk District Regulatory
October 9, 2018 - Recd by DGM


Wallops Flight Facility Northern Breakwater Location
Proposed Breakwater (North)
WETLAND TYPE
Estuarine and Marine Deepwater
Freshwater Emergent Wetland
Estuarine and Marine Wetland
Freshwater Forested/Shrub Wetland
NORTH
0 125 250 500
Feet
WFF Project Location
Virginia

USACE Norfolk District Regulatory
October 9, 2018 - Recd by DGM



USACE Norfolk District Regulatory
October 9, 2018 - Recd by DGM

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October 9, 2018 - Recd by DGM

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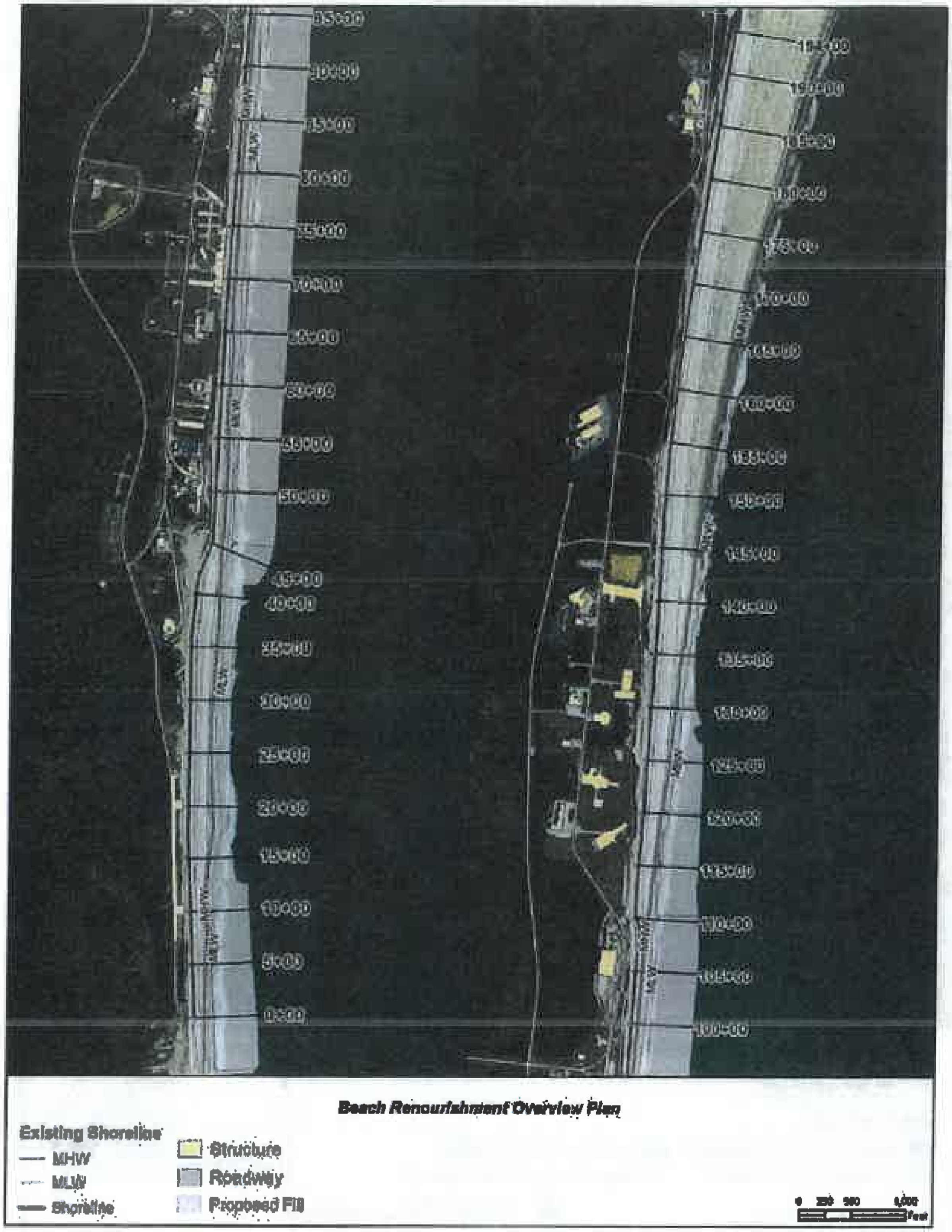
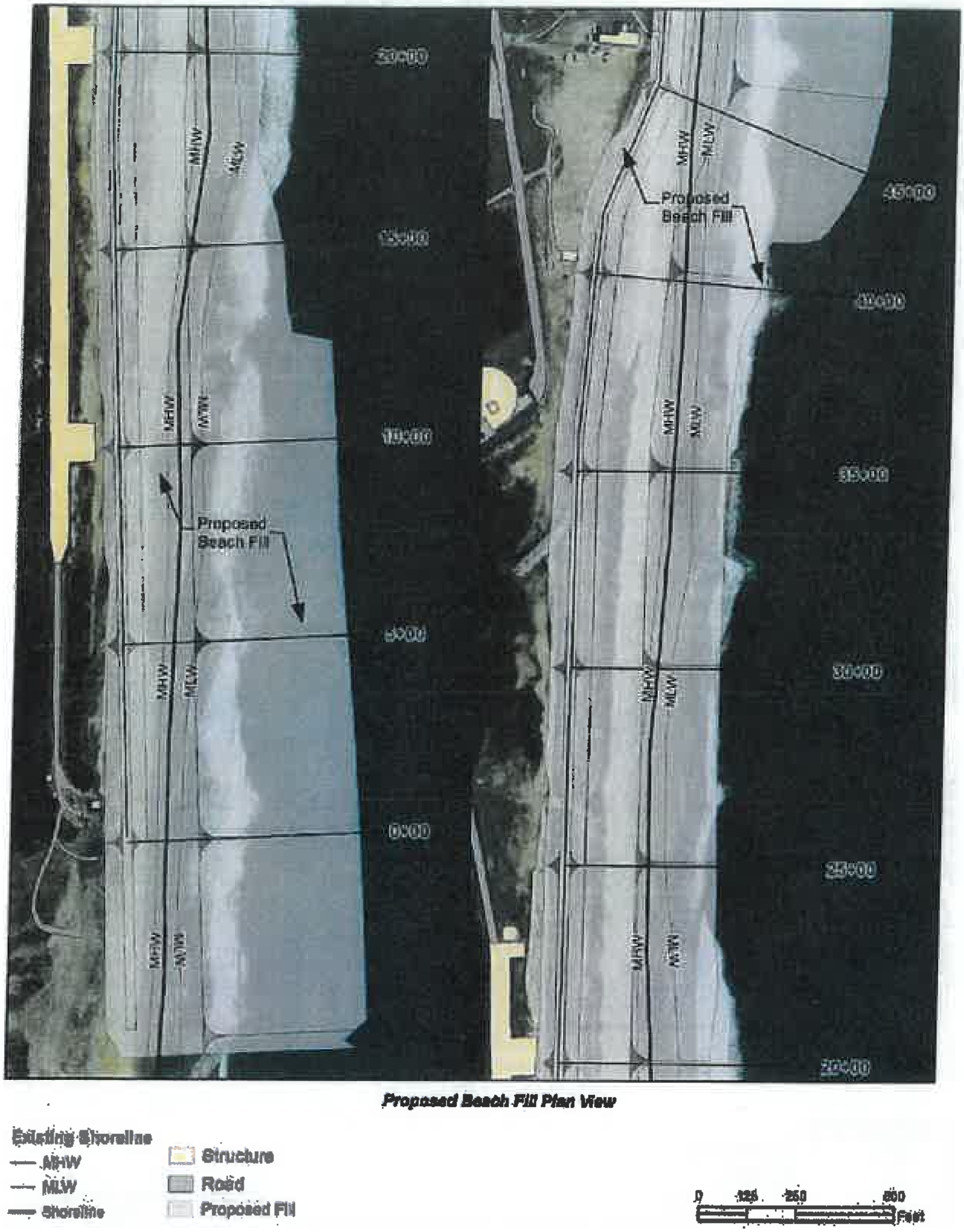
October 9, 2018 - Recd by DGM



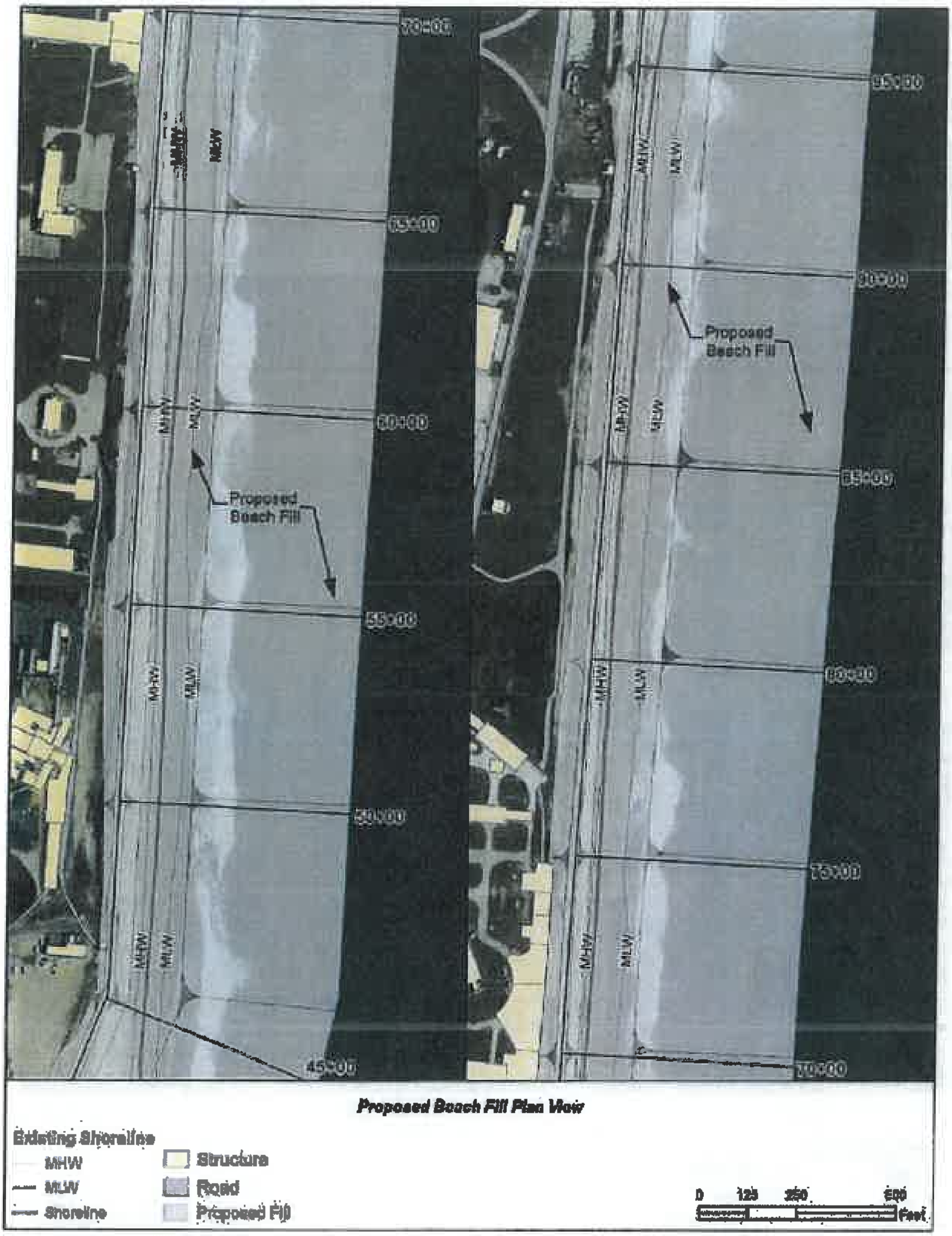
NASA WFF Shoreline Enhancement & Restoration Project 9 of 18

USACE Norfolk District Regulatory
October 9, 2018 - Recd by DGM



Proposed Beach Fill Plan View

USACE Norfolk District Regulatory
October 9, 2018 - Recd by DGM



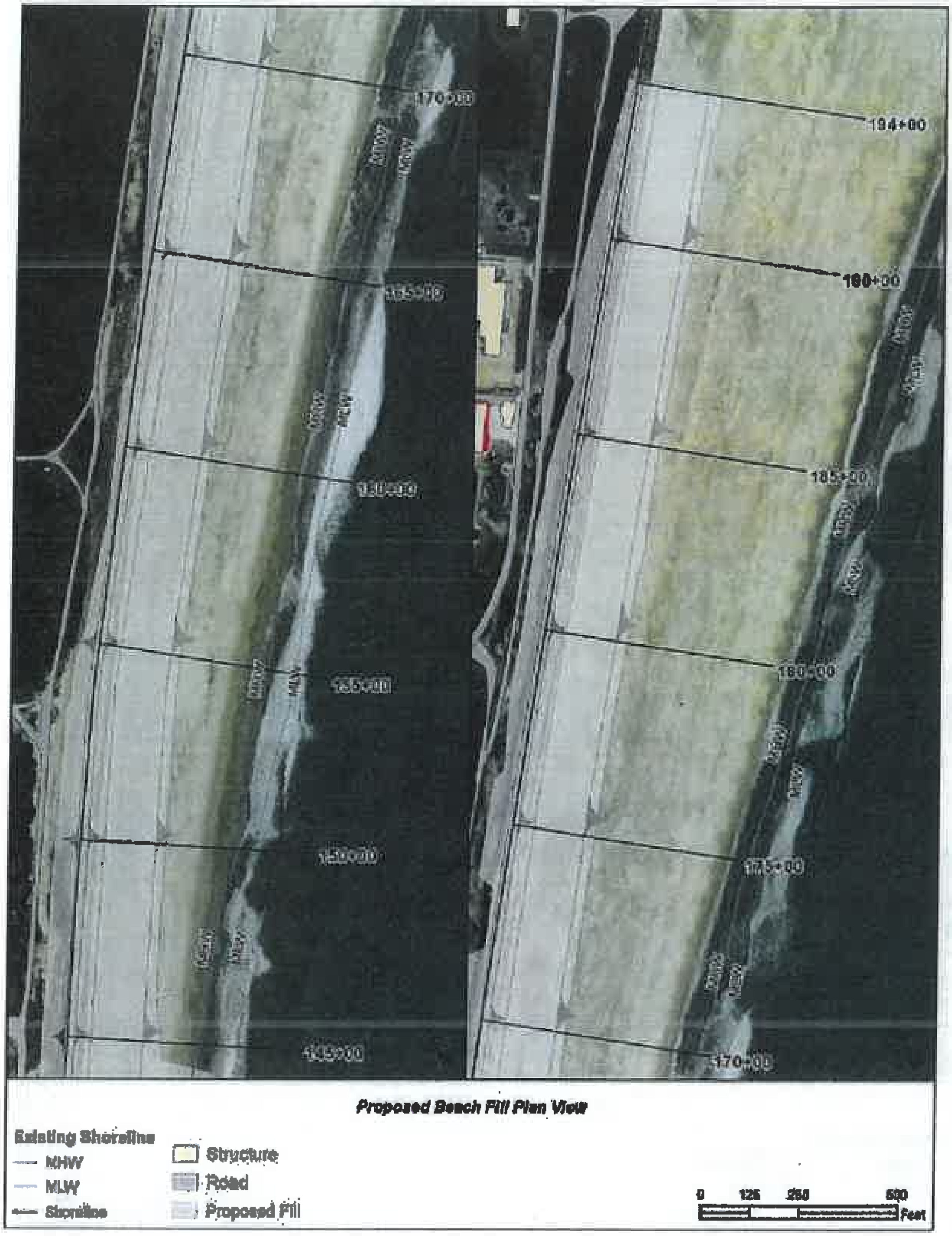
Proposed Beach Fill Plan View

NASA WFF Shoreline Enhancement & Restoration Project 11 of 18

USACE Norfolk District Regulatory
October 9, 2018 - Recd by DGM

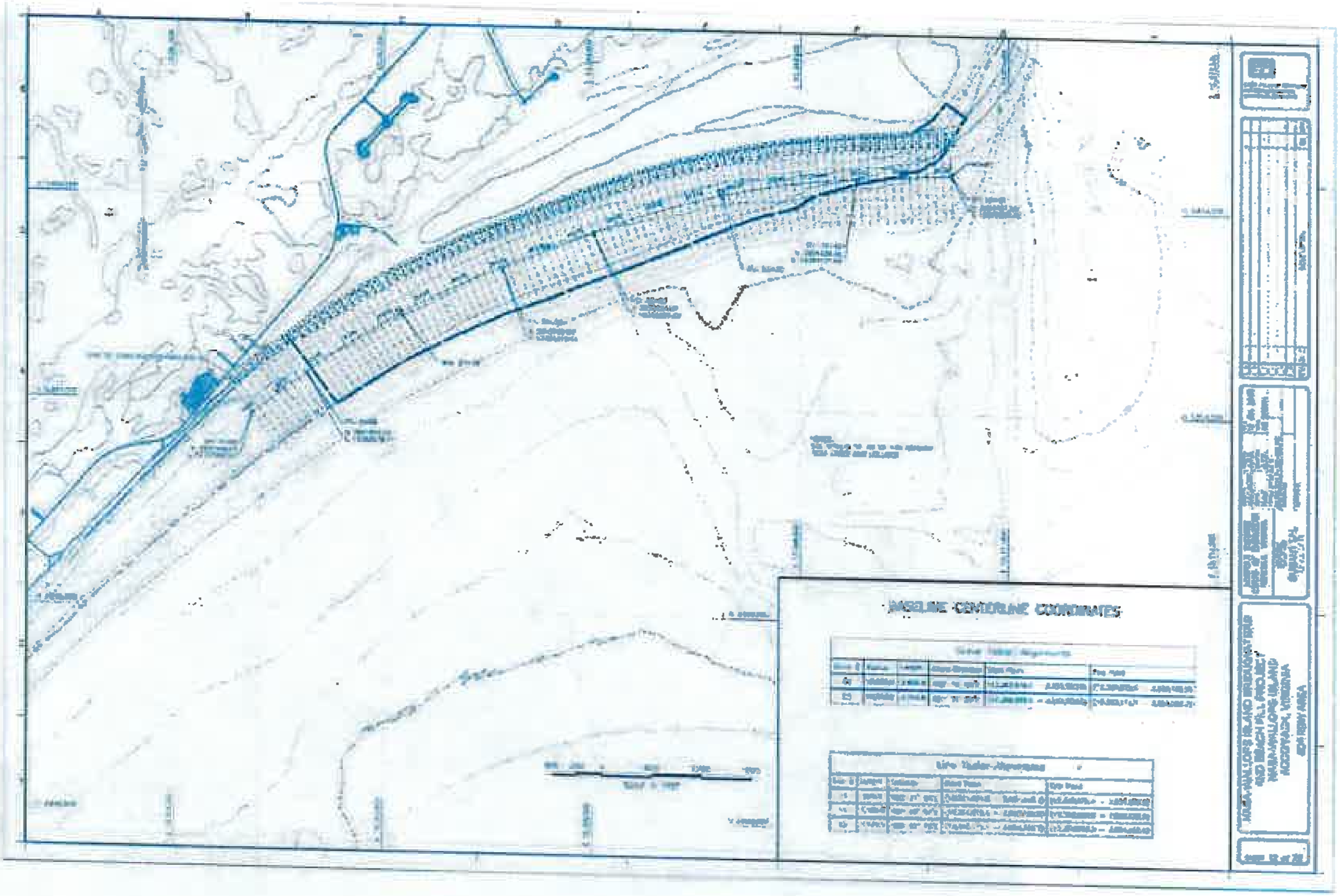
NASA WFF Shoreline Enhancement & Restoration Project 12 of 18

USACE Norfolk District Regulatory
October 9, 2018 - Recd by DGM



NASA WFF Shoreline Enhancement & Restoration Project 13 of 18

USACE Norfolk District Regulatory
October 9, 2018 - Recd by DGM



NASA WFF Shoreline Enhancement & Restoration Project 14 of 18

USACE Norfolk District Regulatory
October 9, 2018 - Recd by DGM

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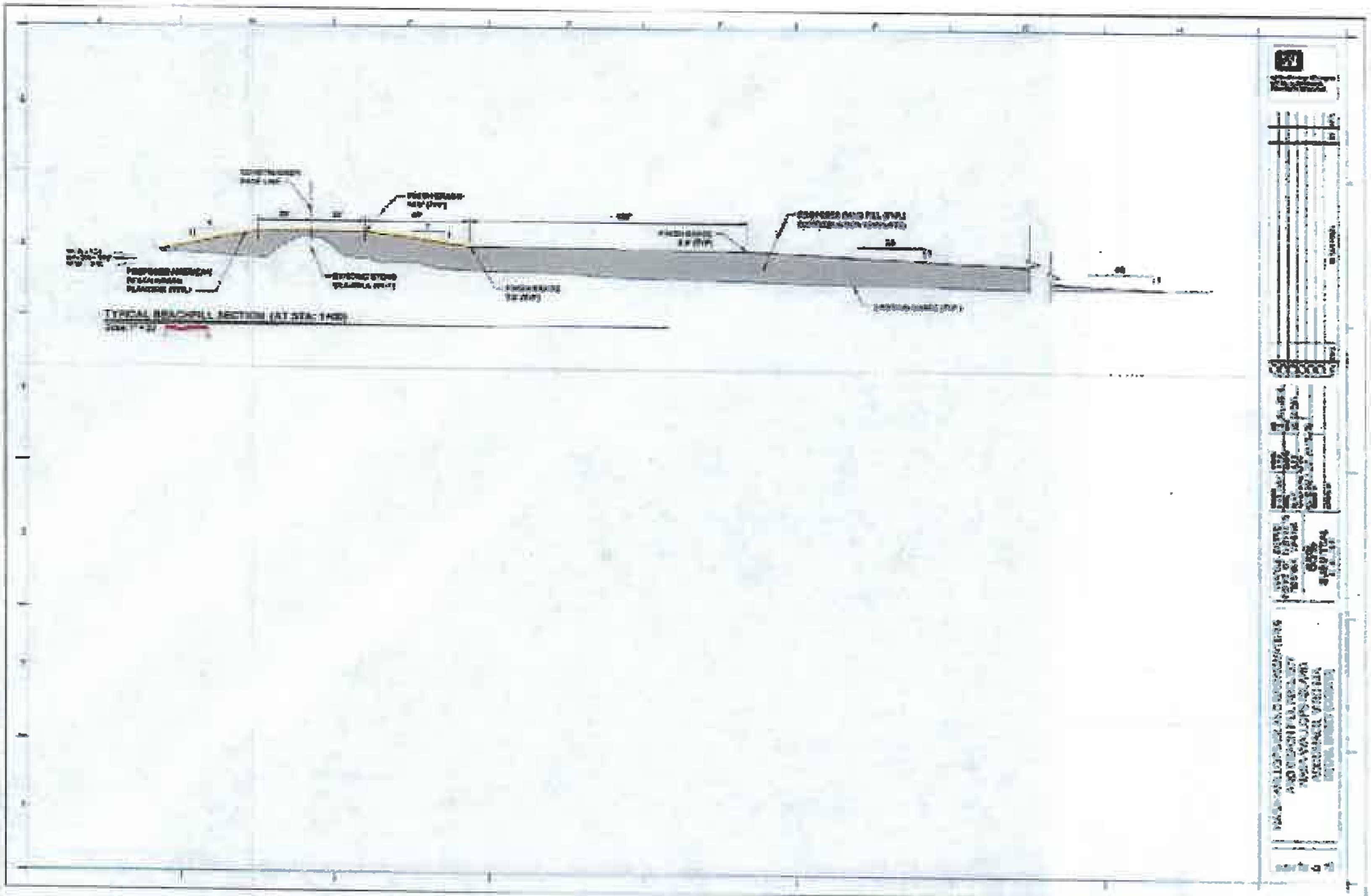

USACE Norfolk District Regulatory
October 9, 2018 - Recd by DGM

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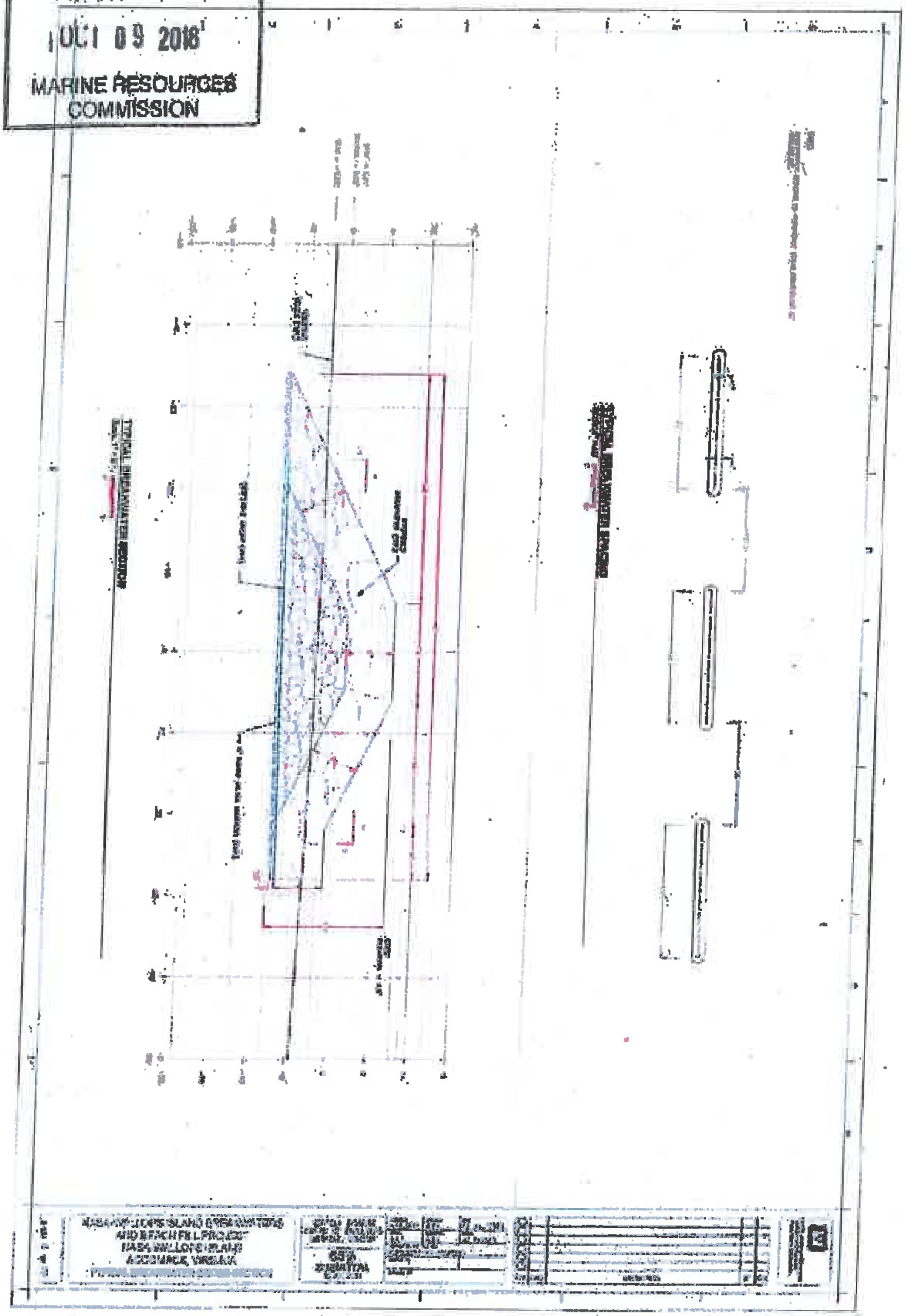
NASA WFF Shoreline Enhancement & Restoration Project 18-[illegible]



NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: NASA/Goddard Space Flight Center/Wallops Flight Facility		File Number: 2018-0834	Date: 7/2/2019
Attached is:			See Section below
X	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)		A
	PROFFERED PERMIT (Standard Permit or Letter of permission)		B
	PERMIT DENIAL		C
	APPROVED JURISDICTIONAL DETERMINATION		D
	PRELIMINARY JURISDICTIONAL DETERMINATION		E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/appeals.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you only have questions regarding the appeal process you may also contact: Mr. James W. Haggerty Regulatory Program Manager (CENAD-PD-OR) U.S. Army Corps of Engineers Fort Hamilton Military Community 301 General Lee Avenue Brooklyn, New York 11252-6700 Telephone number: 347-370-4650

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.		
Signature of appellant or agent.	Date:	Telephone number:

U.S. Army Corps
Of Engineers
Norfolk District

CERTIFICATE OF COMPLIANCE
WITH
ARMY CORPS OF ENGINEERS PERMIT

Permit Number: NAO-2018-1590
VMRC Number: 18-0834

Corps Contact: Dan Bacon

Name of Permittee: NASA/Goddard Space Flight Center/Wallops Flight Facility

Date of Issuance: July 2, 2019

Permit Type: Standard Permit

Within 30 days of completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the following address:

US Army Corps of Engineers - Norfolk District
CENAO-WR-R
Attn: Dan Bacon
803 Front Street
Norfolk, VA 23510-1096

Or scan and send via email to danny.r.bacon@usace.army.mil

Please note that your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification or revocation.

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and conditions of the said permit, and required mitigation has been completed in accordance with the permit conditions.

_______________________________ _______________________________
Signature of Permittee Date

June 7, 2019

Ms. Shari Miller
Lead, Environmental Planning
Code 250.W
Wallops Flight Facility
Wallops Island, VA 23337

Re: Wallops Flight Facility Update and Consolidation of Existing Biological Opinions, Accomack County, VA, Project # 2015-F-3317

Dear Ms. Miller:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (Opinion) based on our review of the referenced project and its effects on the federally listed threatened piping plover (*Charadrius melodus*) (plover), red knot (*Calidris canutus rufa*) (knot), and loggerhead sea turtle (*Caretta caretta*) Northwest Atlantic Ocean distinct population segment (DPS) (loggerhead), in accordance with section 7 of the Endangered Species Act (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA). Your request to reinitiate formal consultation was received on December 18, 2018.

This Opinion is based on information provided in the National Aeronautics and Space Administration's (NASA) December 14, 2018 Shoreline Enhancement and Restoration Project (SERP) biological evaluation (BE); December 7, 2018 Draft NASA Wallops Flight Facility (WFF) SERP Environmental Assessment (EA); telephone conversations; field investigations; and other sources of information. The consultation history is located after the Literature Cited. A complete administrative record of this consultation is on file in this office.

This Opinion expires 15 years from the date of signature.

We concur with the NASA determination that the federally listed threatened northern long-eared bat (*Myotis septentrionalis*) is not likely to be adversely affected by the proposed action with the application of the proposed avoidance and minimization measures in the August 18, 2015 reinitiation and consolidation request letter are followed, with the exception of the removal of identified roost trees. If identified roost trees are proposed for removal at any time, additional consultation may be required on a project-by-project basis. The northern long-eared bat will not be considered further in this Opinion.

The BE included a request for Service concurrence with "not likely to adversely affect" determinations for certain listed resources. NASA determined the proposed action is not likely to adversely affect the federally listed endangered roseate tern (*Sterna dougalii dougalii*), hawksbill sea turtle (*Eretmochelys imbricata*), leatherback sea turtle (*Dermochelys coriacea*), and Kemp's ridley sea turtle (*Lepidechelys kempii*), and federally listed threatened green sea turtle (*Chelonia mydas*) North Atlantic DPS or seabeach amaranth (*Amaranthus pumilius*). We concur with your determination because the species are unlikely to be present or have not been identified in the area during annual monitoring.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

As defined in the ESA section 7 regulations (50 CFR 402.02), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas."

This Opinion serves 2 purposes: (1) provide an Opinion on the proposed SERP and (2) consolidate activities described in the 2016 Wallops Flight Facility Update and Consolidation of Existing Biological Opinions (Service 2016), that have not have changed, into a single Opinion. The following is a summary of the activities that are part of the proposed action requiring reinitiation. All other activities described the Service's 2016 Opinion will remain the same. For ease of reference and readability, information from the Service's 2016 Opinion is provided without edits throughout most of this document, but in some places has been edited for consistency with the actions resulting in reinitiation.

A detailed description of the proposed activities requiring reinitiation can be found in the 2010 Final Shoreline Restoration and Infrastructure Protection Program (SRIPP) Programmatic Environmental Impact Statement (renourishment component of Alternative 1), reexamined in the 2013 Final Post-Hurricane Sandy EA, and described in the SERP EA and SERP BE. NASA is funding the excavation, or "backpass," of approximately 1.3 million cubic yards (MCY) of sand sourced from the north Wallops Island beach to renourish and restore approximately 19,000 linear feet (ft) of shoreline. Additionally, NASA is funding construction of a series of parallel breakwaters approximately 200 ft offshore from the renourished shoreline.

To minimize impacts to knots, plovers, and loggerheads, sand excavation on north Wallops Island will not begin until after the last plover chick has fledged or the last loggerhead has hatched, whichever is later. Sand will continue to be excavated, transported south, and used to renourish the south and mid-island until the fill design template has been met (1.3. MCY of sand has been excavated and redistributed). Work is anticipated to take 6-9 months to complete and depending on the start date, the work may overlap with the arrival and/or nesting of the species in the following year. NASA is planning to renourish every 2-7 years, but the use of backpassing for renourishment is not expected for another 10 years and an offshore shoal will be used for interim renourishments.

Starting March 15 of each year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting plovers and sea turtles. Any nests discovered will be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status and the need to suspend work activities within 1,000 ft of a nest until chicks have fledged and/or sea turtles have hatched.

Establishment of upland areas for equipment and material staging will be discussed with the contractor may be discussed daily, depending on where they are working.

Proposed SERP Activities

Backpassing – The borrow area will be located on NASA property on the northern end of Wallops Island. During excavation, a pan excavator will remove sand from approximately 200 acres (ac) of north Wallops Island beach to the mean low water (MLW) line (Figure 1). The average excavation depth will be 2.35 ft. Sand excavation will impact approximately 169 ac of land above mean high water (MHW), and 31 ac of land seaward of MHW to provide the required volume for the proposed renourishment. Sand will be loaded onto dump trucks for transport to the southern end of the island and will be stockpiled on the southern end once enough beach has been built to accommodate the sand. Trucks will use existing access roads to gain entry to the beach and no new roads will be constructed.

Figure 1. Proposed borrow area, North Wallops Island beach.

Renourishment – Bulldozers will be used to spread the fill material once it is placed on the beach. All heavy equipment will access the beach from existing roads and established access points. No new temporary or permanent roads will be constructed to access the beach or to transport the fill material to renourishment areas. The beach fill will start approximately 1,500 ft north of the Wallops Island-Assawoman Island property boundary and extend north for approximately 3.7 miles (mi) (Figure 2 and 3). The initial fill will be placed to construct a 6 ft high berm extending a minimum of 70 ft seaward of the existing seawall. Remaining fill will slope seaward at varying distances along the length of the renourishment area. Beach renourishment activities may occur year-round. American beach grass (*Ammophila breviligulata*, cultivar "Cape") will be planted at 18 inch (in) intervals over the re-established dune. Plants will be installed between October 1 and March 31. The planting area will be approximately 150 ft wide along the entire length of the newly created dune in the beach renourishment area.

Figure 2. Proposed renourishment area.

Breakwaters – Six rubble mound breakwaters will be constructed in 2 sets of 3, each approximately 200 ft offshore from the MHW line of the renourished beach in the shoreline infrastructure protection area (Figures 3 and 4). Water depth in these areas is approximately 4-8 ft. Each breakwater will be constructed of Virginia Department of Transportation Type I armor stone (1,500-4,000 pounds [lbs]) for the outer layer and Class II Stone (150-499 lbs) for the core layer. All breakwaters will be placed parallel to the shore and measure approximately 130 ft long and 10 ft wide at top crest elevation. The breakwaters will be approximately 100 ft apart from each other. The southernmost set of 3 breakwaters will begin approximately 4,000 ft north of the southern extent of beach nourishment. The second set of 3 breakwaters will be constructed approximately 10,000 ft north of the southern extent of beach nourishment. The rocks for constructing each breakwater may be transported to the WFF area by barge and placed in the water using heavy lifting equipment.

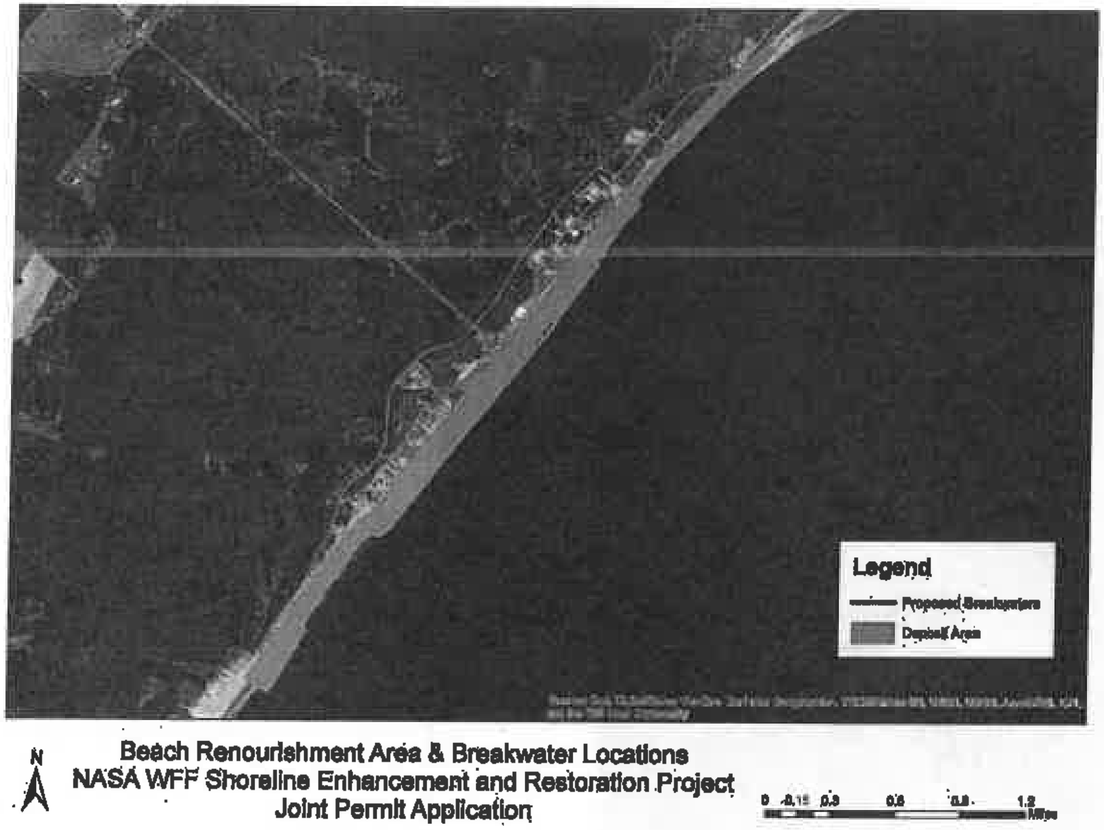


Figure 3. Breakwater and renourishment area overlap.

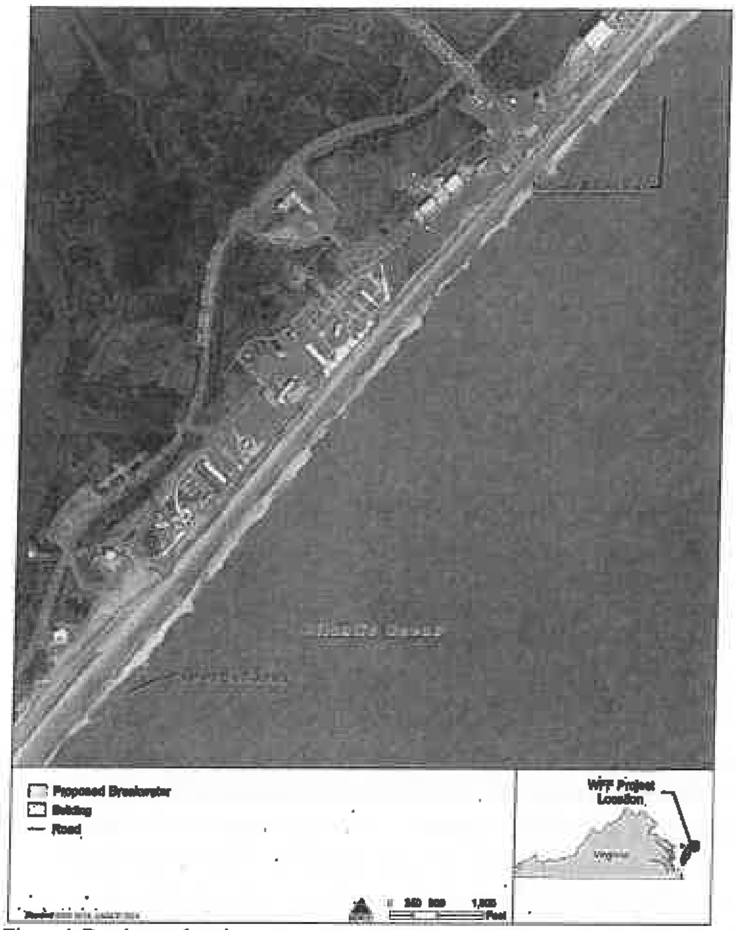


Figure 4. Breakwater locations.

Activities remaining unchanged from Service's 2016 Opinion are summarized in Table 1 and detailed below. The action of Beach Renourishment and Long-term Project Maintenance includes some activities that remain unchanged, described in subsequent paragraphs, while the altered activities have been described in earlier paragraphs in this Opinion.

Table 1. Ongoing launch operations and SRIPP at WFF.

Action	Location	Frequency	Time of Year	Time of Day
Liquid Fueled Expendable Launch Vehicle (ELV) Launches	Pad 0-A	6/year	Year-round	Either
Solid Fueled ELV launches	Pad 0-B	12/year	Year-round	Either
ELV Static Fires	Pad 0-A	2/year	Year-round	Either
Sounding Rocket Launches	Current: Pad 1 and Pad 2 Future: Pad 2 and south Unmanned Aircraft System (UAS) airstrip flat pad	60/year	Year-round	Either
Sounding Rocket Static Fires	Pad 2	33.5 tons double base & 38.3 tons composite propellants/12-month period	Year-round	Either
Disposal of Defective or Waste Rocket Motors	Open Burn Area, south Wallops Island		Year-round	Either
Drone Target Launches	Pad 1, 2, 3 or 4	30/year	Year-round	Either

UAS Flights	Wallops Main Base, South Wallops Island, North Wallops Island	75 missions/week	Year-round	Either
Piloted Aircraft Flights	Wallops Main Base and adjacent airspace	61,100 operations/year	Year-round	Either
Restricted Airspace Expansion	Main Base, Wallops Island, and adjoining airspace	No change in type or tempo or aircraft activity	Year-round	Either
Range Surveillance/Facility Security	Wallops Island	N/A	Year-round	Either
Construction	Wallops Island	N/A	Year-round	Either
Routine Facility Maintenance	Wallops Main Base, Wallops Island	As needed	Year-round	Day
Launch Pad Lighting	Wallops Island	30 days/launch	Year-round	Night
Recreational/ Off-road Vehicle (ORV) Beach Use	Wallops Island	N/A	Year-round	Day
Protected Species Management	Wallops Island	N/A	Spring and Summer	Day
Miscellaneous Activities on Wallops Island Beach	Wallops Island	As needed	Year-round	Day
Education Use of Wallops Island Beach	Wallops Island	Several trips/week	Year-round	Day
Seawall Repair	Wallops Island	As needed	Year-round	Day
Shoreline Reconstruction Monitoring	Wallops Island	2/year	August – October and March-May	Day
Beach Renourishment and Long-term Project Maintenance	Wallops Island	Every 2-7 years	Year-round	Day

Ongoing Launch Operation Activities

Liquid and Solid Fueled ELV Launches and Static Fires – ELVs are launched from Launch Complex 0 at the south end of Wallops Island, between the southernmost extent of the sea wall and the UAS runway. Pad 0-B is topped with a permanent gantry. A transporter erector launcher raises and launches rockets from Pad 0-A. Both launch pads are illuminated with broad spectrum night lighting for up to several weeks on either side of the launch window; effectively resulting in up to 30 calendar days of night lighting per launch event. Exhaust ports on each launch pad direct rocket motor exhaust to the east, across a narrow strip of steep sandy beach and over the Atlantic Ocean. Launches from either pad may occur at any time of day, on any day of the year, as dictated by weather conditions and program needs.

Rockets launched from Pad 0-B use solid fuel systems based on an ammonium perchlorate/aluminum (AP/AL) or nitrocellulose/nitroglycerine (NC/NG) combination. Many classes of rockets may be launched from this site, the largest of which will be equivalent to the LMLV-3(8). Rockets launched from Pad 0-A will use liquid fuel systems with refined petroleum or liquid methane and liquid oxygen as propellants, thus requiring liquid nitrogen prior to launch for cooling the propellants, and gaseous helium and nitrogen as pressurants and purge gases. The largest vehicle proposed to launch from Pad 0-A will be Orbital ATK's Antares 200 Configuration ELV. Orbital rockets deliver spacecraft into orbit that may utilize hypergolic propellants.

The Antares 200 Configuration ELV employs 2 NPO Energomash provided RD-181 engines, which also use liquid oxygen and refined petroleum as propellants. These motors will be more powerful (up to 17 percent more thrust at sea level) than the previous AJ-26 engines and consequently will allow for a heavier payload to be placed into orbit. The Antares 200 Configuration also utilizes modifications to valves and piping in the first stage fuel feed system, modifications to structural and thermal components in the first stage, and changes to avionics and wiring, and requires slightly different ground support equipment (used to handle and test rocket components) and fueling infrastructure. The Antares 200 Configuration will be launched from Pad 0-A, with up to 6 launches per year, and 2 static test fires per year.

Sounding Rocket Launches – Sounding rockets are currently launched from 2 launch pads in the vicinity of Launch Pad 1 and 2. In the future, sounding rockets will be launched from 2 launch pads in the vicinity of Launch Pad 2 and the south UAS airstrip flat pad. These launch pads are topped with mobile shroud sheds rather than gantries, and temporary rail launchers are used to orient the rockets for launch. Sounding rockets do not have a long loiter time on the launch pad after ignition, therefore these launch pads are not equipped with exhaust ports. Many classes of sounding rockets are used at these sites, the largest of which is the Black Brant XII burning 3,350 kilograms (kg) of solid propellant. Propellants used are based on an AP/AL or NC/NG combination. Sounding rockets do not deliver spacecraft into orbit, and therefore do not carry hypergolic propellants. As many as 60 sounding rockets are launched per year, at any time of day, on any day of the year, as dictated by weather conditions and mission needs.

Sounding Rocket Motor Static Fire Testing – NASA performs sounding rocket motor static fire tests so that motor operations can be observed in a non-flight position. Rocket motors may be static test fired from either a horizontal or vertical position. WFF has been authorized by the Virginia Department of Environmental Quality Air Division to perform static fire tests on solid propellant sounding rocket motors from Pad 2. The envelopes for static fire tests are governed by the limits set forth in the Wallops Island State operating permit. Exhaust from static test firings will be directed through a trench and over the Atlantic Ocean. The deluge system used for orbital launches from Pad 0-A will be used to cool the launch pad and dampen vibration during static firing tests. Sounding rocket motor static fire testing encompasses 33.5 tons of double base and 38.3 tons of composite propellants over a 12-month period.

Disposal of Defective or Waste Rocket Motors – Defective or waste rocket motors are ignited at the open burn area south of the UAS runway on the south end of Wallops Island. Motors that cannot be returned to the manufacturer or repurposed for other projects are placed on a concrete pad or bolted to a subunit and ignited to burn off any stored propellant. Multiple motors can be consolidated into a single burn. Ash remaining after a burn is burned again or shipped off-site for disposal. The remaining motor casings are steam cleaned and disposed of as scrap metal. The water used for steam cleaning is captured and tested for toxins before disposal under a Virginia Department of Environmental Quality permit. The maximum amount of propellant to be disposed of per year at the open burn area for sounding rocket static fires and disposal of defective or waste rocket motors is 33.5 tons double base and 38.3 tons composite propellants. Burns are infrequent and have not approached the disposal permit limit.

Drone Target Launches – Drone targets are launched from WFF or air launched from military aircraft in support of U.S. Navy (Navy) missile training exercises. These targets use a variety of fuels, including liquids such as JP-5 jet fuel or hydrazine derivatives, or solid fuels such as AP/AL or NC/NG. Drones travel on preprogrammed flight paths and are engaged by shipboard interceptor systems over the Virginia Capes Operating Area (VACAPES OPAREA), with all debris from the intercept falling within the VACAPES OPAREA boundary. Drone flights may occur at any time of day, on any day of the year, as dictated by training needs and may occur up to 30 times per year.

UAS Flights – UAS are used at WFF in support of scientific missions. UAS flights may use the UAS runway on the south end of Wallops Island, between Pad 0-B and the open burn area, as well as the runways on the Main Base. The largest anticipated UAS that may be flown from the WFF Main Base runways will have engines and fuel capacity one-fifth those of a Boeing 757, though most are considerably smaller.

A new UAS airstrip is planned for construction on the north end of Wallops Island. When this airstrip is operational, the south Wallops Island airstrip will be decommissioned. UAS flown from the North Wallops Island UAS airstrip cannot exceed the noise generated by the Viking 300 or the size (in terms of physical size and quantities of onboard materials) of the Viking 400 (NASA 2012a). UAS operations are projected to occur at a frequency of 75 missions per week and will not exceed 1,040 sorties per year.

Piloted Aircraft Operations – Piloted aircraft use the runways on WFF Main Base. Aircraft using the runways range from small single propeller designs up to the Boeing 747, and include such military designs as the F-16 and F-18. Many of the airfield operations conducted at WFF include military pilot proficiency training that consists primarily of "touch-and-go" exercises in which the aircraft wheels touch down on the airstrip but the aircraft does not come to a complete stop. The U.S. Air Force, Air National Guard, U.S. Army, U.S. Coast Guard, and Navy conduct pilot proficiency training at WFF runways.

An airfield operation represents the single movement or individual portion of a flight in the WFF airfield airspace environment, such as 1 takeoff, 1 landing, or 1 transit of the airport traffic area. The baseline airfield operation level for WFF of 12,843 was established in 2004 using annual airfield operations data for that year with an envelope that included a 25 percent increase above the total. Since 2013, WFF's piloted aircraft operating envelope was increased to include an additional 45,000 operations. The current operating envelope is limited to 61,000 operations per year. Air traffic from Wallops Main Base flies over Wallops Island.

Restricted Airspace Expansion – NASA has requested the Federal Aviation Administration (FAA) grant additional Restricted Airspace such that NASA can conduct experimental aircraft test profiles with a lower risk of encountering non-participating aircraft. No changes are proposed to either the types of aircraft or the types and number of operations conducted within the airspace adjacent to WFF. Consistent with existing practices, aircraft operating within the new restricted airspace will be required to maintain at least a 2,000 ft altitude when operating above the Service's Chincoteague National Wildlife Refuge (CNWR).

Range Surveillance/Facility Security – In general, UH-1 helicopter surveillance flights occur twice per launch countdown and range in altitude from 200 ft above ground level (AGL) to 5,000 ft AGL. Each flight is approximately 2.5 hours in duration, with the helicopter's primary surveillance responsibility being the lagoon area between Wallops Island and the mainland Eastern Shore of Virginia; however, flights can range up to 1.15 mi offshore.

Contracted fixed wing radar surveillance aircraft operate the majority of the time at 15,000 ft AGL and remain within the VACAPES OPAREA airspace. Fixed wing spotter aircraft operate in the same area but their altitude varies between 500 ft and 15,000 ft AGL. The spotters spend less than 10% of their flight time below 1,500 ft; only descending to low altitudes to visually obtain a call sign from an intruding boat or get the attention of the crew. Most of the spotters fly for around 4 hours total; the radar planes fly between 4 and 5.5 hours per mission. A typical ELV mission requires 1-2 fixed wing surveillance aircraft.

Surface surveillance and law enforcement vessels can include up to 8 inboard- or outboard-powered boats, up to approximately 43 ft in length. Generally, the larger inboard vessels range between 10 and 12 knots (kt) cruising speed, whereas the small inboard vessels cruise between approximately 25 and 30 kt.

Navy and NASA facilities on Wallops Island are equipped with exterior lights at ground level, along catwalks, and at FAA mandated heights for aircraft orienteering. Security of facilities on Wallops Island is maintained by a private contractor. Individuals on foot or in vehicles tour the perimeter of Wallops Island, including the beach areas on the north and south end of the island. These patrols may be performed as often as deemed necessary to maintain base security. Security may transition from the current system of frequent roving patrols to a closed circuit television system. If the closed circuit surveillance system is installed, security officer beach access will be reduced to the minimum required to augment the cameras in providing facility security.

Construction – NASA is currently relocating the Wallops Island fire station adjacent to Navy Building V-024. Consistent with the external lighting employed on the Horizontal Integration Facility and Pad 0-A, the new fire station will employ long wavelength exterior lighting to reduce potential effects on nesting loggerheads and their hatchlings (Witherington and Martin 2003).

Routine Facility Maintenance – The operation of WFF requires continuing routine repairs and ongoing maintenance of buildings, grounds, equipment, aircraft, vehicles, laboratory equipment, and instrumentation. Existing infrastructure, such as roads and utilities are maintained on a regular basis to ensure their safety and operational capacity. Existing buildings also require ongoing maintenance. Buildings or utility systems may be rehabilitated or upgraded to meet specific project needs. Brush and trees may be removed to construct a new building, keep the airfield's clear airspace free of intrusions, maintain the facility's perimeter fence, manage wildlife, maintain radar and tower line of sight, or enhance operation of other radio frequency equipment. Routine repairs are often required after hurricanes or intense storms. NASA contractors use heavy equipment to clear roads and stormwater systems.

The boat dock at the north end of Wallops Island receives equipment such as rocket components that cannot be delivered to the island by truck. The existing access channel and boat basin will be maintained via dredging to a depth of 4 ft at low tide to accommodate deliveries at any time of day.

Launch Pad Lighting – During orbital and suborbital launch operations, bright, broad-spectrum area lighting is required. Observations of operations at both Pads 0-A and 0-B have shown that broad spectrum night lighting can be required for up to several weeks on either side of the launch window, effectively resulting in up to 30 calendar days of night lighting per launch event. During non-critical operations, the launch pad area will be illuminated by a combination of amber light emitting diode and low pressure sodium fixtures.

Recreational/ORV Beach Use – WFF personnel and their families are allowed to use the north end of Wallops Island for recreation outside of NASA operations periods. Recreational use may involve operation of vehicles on the beach, in addition to foot traffic. Users access the beach by the north Wallops Island ORV access. Beach access is year-round and is not expected to increase in frequency from the level previously considered. The northernmost extent of Wallops Island beach is closed to all recreational use from March 16 through August 31, or until the last plover chicks fledge (see Figure 10). The south end of Wallops Island is closed to recreational use year-round.

Protected Species Management – In accordance with its Protected Species Management Plan (NASA 2015a), NASA will continue to monitor Wallops Island beach for beach nesting species activity. Protected species management activities involve conducting frequent monitoring surveys, implementing area closures and posting signage, placing plover nest exclosures, and similar actions. Additional protective measures, including employee education, seasonal closure of the northernmost extent of Wallops Island beach, nest exclosures, and predator management will continue.

Miscellaneous Shoreline Activities – Occasional shoreline debris (biotic and abiotic) removal is necessary within all areas of Wallops Island beach. For example, if a large tree limb is deposited on the shoreline during a storm, it will be removed. Likewise, following rocket launches from Launch Complex 0, particularly Pad 0-B, miscellaneous metallic and non-metallic debris is often deposited on the nearby shoreline. Similarly, these items will be removed. While in recent years such debris could be reasonably removed by hand, it is possible that in certain cases mechanized equipment will be required to extract a partially buried or heavy item. Finally, there could be instances where mechanized equipment will be necessary within this area to conduct miscellaneous activities that do not relate to typical beach debris removal or periodic renourishment activities. An example of such an instance occurred in July 2013, when a deceased juvenile humpback whale (*Megaptera novaeangliae*) was buried on the north Wallops Island beach; requiring use of a backhoe. Debris removal is only scheduled during off-season unless there is a rocket accident or some other emergency. For any operation that occurs during nesting season, whether debris removal or another operation, nest locations are always translated to the cognizant Program Manager and the WFF Safety Office.

Educational Use of Wallops Island Beach – Students affiliated with NASA and the Chincoteague Bay Field Station of the Marine Science Consortium education programs regularly use Wallops Island beach for field trips and related activities. Such use of the beach occurs year-round with activity levels peaking during the summer months. Groups range in size from 5-20 students. These groups access the beach by either the north Wallops Island ORV access or the path east of the Island helicopter pad. Groups may only access the beach on-foot and must be under the supervision of a trained faculty or staff member.

Proposed and Ongoing Shoreline Restoration and Beach Renourishment Activities

The SRIPP is intended to use a multi-tiered approach to reduce damages to Wallops Island facilities from ongoing beach erosion and storm wave damage incurred during normal coastal storms including tropical systems and nor'easters. NASA has identified the SRIPP's design target performance of providing significant defense against a 100-year return interval storm with respect to storm surge and waves. The performance is provided by a combination of the reconstruction of a beach, berm, and dune that will help to absorb and dissipate wave energy before it nears NASA infrastructure, and a rock seawall embedded within the dune that will protect against the most severe energy. For these features to provide reliable protection for the SRIPP's design lifetime of 50 years, the beach must be maintained routinely throughout 50 year lifetime. The shoreline on the southern end of Wallops Island has been retreating at a rate of approximately 10 ft per year as a result of erosion (U.S. Army Corps of Engineers [Corps] 2010).

Seawall Repair – A seawall composed of large rock is currently located along 15,900 ft of the Wallops Island shoreline. This seawall was built in 1992 and protects WFF infrastructure within the northern portion of the eroding shoreline from damage due to storms and large waves. The wall has prevented overwash and storm damage, but erosion of the shoreline seaward of the wall has continued, resulting in an increased risk of damage to the seawall. NASA may repair and extend the existing rock seawall up to an additional 4,600 ft. Additional maintenance of the existing seawall may include operation of heavy equipment and placing or replacing dirt and/or rock in previously disturbed areas behind the seawall to maintain and augment the function of the existing seawall and protection resulting from these features.

In conjunction with construction activities, qualified biologists will continue to regularly survey the beaches in the vicinity of the project for use by sea turtles, plovers, and other species. If nesting activity of protected species is recorded, NASA will avoid work in areas where nesting occurs and/or implement other appropriate mitigation measures.

Shoreline Reconstruction Monitoring – As part of the SRIPP, NASA is conducting a shoreline monitoring program to record and document changes in shoreline characteristics over time as the project is subjected to normal weathering and storm events. The monitoring effort began prior to construction of the seawall, beach, and dune to establish a baseline condition and record any changes that occur between design and implementation.

A monitoring survey of the shoreline in the vicinity of Wallops Island is conducted twice a year. The first monitoring event is conducted along the entire length of Wallops and Assawoman Islands, a distance of approximately 8.5 miles. The second monitoring event is limited to the length of shoreline from Chincoteague Inlet south to the former Assawoman Inlet, which defines the south end of Wallops Island. In the cross-shore direction, elevation data is collected from behind the dune line to seaward of the depth of closure (the eastern edge of the underwater fill profile), estimated to be at approximately -15 to -20 ft below MLW. Near Chincoteague Inlet the ebb shoal complex creates a large shallow offshore area; therefore, surveys in this area extend a maximum of 2 miles offshore if the depth of closure is not reached. These surveys will be repeated annually once at the end of summer (August to October) and once at the end of winter (March to May).

Cross-sections of the beach have been taken along new and/or previously established baselines on set stations every 500 ft from Chincoteague Inlet to Assawoman Inlet and every 1,000 ft from Assawoman Inlet to Gargathy Inlet. The beach surveys extend from the baseline to a depth of -4 ft below MLW offshore. An offshore hydrographic survey along the previously established baseline on set stations every 500 ft was conducted. The offshore survey extended from -3 ft below MLW to the depth of closure, anticipated to be between -15 to -20 ft below MLW. The hydrographic survey was conducted within 2 weeks of the beach survey. Light Detection and Ranging data will continue to be obtained for the monitoring area approximately once a year. Both horizontal and vertical survey datum will be obtained. The survey of the beach, surf zone, and offshore area, will document changes in the Wallops Island shoreline in addition to areas adjacent to Wallops Island. The results of these monitoring efforts are being used to measure shoreline changes to evaluate the performance of the project, potential impacts to resources, and to aid in planning renourishment when needed to ensure continued project function.

Beach Renourishment and Long-Term Project Maintenance – To maintain a beach and dune at a fixed location in a condition to effectively buffer wave energy, NASA plans beach renourishment cycles throughout the 50-year life of the SRIPP as determined by the proposed monitoring program. The location, extent, and magnitude of renourishment events may vary significantly as a result of the frequency and severity of storm activity and subsequent shoreline erosion. The availability of funding, logistical constraints, and other issues may also affect the implementation of renourishment. Even if renourishment is needed based on the modeled project performance and intent, NASA may choose to forego or delay renourishment because the project will retain most of its intended and designed storm protection function even if renourishment is not implemented as envisioned in the Programmatic Environmental Impact Statement (NASA 2010a).

The projected renourishment frequency and amounts are based on the modeled average rates of sand loss, with models based on the historic meteorological conditions recorded at and near the project area. Based on available modeling of project performance over time, the SRIPP identified an expected renourishment frequency of approximately every 5 years for the 50-year life of the project, but which may be as frequent as every 2 years or may be delayed to every 7 years. Based on the general characterization of function, the SRIPP estimates that each renourishment cycle will require approximately 806,000 cubic yards ($yd^{3)}$ of sand placed on the beach in each of the 9 renourishment events, for a total expected renourishment volume of 7,254,000 yd^3 of sand over the life of the project, excluding the amount required for the initial beach and dune reconstruction.

If future renourishments use sand of smaller grain size or reduced quality, more frequent renourishment or larger volumes of sand may be required. The last two sand renourishments were from the offshore shoal, and the grain size on the island is identical to those of the shoal. However, testing has shown variation in grain size based on sand source, so there is potential for differences in grain size during future renourishments (NASA 2010a, see table 6). If there are changes in the pattern of sand movement along the shoreline, such as reduced southerly transport over time, renourishment may be needed less frequently. In the Programmatic Environmental Impact Statement, NASA considers the addition of breakwaters or groins as the addition of these features may result in reduced sand requirements, however groins are not evaluated in the proposed action.

The Wallops Island shoreline will experience effects of future sea level rise, and this has been anticipated by providing an additional sediment volume during each renourishment event that will raise the level of the entire beach fill by an amount necessary to keep pace with the projected rise rate (Corps 2010). Applying the Corps' standard sea level rise equation based on local measurements to a 50-year project at Wallops Island yields sea level elevations between 0.84 ft and 2.53 ft above present levels. For project planning purposes, a target fill volume 85 percent of the upper estimates of the amount needed to match the 50-year projected sea level rise was selected, but the SRIPP includes adding that volume in constant increments over time instead of in a pattern that will match anticipated increases. This means that in the early years of the project the amount of fill being added will exceed the amount necessary to match the expected amount with the crossover point being in the 28th year (2038) of the project. This way, the sea level fill volume could be increased, if needed, during later renourishment events. The sea level rise volume, which is an additional amount added during each renourishment event (assuming a 5-year interval between events), is 112,000 yd^3. Deviations from existing modeled or projected sea level rise scenarios may change the amount of sand needed for renourishment.

The number of uncertainties included in the projections resulting from the modeling, model assumptions, limitations of the records of past meteorological and climatological measurements in the area, current understanding of meteorological and climatic patterns, and future decisions of NASA and other agencies are likely to result in deviations from the projected renourishment.

Sources of Sand for Renourishment – Three borrow sites have been identified as sources for potential future beach renourishment: the on-shore north Wallops Island borrow area, unnamed shoal A, and unnamed shoal B (located east of shoal A). All of these sites have been determined to be consistent with the project purpose and suitable, but all have different costs and concerns associated with their use that must be evaluated prior to use in each proposed future renourishment. The on-shore north Wallops Island borrow area was described earlier in the description of the action (also see Figure 1).

Unnamed shoal A, the source of sand for the initial reconstruction, may be used as the source for renourishment. The shoal covers an area of approximately 1,800 ac and the total predicted volume of shoal A is approximately 40 MCY. The sand grain size (0.46 millimeter [mm]) is the largest of the 3 sources.

Unnamed shoal B is located offshore approximately 12 mi east of the southern portion of Assateague Island. This shoal covers an area of approximately 3,900 ac. The total predicted sand volume of this shoal is approximately 70 MCY. The average sand grain size is 0.34 mm with a 19 mi transit distance from the shoal to the pump out location.

ACTION AREA

The Action Area is defined at (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." The Service has determined that the Action Area (Figure 4) is the same as that established in the Service's 2016 Opinion. However, for the purpose of discussion of the actions resulting in reinitiation, a subset of the Action Area has been identified as the area impacted by effects of these actions. This area extends from Gargathy Inlet northward to Beach Road on Assateague Island (Figure 5).

Figure 4. Action Area for proposed and ongoing activities.

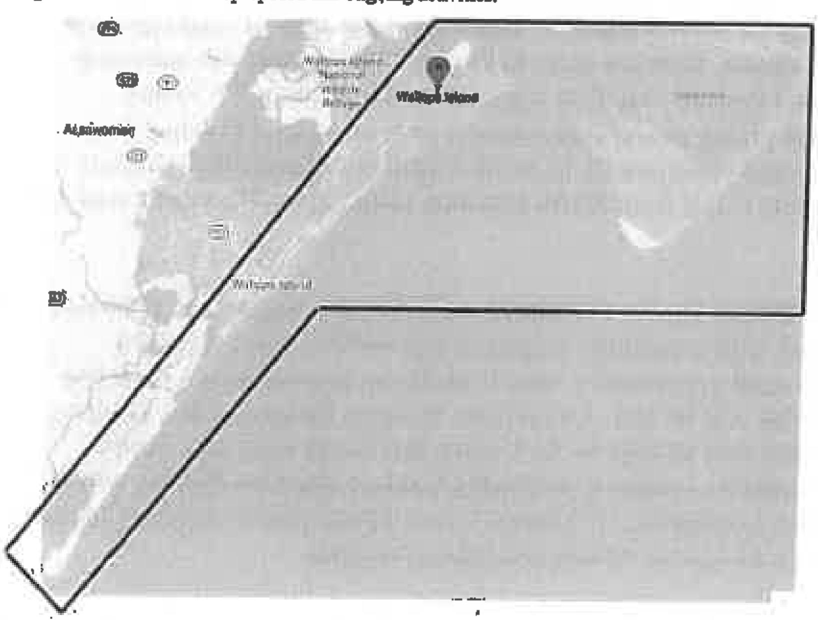


Figure 5. Subset of Action Area—Gargathy Inlet extending northward to Beach Road on Assateague Island.

STATUS OF THE SPECIES

Per ESA section 7 regulations (50 CFR 402.14(g)(2)), it is the Service's responsibility to "evaluate the current status of the listed species or critical habitat."

To assess the current status of the species, it is helpful to understand the species' conservation needs which are generally described in terms of reproduction, numbers, and distribution (RND). The Service frequently characterizes RND for a given species via the conservation principles of resiliency (ability of species/populations to withstand stochastic events which is measured in metrics such as numbers, growth rates), redundancy (ability of a species to withstand catastrophic events which is measured in metrics such as number of populations and their distribution), and representation (variation/ability of a species to adapt to changing conditions which may include behavioral, morphological, genetics, or other variation) (collectively known as the three Rs).

Plover – The Service listed the Atlantic Coast and Northern Great Plains populations of piping plover as threatened on December 11, 1985 (50 FR 50726-50734). The following is a summary of piping plover general life history drawn from the species revised recovery plan (Service 1996) and 5-year review (Service 2009a). For a more detailed account of the species description, life history, population dynamics, threats, and conservation needs, refer to https://ecos.fws.gov/ecp/species/6039.

Plover prey on infaunal invertebrate species such as crabs and worms, which inhabit the surface layer of sand. After they establish territories and conduct courtship rituals beginning in late March or early April, plover pairs form shallow depressions (nests) in the sand to lay eggs. Nests are situated above the high tide line on coastal beaches, sandflats at the ends of sand spits and barrier islands, gently sloping foredunes, blowout areas behind primary dunes, and washover areas cut into or between dunes and typically lay four eggs that hatch in about 27-30 days (Service 1996). The Atlantic Coast piping plover population breeds on coastal beaches from Newfoundland to North Carolina (and occasionally in South Carolina). Plovers then migrate to wintering beaches along the Atlantic Coast from North Carolina south, along the Gulf Coast, and in the Caribbean.

Sea level rise and more frequent, intense storms associated with climate change both pose threats to plovers. Sea level rise combined with coastal development and stabilization presents a considerable threat because the coastal ecosystem's natural ability to respond to sea level rise and generate newly available habitat will be lost. An increase in storm frequency and intensity will exacerbate coastal flooding that will already be increasing due to sea level rise. While climate change related effects on plovers remain a continuing concern (Service 2009a), effects of accelerating sea level rise on future availability of Atlantic Coast piping plover breeding habitats will largely depend on the response of barrier islands and barrier beaches.

The Atlantic Coast piping plover population is distributed among 4 recovery units (RUs) identified as: Atlantic Canada, New England, New York-New Jersey, and Southern (DE-MD-VA-NC) (Service 1996).

To meet the goal of recovery of the Atlantic Coast plover population, the following are recommended (Service 1996):

1. Increase and maintain for five years a total of 2,000 breeding pairs, distributed among four recovery units: Atlantic Canada, 400 pairs; New England, 625 pairs; New York-New Jersey, 575 pairs; Southern (DE-MD-VA-NC), 400 pairs.
2. Verify the adequacy of a 2,000-pair population of piping plovers to maintain heterozygosity and allelic diversity over the long term.
3. Achieve five-year average productivity of 1.5 fledged chicks per pair in each of the four recovery units, based on data from sites that collectively support at least 90% of the recovery unit's population.
4. Institute long-term agreements to assure protection and management sufficient to maintain population targets and average productivity in each recovery unit.
5. Ensure long-term maintenance of wintering habitat, sufficient in quantity, quality, and distribution to maintain survival rates for a 2,000-pair population.

The primary actions to address these criteria include (Service 2009a):

1. Increase efforts to restore and maintain natural coastal formation processes in the New York-New Jersey recovery unit.
2. Identify and secure reliable funding to support continuing management of threats from human disturbance and predation.
3. Accelerate development of agreements needed to assure long-term protection and management to maintain population targets and productivity.
4. Develop strategies to reduce threats from accelerating sea-level rise. Identify sites most likely to maintain (or increase) characteristics of suitable piping plover breeding and/or migration habitat. Identify human coastal stabilization practices that increase or decrease adverse effects of sea level rise on coastal piping plover habitats.
5. Conduct studies to understand potential effects of wind turbine generators that may be located or proposed for the Outer Continental Shelf, nearshore, and within or between nesting and foraging habitats.
6. Conduct studies, including meta-analyses of local studies, to understand factors that affect latitudinal variation in productivity needed to maintain stationary populations of Atlantic Coast piping plovers.
7. Conduct demographic modeling to explore effects of latitudinal variation in productivity, survival rates, and the carrying capacity of habitat on population viability within individual recovery units and the Atlantic Coast population as a whole.
8. Review state laws within the Atlantic Coast piping plover's breeding and wintering range to assess protections that would be afforded if the species were removed from ESA listing.

9. Support effective integrated predator management through studies of ecology and foraging behavior of key predators.

The primary factors influencing the status include habitat loss and degradation, predation, human disturbance, and inadequacy of regulatory mechanisms. Climate change and wind turbine generators have also emerged as threats since publication of the 1996 recovery plan. While 3 of the 4 recovery units have experienced net declines compared with the 2008 estimates that informed the 2009 5-Year review, reinforcing long-standing concerns about the uneven distribution of Atlantic Coast piping plovers, their rangewide status has improved since the 1986 listing (Service 2019a).

Knot – The Service listed the red knot as threatened on January 12, 2015 (79 FR 73705-74748). The following is a summary of red knot general life history drawn from the background information and threats assessment (Service 2014a) and the recovery outline (Service 2019b). For a more detailed account of the species description, life history, population dynamics, threats, and conservation needs, refer to https://ecos.fws.gov/ecp/species/1864.

The rufa red knot migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the Southeast U.S., the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. During both the northbound (spring) and southbound (fall) migrations, red knots use key staging and stopover areas to rest and feed and are highly dependent on the continued existence of quality habitat at these staging areas. Major spring stopover areas along the U.S. Atlantic coast include the Virginia barrier islands and Delaware Bay. In the Southeast U.S., red knots forage along sandy beaches, tidal mudflats, and peat banks during spring and fall migration from Maryland through Florida. The red knot eats hard-shelled mollusks, sometimes supplemented with easily accessed softer invertebrate prey, horseshoe crab (*Limulus polyphemus*) eggs and *Donax spp.* clams (Service 2014a).

Warming temperatures or changes in storm intensity and timing due to climate change may alter when horseshoe crabs lay eggs or invertebrate prey becomes available. This can change peak abundance of prey to occur at a time that does not coincide with arrival of red knots at spring and stopover sites and their Arctic breeding grounds (79 FR 73705-74748). A successful migration is dependent on the timing of these events, so deviations may negatively affect the knot. The availability of alternate prey species for the knot's predators, such as Arctic fox, is being disrupted by climate change. This may increase predation on knots during their breeding season on the Arctic. Additionally, loss of breeding and nonbreeding habitat due to arctic warming and sea level rise, respectively, are increasing extinction risk for the species (79 FR 73705-74748).

To meet the goal of recovery, the following preliminary criteria have been identified (Service 2019b):

1. Populations within all four wintering regions (Argentina/Chile, northern South American coast, northwestern Gulf of Mexico, and southeastern United States/Caribbean) are

sufficiently large and stable, based on adequate surveys and monitoring, and on scientific modeling such as a full-life-cycle population viability analysis;

2. Rates, trends, and trajectories of adult survival, juvenile survival, and reproduction are adequately understood (including consideration of Arctic ecosystem change), and are sufficient to support the resilient wintering populations described in (1) above;
3. The rufa subspecies breeding and nonbreeding distributions are well understood and delineated relative to other subspecies, and the rufa population structure is clarified (e.g., genetic relationships among subspecies, and among the rufa wintering regions);
4. A network of key wintering habitats and major spring and fall migration staging areas across North America and South America provides sufficient suitable food resources at the appropriate times in the annual cycle and is adequately managed and protected;
5. Migration stopover habitats across the range (in addition to the key staging areas) are sufficient to allow red knots to adapt to short-term (e.g., annual weather, food, predation, disturbance conditions) and long-term (e.g., climate change, sea level rise, habitat modification) changes in their migratory landscape and timing, and are adequately managed and protected.

A preliminary action plan identified the following near-term actions (Service 2019b):

1. Support, encourage, and if possible, fund the research priorities listed in U.S. Fish and Wildlife Service Rufa Red Knot Research Priorities, 2019 to 2022.
2. In Delaware Bay, continue the Service's active role in horseshoe crab management, in the management of intertidal aquaculture, and in supporting State-led efforts to monitor and protect red knots, with a goal of steadily increasing the percent of red knots that depart the bay at adequate weights even as numbers of knots using the bay also increases.
3. Avoid and minimize loss and degradation of nonbreeding habitat from coastal engineering and development
   a. Work through the Atlantic Flyway Shorebird Initiative's (AFSI) Coastal Engineering Committee (Habitat Work Group) to develop best practices.
   b. Work with the Corps and the States to adopt the best practices at the landscape- and project-level scales (e.g., through sections 7(a)(1) and 7(a)(2) of the ESA).
   c. Focus on documented red knot staging areas, as well as regularly used stopover and wintering habitats. When possible, pursue multispecies conservation opportunities that also benefit other State or federally listed species.
4. Work with partners to preserve, enhance, and restore nonbreeding habitat, both proactively and incidental to engineering and development projects. For example, carefully planned beach nourishment can increase of improve red knot habitat in some areas, such as parts of Delaware Bay.
5. Develop Service recommendations for managing recreation and other sources of human disturbance in red knot nonbreeding habitats. In developing the recommendations, build on related work being done by the National Wildlife Refuge System, through the AFSI's Human Activities Committee (Habitat Working Group), and in the piping plover wintering range. Work with land managers and project proponents to implement the

Service's recommendations. Also work with recreation user groups (e.g., fishermen) to enlist support for minimizing disturbance of red knots.

6. Work with partners to monitor and manage invasive vegetation in red knot nonbreeding habitats.
7. Work with land managers to evaluate gull and raptor management in the vicinity of red knot nonbreeding habitats on a case-by-case basis. In some instances, management adjustments may be warranted, such as relocating peregrine falcon (*Falco peregrinus*) nesting structures. Build on the AFSI's forthcoming shorebird predation best management practices.
8. Work with the U.S. Coast Guard and other partners to identify key red knot habitats in oil spill response planning, and prioritize these areas for protection in the event of a spill.
9. Work with wind energy developers and regulators to explore alternatives to siting new wind turbines in red knot concentration areas of along major migration pathways.
10. Work with all States, Service Regions, and the U.S. Geological Survey's Bird Banding Lab to ensure best practices are followed by all individuals and entities engaged in red knot trapping, marking, and other research.
11. Establish a Red Knot Information Partnership of interested species experts, researchers, and conservation practitioners from across the species' range. Facilitate the exchange of information by establishing an email listserve and perhaps other electronic tools/platforms. Hold and annual conference call or webinar to discuss collaborative research, new advances in red knot science, new information about threats, and new developments in conservation. Hold ad hoc conference calls of webinars to address less urgent issues as they arise.
12. Enhance and facilitate international cooperation on red knot research and conservation.

The primary threats to the knot are: habitat loss and degradation attributable to sea level rise, shoreline stabilization, and Arctic warming; and reduced food availability and asynchronies in the migration timing relative to food availability and favorable weather conditions. Secondary threats include hunting, predation, human disturbance, algal blooms, oil spills and wind energy development.

Sufficient reliable data to produce a rangewide population estimate is not available. However, the best available data indicate a sustained decline in the early 2000s and the possibility of stabilization at low levels in recent years. In summary, as a whole, the rangewide status of the species is stable (Service 2019b).

Loggerhead – The Service and National Marine Fisheries Service (NMFS) jointly listed the loggerhead sea turtle as threatened on July 28, 1978. The following is a summary of loggerhead sea turtle general life history drawn from the species' recovery plan (NMFS and Service 2008), 5-year review (NMFS and Service 2007), and 2009 status review (Conant et al. 2009). For a more detailed account of the species description, life history, population dynamics, threats, and conservation needs, refer to https://ecos.fws.gov/ecp/species/1110.

Loggerhead sea turtles inhabit temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Adult loggerheads are known to make long migrations between foraging areas and nesting beaches. The highly migratory behavior of loggerheads means that conservation efforts for loggerhead populations in one country may be jeopardized by activities in another (NMFS and Service 2008). Loggerheads nest on ocean beaches and occasionally on estuarine shorelines with suitable sand, typically between the high tide line and the dune front. Within the continental U.S., loggerheads nest from Texas to Virginia. Nesting is often highly variable from year to year due to a number of factors including environmental variability, ocean conditions, anthropogenic effects, and factors affecting survival, growth, and reproduction (NMFS and Service 2008). Hatchlings emerge from their nests en masse almost exclusively at night, and presumably use decreasing sand temperature as a cue. Hatchlings then use light cues to find the ocean; ambient light from the open sky creates a relatively bright horizon compared to the dark silhouette of the dune and vegetation landward of the nest (NMFS and Service 2008).

Climate change may impact loggerheads through sea level rise and rapidly increasing temperatures. Sea level rise may contribute to the loss of nesting habitat through inundation of nest sites and beach erosion, which will be compounded by increasing coastal development and stabilization. Given that sea turtles exhibit temperature-dependent sex determination, global increases in temperature may also increase sand temperatures and increases incubation temperatures resulting in female-biased sex ratios (NMFS and Service 2008).

Five RUs have been identified in the Northwest Atlantic Ocean DPS based on genetic differences and a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries. The first 4 RUs represent nesting assemblages in the southeast U.S. The boundaries of these 4 RUs were delineated based on geographic isolation and geopolitical boundaries. The fifth RU includes all other nesting assemblages within the Northwest Atlantic. While the Northern RU includes southern Virginia, the Eastern Shore is not part of any RU.

To meet the recovery goal of the loggerhead, the NMFS and Service (2008) recommended the following recovery criteria:

1. Number of Nests and Number of Nesting Females
    a. Specific nest numbers and rate of increase varies by recovery unit, but increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).
2. Trends in Abundance on Foraging Grounds
    a. A network of in-water sites, both oceanic and neritic across the foraging range is established and monitoring is implemented to measure abundance. There is statistical confidence (95 percent) that a composite estimate of relative abundance from these sites is increasing for at least one generation.
3. Trends in Neritic Strandings Relative to In-water Abundance
    a. Stranding trends are not increasing at a rate greater than the trends in in-water relative abundance for similar age classes for at least one generation.

To address these criteria for the Northwest Atlantic DPS the recovery plan (NMFS and Service 2008) lists the 208 primary actions, of which there are 34 Priority 1 actions.

The primary factors influencing the status include bottom trawl, pelagic and demersal longline, longline, and demersal large mesh gillnet fisheries; legal and illegal harvest; vessel strikes; beach armoring; beach erosion; marine debris ingestion; oil pollution; light pollution; and predation by native and exotic species. Numerous beaches in the Southeast U.S. are eroding due to both natural (e.g., storms, waves, shoreline geology) and anthropogenic (e.g., construction of armoring structures, groins, and jetties; coastal development; inlet dredging) factors. Such shoreline erosion leads to a loss of nesting habitat for sea turtles (Conant et al. 2009). In summary, as a whole, the rangewide status of the species is declining (NMFS and Service 2008).

STATUS OF CRITICAL HABITAT

Plover – Critical habitat for the wintering population of plover has been designated along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas; however, this action does not affect those areas.

Knot – No critical habitat has been designated for knot.

Loggerhead – Critical habitat for the loggerhead Northwest Atlantic Ocean DPS has been designated along approximately 685 mi of specific terrestrial environments along the U.S. Atlantic and Gulf of Mexico coasts; however, this action does not affect those areas.

ENVIRONMENTAL BASELINE

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the past and present impacts of all federal, state, or private actions and other human activities in the Action Area. Also included in the environmental baseline are the anticipated and/or ongoing impacts of all proposed federal projects in the Action Area that have undergone Section 7 consultation, and the impacts of state and private actions which are contemporaneous with the consultation in progress.

Status of the Species within the Action Area

Plover – The Action Area is within the Southern RU. Following low productivity in 2016 and 2017, the number of breeding pairs in Virginia and the Southern RU (for which Virginia is the largest contributor) declined sharply in 2018. While 2018 productivity estimates appear to have increased slightly from 2017, it was not sufficient to stabilize the breeding population (Service 2017; A. Hecht, Service, email to E. Argo, Service, October 30, 2018).
Within the Action Area, plovers use wide sandy beaches on Metompkin, Assawoman, Wallops, and Assateague Islands for courtship and nesting (Table 2 and 3). Suitable habitat has a variable distribution along the seaward edge of islands within the Action Area year-to-year due to the

competing effects of erosion and vegetation succession. Annual plover production within the Action Area indicates that all islands possess some nesting habitat, with the most extensive areas of suitable beach occurring on Assawoman Island and in the Hook, Overwash, and Public Beach portions of Assateague Island (Service 2009b). Metompkin Island also supports large numbers of plovers (Smith et al. 2009). Little potential habitat is available for plover nesting on the south end of Wallops Island, although 1-2 birds originating from nesting areas south of Wallops Island are known to forage near camera stand Z-100 (S. Miller, NASA, email to E. Argo, Service, May 8, 2019; S. Miller, NASA, email to E. Argo, Service, June 6, 2019; see Figure 9). The north end of Wallops Island has been rapidly accreting, offering increasing quantities of wide sandy beach on which plovers nest. Shoreline restoration created a substantial increase in beach habitat available on Wallops Island north of the reconstructed seawall and south of the north Wallops Island area (NASA 2015a).

Most plovers that nest farther north within the Atlantic population are likely to pass through the Action Area during migration between mid-February and mid-May in the spring and from mid-July to mid-October in the fall. This may involve birds passing through in flight, but many of these birds may stop and roost or feed on beaches, tidal flats, and overwash areas within the Action Area. While breeding plovers select a narrower range of micro-habitats in Virginia compared to other areas along the East Coast of the U.S. and outside of the Southern RU and changes in habitat suitability may be a factor in the recent decline, it seems unlikely that the habitat was completely saturated in 2018 (A. Hecht, Service, email to E. Argo, Service, October 30, 2018).

Table 2. Plover nest and fledgling numbers for islands in Action Area (Service 2009b, 2014b, 2018a, 2018b; Smith et al. 2009; NASA 2010b, 2011, 2012b, 2013, 2014a, 2015b, 2016, 2017, 2018)

Year	Island	Number of Nests	Number of Chicks Fledged
2009	Assateague (Hook, Overwash, and Public Beach)	32	26
	Wallops	4	10
	Assawoman	26	31
	Metompkin	46	51
2010	Assateague (Hook and Overwash)	32	54
	Wallops (first season of official monitoring program)	4	4
	Assawoman	24	35
	North Metompkin	3	4
2011	Assateague (Hook and Overwash)	27	41
	Wallops	3	9
	Assawoman	32	52
	North Metompkin	8	11
2012	Assateague (Hook and Overwash)	20	9
	Wallops	6	3
	Assawoman	39	78
	North Metompkin	11	15
2013	Assateague (Hook and Overwash)	31	29
	Wallops	3	8
	Assawoman	40	60
	North Metompkin	14	15
2014	Assateague (Hook and Overwash)	42	70
	Wallops	5	5
	Assawoman	40	71
	Metompkin	53	82
2015	Assateague (Hook and Overwash)	47	59
	Wallops	6	8

Year	Island	Number of Nests	Number of Chicks Fledged
	Assawoman	33	28
	Metompkin	61	78
2016	Assateague (Hook and Overwash)	61	36
	Wallops	9	9
	Assawoman	30	39
	North Metompkin	11	15
2017	Assateague (Hook and Overwash)	52	43
	Wallops	6	7
	Assawoman	38	14
	North Metompkin	12	5
2018	Assateague (Hook and Overwash)	34	--
	Wallops	3	3
	Assawoman	23	--
	North Metompkin	10	--

Table 3. Plover nest data for Wallops Island.

Year	Earliest Nest Date	Latest Fledge Date	Number of Nests
2010	May 3	n/a	3
2011	May 16	June 19	3
2012	May 24	Aug 16	5
2013	May 15	July 22	4
2014	May 20	July 20	5
2015	May 13	July 9	6
2016	May 31	July 5	9
2017	May 1	Aug 10	6
2018	May 21	July 13	3

<u>Knot</u> – Following migration from southern overwintering areas, the majority of knots arrive in the mid-Atlantic between late April and early June. The Delaware Bay has long been regarded as the final and most crucial stopover during the springtime northern migration. At this stopover, the birds gorge on eggs of spawning horseshoe crabs in preparation for their nonstop flight to the Arctic (Karpanty et al. 2006). Virginia's Eastern Shore also provides important stopover habitat, including Wallops Island (Watts and Truitt 2015).

The majority of knot activity on Wallops Island occurs on the north end of the island, well north of launch Complex 0 during the month of May (NASA 2012b, 2013, 2014a, 2015b, 2016, 2017, 2018). Flock sizes have varied year-to-year, with the smallest numbers observed in 2014 (Table 4 and Figure 6). Although the potential exists for knot foraging activity to occur within the renourished beach area adjacent to the launch pads, their presence on the regularly nourished beach is unlikely due to the suppressed forage base and resultant lower habitat value. Knots have also been observed on Assawoman and Assateague Islands from May through September. Flock sizes have ranged from a single birds to over 100 individuals since 2014 (Service 2018c).

Along Virginia's Eastern Shore, knots make use of beach and peat bank habitats (Service 2015a). They have been documented feeding both day and night, which may be necessary to meet energy requirements from available prey species to complete migration (Cohen et al. 2011). During the 2006 and 2007 migration seasons, Virginia supported a knot population of over 7,000 individuals (Cohen et al. 2009). Counts during peak migration have documented both increases and decreases from 2007 through 2018 (Karpanty et al. 2018). Additionally, wintering knots are known to occur on Virginia's Eastern Shore (S. Karpanty and J. Fraser, Virginia Polytechnic Institute and State University, per. obs. March 13, 2019), but the Service is not aware of data identifying the Action Area as part of these wintering grounds.

Table 4. Knot migration data for Wallops Island (NASA 2010b, 2011, 2012b, 2013, 2014a, 2015b, 2016, 2017, 2018).

Year	Annual Maximum Number Observed	Annual Mean of Numbers Observed
2010	483	180
2011	407	100
2012	672	293
2013	1162	383
2014	34	9
2015	560	218
2016	383	179
2017	150	83
2018	223	98

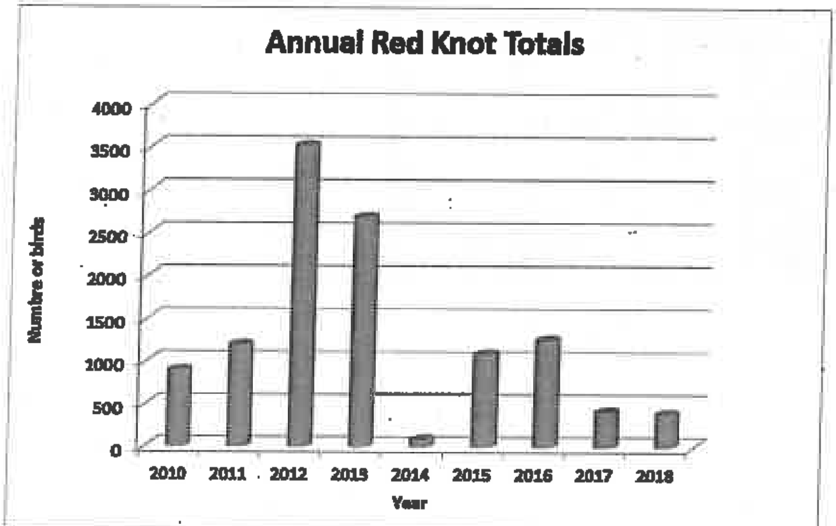


Figure 6. Total of numbers of knots observed on the north end of Wallops Island (NASA 2018).

Loggerhead – The loggerhead occurs in waters adjacent to and offshore of islands within the Action Area. The Action Area is at the northern extent of recorded nesting activity for the species. Loggerheads are known to occasionally nest within the Action Area, primarily on Assateague Island (Table 5 and 6). In Virginia, nesting has been documented from May through August (Virginia Department of Game and Inland Fisheries [VDGIF] 2017), with hatching occurring approximately 60 days later.

Nests on Wallops Island have been documented on the recreational beach and in front of the rock wall, but are not documented every year (Table 6 and Figure 7; NASA 2010b, 2011, 2012b, 2013, 2014a, 2015b, 2016, 2017, 2018). Results of DNA analysis indicated that nests in 2010 were all dug by a single female (NASA 2010b). There is no evidence of sea turtle nesting documented on Wallops Island since 2014 (NASA 2014a, 2015b, 2016, 2017, 2018). As more southern beaches warm and nests experience increased egg mortality, nesting activity may shift in a northerly direction. In addition, some southern nesting beaches have been producing highly female-skewed sex ratios for decades (e.g., Hanson et al. 1998), so northern beaches that produce more males may become more important to the species recovery.

Table 5. Loggerhead nest activity within the Action Area from 1974-2017 (Service 2009c, 2015b, 2018d; VDGIF 2017; NASA 2010b, 2011, 2012b, 2013, 2014a, 2015b, 2016, 2017, 2018).

Location	False Crawls	Nests	Total Activity
Metompkin Island	0	0	0
Assawoman Island	1	0	1
Wallops Island	22	13	21
Assateague Island – Hook and Overwash	72	38	141

Table 6. Loggerhead crawl and nest dates and numbers for Wallops Island (NASA 2010b, 2012b, 2013, 2014a).

Year	Latest Crawl Date	Latest Expected Hatch Date	Number of Crawls/Nests
1975	July 24	October 22	3/0
1979	July 21	October 19	1/1
1982	July 14	October 12	1/1
1989	June 5	September 3	1/1
2002	July 9	October 7	1/1
2008	August 3	November 1	2/1
2010	July 28	October 26	6/4
2012	July 12	October 10	4/2
2013	July 26	October 24	3/2

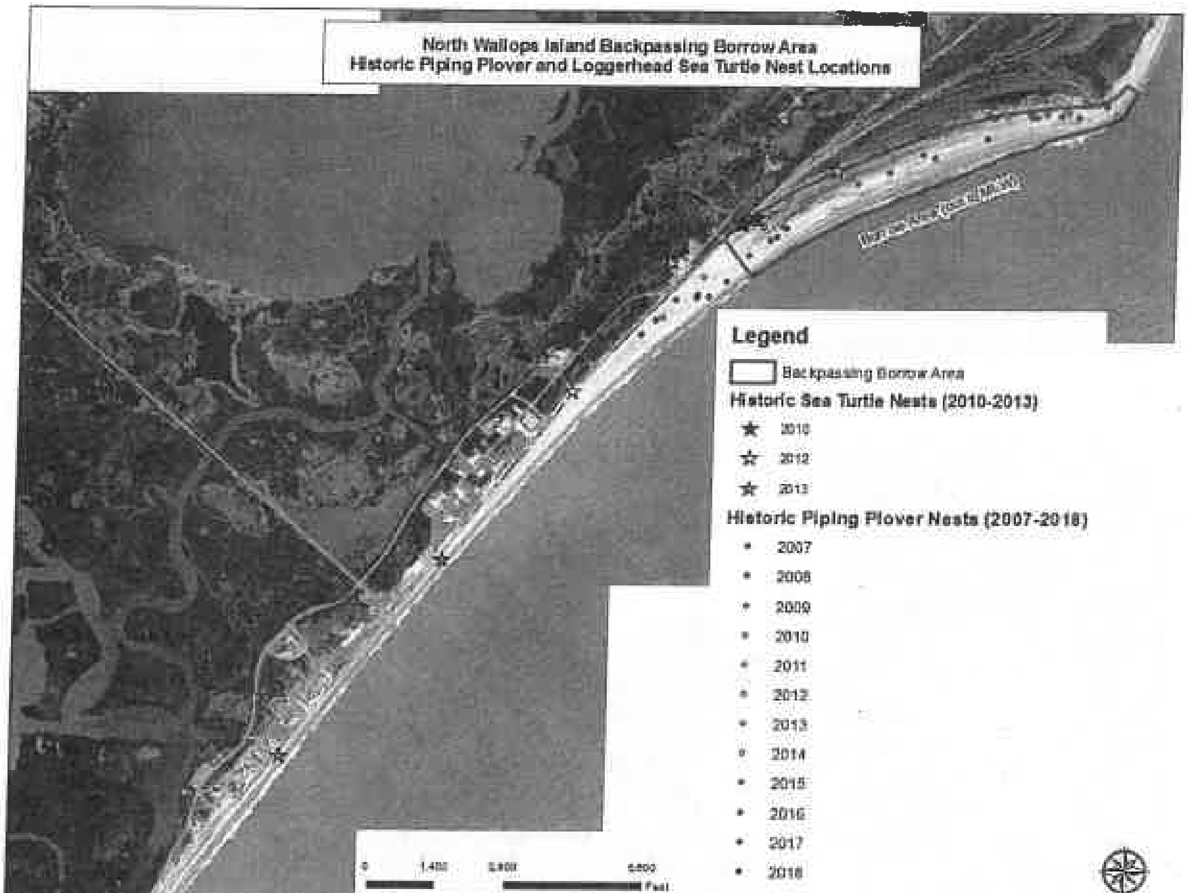


Figure 7. Historic plover and loggerhead nest locations. Image provided by NASA.

EFFECTS OF THE ACTION

Direct effects are the direct or immediate effects of the project on the species, its habitat, or designated/proposed critical habitat. Indirect effects are defined as those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. Direct and indirect effects of the proposed action along with the effects of interrelated/interdependent activities are all considered together as the "effects of the action." For the purposes of this Opinion, we are considering the effects of the action over the next 15 years.

The Corps' Chincoteague Inlet Inner Channel Federal Navigation Project was originally approved in 1972 (*https://www.nao.usace.army.mil/About/Projects/ChincoteagueNav.aspx*; accessed May 17, 2019) and has been taking place an average of twice a year (Corps 2019) in the waters adjacent to Wallops Island, within the Action Area (Figure 8). The Corps' permit expired on April 29, 2019 and the Corps submitted a Joint Permit Application on February 25, 2019 to continue the project (Corps 2019). In the model provided by NASA and conducted by the Corps, it was stated that the proposed beach nourishment activities should have no effect on the channel given that it has not needed to be dredged in 7 years, any dredging conducted will only be for maintenance, and sand material is not accumulating in the channel (Corps 2018a). While the Corps recognized it would be ideal to include the inlet in the numerical model, they elected not to include this information due to the need for a full sediment budget. As a result, NASA did not provide the Service with any information regarding potential effects to listed species from the interaction of the Navigation Project, backpassing, and beach nourishment. The Corps has not consulted with the Service on the Navigation Project nor do we have any sources of information available from which to assess effects on listed species.

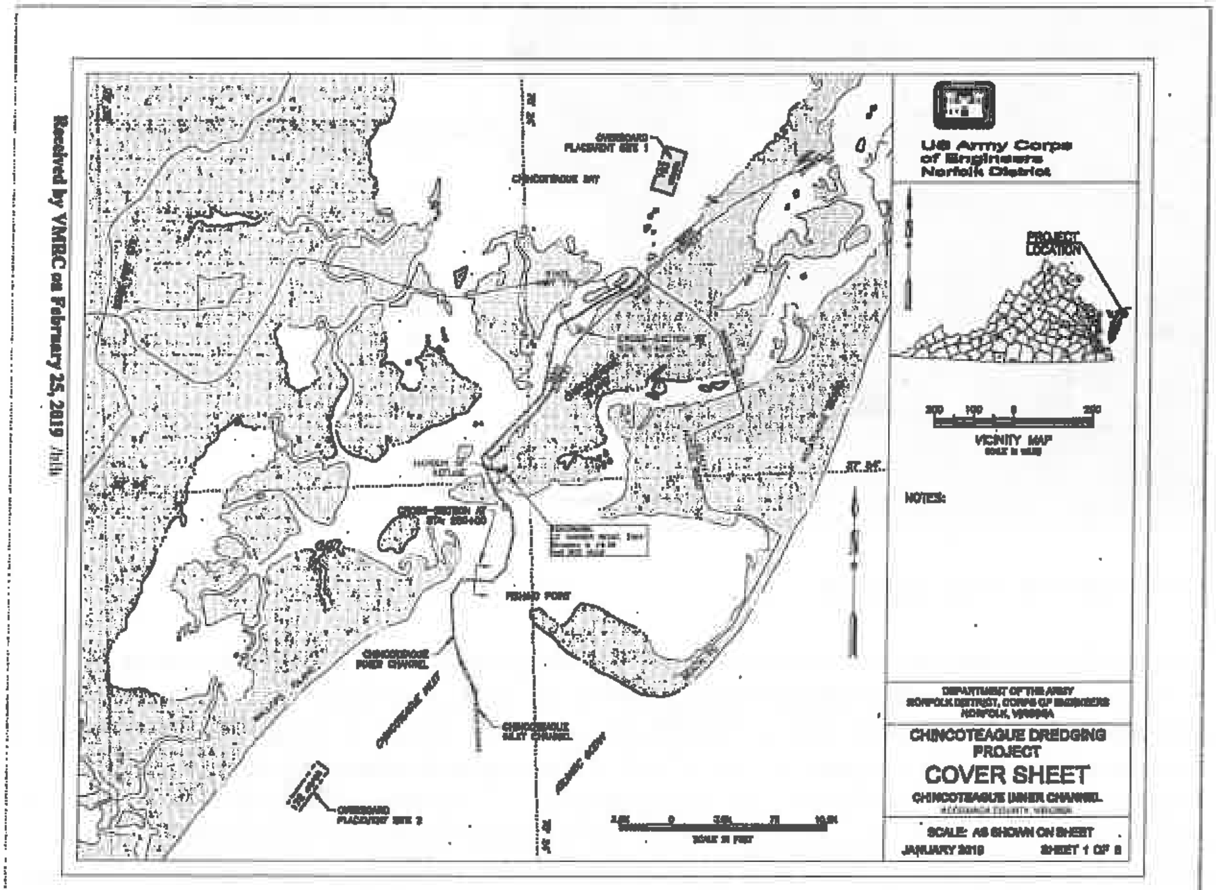


Figure 8. Dredging and sand placement sites highlighted in yellow (base image from Joint Permit Application).

The potential effects of the proposed activities are described in Table 7 (see Appendix A) and 8. Activities in Table 7 require reinitiation, while those in Table 8 remain unchanged from the Service's 2016 Opinion.

Those components of the proposed action requiring reinitiation determined to result in "no effect" or "not likely to adversely affect" are described in Table 7 and will not be further discussed in this Opinion. Multiple components of the project have been identified as having the potential to affect plovers, knots, and loggerheads (Table 7). These include:

- Operation of equipment (day)
- Operation of equipment (night)
- Presence of additional personnel
- Sand excavation
- Renourishment
- Breakwater construction
- Equipment staging
- Sand stockpile

Effects to federally listed species from the actions necessitating reinitiation were evaluated based on data in the shoreline change and transport model (GenCade) (Corps 2018a, 2018b) provided to the Service by NASA. Experts in the fields of coastal geomorphology and sediment transport have indicated that there will be impacts to Assateague and Assawoman Islands beyond the immediate Wallops Island area; however, the magnitude and extent of these impacts is unknown at this time (Varnell 2019). Information on the sediment transport dynamics in the area surrounding Wallops Island is incomplete, but the information necessary to develop additional models is not currently available (L. Varnell, Virginia Institute of Marine Science, pers. obs. November 26, 2018).

Given that backpassing, and the associated renourishment and equipment use, is anticipated to take place on a 10-year interval, the effects described below and in Table 7 are anticipated to occur following a second round of backpassing and renourishment in 2029-2030. Similarly, renourishment activities, using an offshore shoal as a sand source, are expected to continue on a 2-7 year interval and the effects described below and in Table 7 are anticipated to occur following each subsequent renourishment event. Because NASA is unable to more specifically predict the frequency of renourishment activities using the offshore shoal as a sand source, we are assuming that renourishment will occur every 2 years during the 15 year timeframe of this Opinion (2021, 2023, 2025, 2027, 2031, 2033) except during the years where backpassing and associated renourishment occurs.

Backpassing (sand excavation) and renourishment

Plover – Sand excavation will remove nesting habitat at the northern end of Wallops Island, resulting in a reduction in breeding carrying capacity, lack of nesting, and birds searching for suitable nesting habitat elsewhere. Searching for alternative suitable habitat leads to increased energy expenditure from additional search times and increases exposure to predators. Expending additional energy searching for and reaching suboptimal habitat that may have limited food resources does not allow plovers to maintain optimal body condition, resulting in decreased nest productivity or inability to nest. The use of suboptimal habitat may lead to nesting on less suitable habitat, such as on a narrower beach more vulnerable to flooding, and decreased nest or brood attendance by adults could increase predation of eggs and/or chicks. If the habitat is suboptimal, foraging opportunities may be limited and decrease chick survival. If birds seek nesting habitats elsewhere, they will also face competition for territories with birds already established there, leading to lower productivity and lower adult survival from reduced food availability. Optimal nesting habitat will be unavailable in the sand excavation area until sand accretes to the northern end of Wallops Island 4-6 years post-excavation (Corps 2018a, 2018b).

Renourishment (placement of backpassed sand) will reduce the quality of nesting habitat. Birds that have been nesting in the area proposed for renourishment may continue to return and attempt to nest, resulting in lower nest productivity (A. Hecht, Service, pers. obs. April 24, 2019). This will cause a loss in carrying capacity in the Action Area and the loss and degradation of this nesting area may cause long-term adverse impacts to population productivity and growth. Birds may seek nesting habitat elsewhere, resulting in the effects described above. Additionally, as compared to nesting plovers on beaches in the northeastern U.S, nesting plovers may abandon their nests since birds along the Eastern Shore of Virginia startle or flush easily (R. Boettcher, VGDIF, pers. obs. March 29, 2019).

Renourishment will also bury available prey. Recovery of invertebrate prey species varies based on time of year of renourishment and technique used (Corps 1982, Schlacher et al. 2012, Bishop et al. 2006). Over time, the characteristics of a natural beach are expected to return as the renourished area is recolonized by native fauna and plants, and as wave action, wind, rain, and other natural forces weather the beach (National Research Council 1995). Plovers will expend additional energy seeking available foraging habitat elsewhere, resulting in the effects described above. We expect that beach habitat will be unsuitable for plover foraging for 1 year following renourishment.

Plover and knot – Sand excavation will impair or kill invertebrate prey species and will remove or alter habitat making the site unavailable or less desirable for foraging for plovers and knots. Sand will be excavated to MLW, creating tidal pools. *Donax* spp., a primary knot food source, will likely be suppressed when material is systematically removed from the intertidal zone, as proposed. Additionally, wrack, another source of forage for knots and plovers, will be displaced. However, wrack is expected to more rapidly regenerate as compared to *Donax*. As a result, foraging habitat on the northern end of Wallops Island will be unavailable until sand accretes to the backpass area in 4-6 years (Corps 2018a, 2018b) and prey species recover. Knots and plovers are expected to search for alternative suitable habitat leading to increased energy expenditure from additional search times and increased exposure to predators. Suboptimal habitat may have more predators, thus increasing predation risk, resulting in harm or death. For knots, if the nearby islands that provide alternate habitat do not provide sufficient resources to fulfill their foraging needs, there is a risk that they will not reach an adequate weight, which will negatively affect their breeding success in the Arctic.

Loggerhead – Loggerheads have nested in both the areas slated for sand excavation and renourishment. The removal of sand will remove known nesting habitat, resulting in a lack of nesting or expenditure of additional energy to find a suitable nesting site. Beach habitat in the sand excavation area will be unavailable for sea turtles for at least 2 consecutive nesting seasons following sand mining. Return of previous beach topography that provided nesting habitat is expected to take 4-6 years.

Placement of sand may alter beach topography and result in sand compaction, reducing the quality of nesting habitat. If a female does attempt to nest, the sand may have been compacted by equipment, reducing the female's ability to dig a nest chamber. However, a portion of the area where nests have been documented (in front of the riprap protection) has eroded in recent years and the addition of sand to this area could increase available nesting habitat along this stretch of Wallops Island. On most beaches, nesting success typically declines for the first 1 to 2 years following sand placement, even though more nesting habitat is available for turtles (Conant et al. 2009). However, the effects of beach renourishment on nesting are not predictable and potential effects should be considered on a case-by-case basis (Crain et al. 1995). NASA has observed nesting on renourished areas on Wallops Island in both 2012 and 2013 (NASA 2012b, 2013). Nest failure and reduced rates of hatchling emergence are expected to occur for up to 2 years after sand placement.

Operation of heavy equipment (day and night) and presence of additional personnel

Plover – Operation of equipment and presence of additional personnel will discourage habitat use and cause plovers to expend additional energy seeking available habitat elsewhere. Searching for alternative suitable habitat leads to increased energy expenditure from additional search times and increases exposure to predators. Expending additional energy searching for and reaching suboptimal habitat that may have limited food resources does not allow plovers to maintain optimal body condition, resulting in decreased nest productivity or inability to nest. This may lead to nesting on less suitable habitat, such as on a narrower beach more vulnerable to flooding, and decreased nest or brood attendance by adults could increase predation of nests and/or chicks. If the habitat is less suitable foraging opportunities may be limited and decrease chick survival. If birds seek nesting habitats elsewhere, they will also face competition for territories with birds already established there, leading to lower productivity and possibly adult survival from reduced food availability. Additionally, nesting plovers may abandon their nests since birds along the Eastern Shore of Virginia flush easily (R. Boettcher, VDGIF, pers. obs. March 29, 2019).

Plover and knot – Operation of equipment will generate noise, disturbing foraging and roosting individuals. Individuals are likely to cease normal behaviors and alter their flight path, causing them to expend additional energy reaching habitat that may have limited food resources that does not allow them to maintain optimal body condition and cause them to spend a longer time foraging, thereby increasing their vulnerability to predators. The release of small amounts of fuel from the equipment may directly impact plovers and knots through ingestion or by getting on their feathers harming the birds. Fuel releases will also and negatively impact their prey species, reducing prey availability and quality causing the birds to spend additional time foraging, increasing the time they are available to predators. Additionally, sand compaction from equipment will cause burial or suffocation of invertebrate prey species and generally degrade the foraging habitat. The presence of additional personnel will also discourage the use of the habitat for foraging, causing the birds to seek suitable habitat elsewhere. Searching for alternative suitable habitat leads to increased energy expenditure from additional search times and increases exposure to predators. For knots, use of suboptimal foraging habitat may also result in lower weight when reaching the Arctic leading to reduced reproductive success.

Loggerhead – A nesting female may encounter operating equipment on the beach that could deter nesting attempts. If a female does attempt to nest, the sand may have been compacted by equipment, reducing the female's ability to dig a nest chamber, resulting in a reduction in nesting success. If hatchlings travel beyond the 1,000 ft buffer they may be crushed by operating equipment or encounter ruts and divots left by equipment that make it difficult to travel to the ocean and make them more vulnerable to predators while traversing the beach.

Breakwater construction

Plover and knot – Breakwater construction will generate noise, disturbing foraging plovers and knots. Individuals are likely to cease normal behaviors and alter their flight path, causing them to expend additional energy searching for available habitat elsewhere. Searching for alternative suitable habitat leads to increased energy expenditure from additional search times and increases exposure to predators. Suboptimal habitat may have limited food resources that does not allow plovers or knots to maintain optimal body condition and may also have a larger number of predators, thereby increasing their vulnerability to predators. For knots, use of suboptimal foraging habitat may result in lower weight when reaching the Arctic leading to reduced reproductive success.

Breakwaters would also change the beach topography, causing tombolos to form and reducing the rate of recovery of the foraging (plover and knots) and nesting (plovers) habitat. The effects of the reduced rate of habitat recovery on plovers and knots are the same as those discussed above.

Equipment staging

Loggerhead – Equipment staging areas may be modified daily and may not always be established in an upland area. Any equipment staged on the sand/beach may present an obstacle to nesting loggerheads causing them to return to the ocean instead of nesting or expend additional energy to find a suitable nesting site, resulting in a reduction in nesting success. Hatchlings may encounter equipment on the beach at night during hatching if they travel outside of the 1,000 ft buffer, causing them to spend more time reaching the ocean, leaving them vulnerable to predators, which increases the likelihood of harm or death.

Sand stockpile

Loggerhead – Any sand stockpiled on the beach may present an obstacle to nesting loggerheads causing them to return to the ocean instead of nesting or expend additional energy to find a suitable nesting site, resulting in a reduction in nesting success. Hatchlings may encounter the stockpile on the beach at night during hatching if they travel outside of the 1,000 ft buffer or a nest is laid after the stockpile has been established and, therefore, is within the 1,000 ft buffer. This will cause hatchlings to spend more time reaching the ocean, leaving them vulnerable to predators, which increases the likelihood of harm or death.

The effects of the actions remaining unchanged from the Service's 2016 Opinion are detailed below.

Table 8. Expected direct and indirect effects of the proposed actions.

Action	Direct and Indirect Effects					
	Noise	Vibration	Rocket Exhaust	Use Related Disturbance	Lighting	Habitat Loss/Suitability
Liquid Fueled ELV Launches	X	X	X		X	
Solid Fueled ELV Launches	X	X	X		X	
ELV Static Fires	X	X	X		X	
Sounding Rocket Launches	X	X	X		X	
Sounding Rocket Static Fires	X	X	X		X	
Disposal of Defective or Waste Rocket Motors	X		X			
Drone Target Launches	X	X	X		X	
UAS Flights	X	X			X	
Piloted Aircraft Flights	X	X			X	
Restricted Airspace Expansion	X					
Range Surveillance/Facility Security	X			X		
Construction	X				X	
Routine Facility Maintenance	X					
Launch Pad Lighting					X	
Recreational/ ORV Beach Use				X		
Protected Species Management				X		
Miscellaneous Activities on Wallops Island Beach				X		
Education Use of Wallops Island Beach				X		
Seawall Repair				X		
Shoreline Reconstruction Monitoring				X		
Beach Renourishment (from offshore shoal)				X		X

Noise

Effects on plover, knot, and loggerhead from liquid fueled ELV launches, solid fueled ELV launches, ELV static fires, sounding rocket launches, sounding rocket static fire testing, disposal of waste rocket motors, drone target launches

Support activities prior to a rocket launch include transportation of rocket parts between storage facilities and the launch complex and other associated activities. Support activities often result in an increase in noise and general activity due to additional presence of people in the vicinity of the rocket launch areas. Increased noise from support activities may disturb loggerheads attempting to nest and nesting plovers on the sound end of Wallops Island.

Ignition of rocket engines for orbital launches or static tests will produce instantaneous noise audible for a considerable distance from Launch Complex 0. In close proximity to the launch sites, the noise generated will be high intensity across a broad range of frequencies. Sound intensity may exceed 160 decibel (dB) on the beach and dune in close proximity to launch sites. The WFF Range Safety Office, using the NASA rocket size/noise equation (NASA 2009), estimated noise levels expected to occur during launches of envelope vehicles from each launch pad in the complex. An LMLV-3(8) rocket launched from pad 0-B will produce a noise level of 129 dB at 0.68 mi, attenuating to 108 dB up to 7.8 mi from pad 0-B. As many as 12 such launches could be performed per year at pad 0-B. Noise levels from static tests performed at pad 0-A will reach 124 dB within a 1 mi radius, attenuating to 108 dB at a distance of 6 mi from pad 0-A. As many as 6 launches and 2 static tests could be performed per year at pad 0-A. These noise levels are expected to be sustained for 30 to 60 seconds during a launch and for up to 52 seconds during a static test. Plover and loggerhead nests may occur within 328 ft of the launch sites, and when they occur between 328 ft and 1 mi of launches, they will be subjected to high intensity sound. The majority of knot activity on Wallops Island occurs on the north end of the island, more than 1.8 mi north of Pad 0-A (NASA 2012b, 2013, 2014a). Knot presence on the regularly nourished beach is unlikely due to the suppressed forage base. It is unlikely that knot will be subjected to high intensity sound on north Wallops Island.

Deafening of plovers, knots, and loggerheads is not expected at the decibel levels predicted at 0.7 to 0.9 mi from launches, but progressively closer to the rockets, the noise intensity may reach levels that could cause tissue damage. While not known in birds specifically, sound intensity of near 180 dB can result in nearly instantaneous tissue damage to the inner ear (McKinley Health Center 2007). Exposure to noises within these radii could deafen plovers or knots present during ignition if exposed to high intensity noise. Deafness will significantly impair the ability of a plover or knot to breed, shelter, and behave normally. In addition to deafening, low frequency and high intensity sound expected in very close proximity to the launch sites may be debilitating and cause disorientation or loss of balance, but these effects are not well established (Leventhall et al. 2003). Birds may be able to recover from sound-induced deafening over time (Adler et al. 1995), but some period of deafness may result from loud noises. Birds may recover from disorientation and other sound-induced effects, but the amount of time required is not known for plover or knot. Debilitated birds will be subject to increased vulnerability to predators and physiological stress, resulting from inability to detect and avoid predators, feed, care for eggs/young, and seek shelter.

Burger (1981) demonstrated startle effects in birds exposed to anthropogenic sound pressure of 108 dB. Within 6 mi of pad 0-A, such noise levels will occur as a result of rocket launches or static tests as many as 20 times per year. Several other sources of loud noises exist in the Action Area. Anthropogenic sources include: sounding rocket and drone target launches from Wallops Island, waste engine disposal at the open burn area on Wallops Island, and aircraft landing and taking off from Wallops Main Base and the UAS runway on Wallops Island. Collectively, several thousand such events take place within WFF annually (NASA 2005, 2015a). Some of these activities produce noise levels similar to the noise expected to be produced by the large rocket launches. While many of these sounds are of similar intensity, the frequency of the sounds varies, with noise generated from rocket launches generally in the low frequency range and aircraft noise generally in higher frequency ranges.

Plovers and knots not debilitated by high intensity noise are expected to be disturbed by launches and exhibit a startle response that interferes with normal behaviors, including breeding, feeding, and sheltering. It is not likely that plovers and knots will startle or flush from all of the relatively intense sound disturbances. Individual birds may become habituated to the noises. Some of the noises are likely below the disturbance threshold, will be attenuated by atmospheric conditions, or may occur during periods of elevated natural noise intensity (e.g., strong winds, large waves) so that the noises will be less intense relative to background noise levels.

In response to high intensity noises, plovers are not expected to permanently abandon nests, but may flush from nests. More significant effects result from exposure to predators as a result of flushing. This species relies largely on its cryptic coloration and concealment for protection from predators, and flushing from nests will alert predators to the location of the nest and leave eggs or chicks exposed. Startle responses to noises and associated visual stimuli are expected to result in an incremental reduction in nest success and/or chick survival. Knots are not expected to permanently abandon migratory stopover locations, but may flush from Wallops Island roosting or foraging locations, resulting in an expenditure of energy.

Atmospheric noise has been demonstrated to prevent loggerheads from entering an area (Manci et al. 1988). In the beach areas adjacent to rocket launch pads, the high intensity noise that occurs during rocket launches is expected to prevent loggerheads from coming ashore to nest. The intensity of noise close to launch pads is not expected to be sufficient to impair development of loggerhead eggs. Sand above the eggs is expected to attenuate the sound, but the degree of attenuation is not known. Noise is not expected to have an effect on loggerheads that come ashore to nest in habitat not located in the vicinity of the launch pads.

Effects on plover and knot from UAS flights, piloted aircraft operation, expansion of restricted airspace, range surveillance, and facility security

Jones et al. (2006) reported that wading birds were not disturbed by UAS overflights in excess of 328 ft above the birds. Similarly, Sarda-Parlomera et al. (2012) did not observe notable responses when they repeatedly overflew black-headed gull (*Chroicocephalus ridibundus*) colonies with small UAS at altitudes between 65 and 131 ft AGL. Most UAS flights originating from the north Wallops Island airstrip are expected to maintain at least 500 ft AGL except during landing and take-off (NASA 2012a). Therefore, UAS flights conducted from north Wallops Island airstrip have a minimal potential for disturbing plovers or knots to the level at which "take" would be expected.

Peak noise levels generated by aircraft at WFF range from 67 dB for a single-engine propeller airplane landing on Wallops Main Base to 155 dB for an F-18 conducting a touch and go maneuver at Wallops Main Base. Studies of the effects of helicopter overflight on waterbirds have shown (1) temporary behavioral response to low-altitude overflight, ranging from assuming an alert posture to taking flight; (2) responses decreasing in magnitude as overflight elevation increases; and (3) rapid resumption of the behaviors exhibited prior to the overflight (Komenda-Zehnder et al. 2003). Early research in Florida detected limited adverse effects when a helicopter overflew nesting waders (Kushland 1979). The majority of birds overflown did not exhibit any response to the stimulus and those that left their nests returned in less than 5 minutes. Smit and Visser (1993) found shorebirds and curlew to be particularly sensitive to helicopter overflights at less than 820 ft AGL, resulting in flushing of 33 – 75% of birds overflown, depending on the species. Flushing a bird from its nests can result in a range of adverse effects, from predation or abandonment of the chicks to energy expenditure of the parents.

Plovers may be disturbed by the operation of aircraft maneuvering or overflying the area where nesting occurs. Not all aircraft operation is likely to result in disturbance, and plovers are most likely to be disturbed by flights at low altitude down the beach or just offshore. Effects to plovers may include flushing from nests when incubating eggs, interruption of feeding or courtship, or similar responses. Effects to knots may include interruption of feeding or sheltering behaviors. Most noises are of short duration and plovers and knots are expected to return to normal behavior within a few minutes of the noise.

Effects on waterbirds can be reduced substantially if helicopters maintain minimum altitudes of at least 1,476 ft (Komenda-Zehnder et al. 2003). Birds may become habituated to aircraft overflight in an area of somewhat regular disturbance, such as the marshes between Wallops Main Base and Island or along the Wallops Island beach. Birds in more remote areas subject to surveillance flights, such as the barrier islands south of Wallops Island, could be more sensitive to overflights. NASA determined in their Biological Assessment that maintaining an altitude in excess of 1,476 ft will be possible for aircraft transiting from the Main Base airfield to an offshore surveillance area; however, aircraft conducting surveillance operations between Wallops Mainland and Island will be required to fly below 1,476 ft, which is expected to startle plovers and knots. Most noises are of short duration and plovers and knots are expected to return to normal behavior within a few minutes of the noise.

There is potential for a bird strike to occur (Washburn et al. 2014). Fifty-one percent of all bird strikes occur between September and February, during the months when plovers and knots are not expected to be present (Washburn et al. 2014). In addition, airfield activities conducted at Wallops Main Base are not expected to strike plovers or knots, as there is no suitable habitat present adjacent to the airfield. The new UAS airstrip is located in closer proximity to suitable habitat for plovers, although it will be located inland and away from nesting, foraging and roosting areas. The potential for plovers or knots to strike an aircraft is discountable.

The expansion of restricted airspace is likely to result in similar effects to those expected as a result of UAS and piloted aircraft operation, simply in an expanded area. There is no expected change to either the types of aircraft or the types and number of operations conducted within the airspace adjacent to WFF. As a result, the scale of overall impacts will not change, rather, they will be spread over a larger geographic area. Knots or plovers may be impacted by flights at low altitude or just offshore by disturbance to migrating behavior as described above.

Effects on plover, knot, and loggerhead from construction and routine facility maintenance

Construction will increase noise as a result of the presence of additional people and associated activities. Effects will be confined to the vicinity of the new fire station location adjacent to Navy Building V-024 and are not expected to result in more than minor behavioral responses from all 3 species.

Road resurfacing and infrastructure replacement will use heavy equipment and may elicit a startle response causing plovers and red knots to cease normal behaviors temporarily until noise has stopped in response to increased noise. Effects to loggerheads are unlikely as infrastructure projects are not located in proximity to areas used for nesting attempts.

Routine repairs are often required after hurricanes or intense storms. Heavy equipment is used to clear roads and stormwater systems. Activities conducted away from the beach are less likely to affect listed species. Maintenance activities on the beach are likely to create a startle response and may cause plovers or knots to temporarily cease foraging or resting and plovers may temporarily cease nesting. These activities are not expected to be intense or sustained enough to adversely affect plovers or knots.

Effects of noise from construction and routine maintenance to plovers may include flushing from nests when incubating eggs, interruption of feeding or courtship, or similar responses. Effects to knots may include interruption of feeding or sheltering behaviors. Most noises are of low intensity but long duration and plovers and knots are expected to habituate to the noise and return to normal behavior over time.

Vibration

Effects on plover, knot, and loggerhead from liquid fueled ELV launches, solid fueled ELV launches, ELV static fires, sounding rocket launches, sounding rocket static fire testing, drone target launches, UAS flights, piloted aircraft flights

Some energy from rocket launches, static tests, drone target launches, UAS flights, and piloted aircraft flight on Wallops Island will manifest as vibration in the ground near the launch pad or airstrip. Vibration may be significant from rocket launches, engine tests, and open burns. Effects from vibrations are likely to be confined to an additive disturbance to adult plovers, adult knots, and nesting loggerheads that may cause birds and turtles to temporarily cease normal behaviors. Due to the distance between rocket launch sites and nesting habitat for plovers and loggerheads, it is unlikely that vibrations will be significant enough to affect egg viability. Vibration at other NASA launch facilities has not been demonstrated to harm bird or sea turtle eggs (NASA 2009). Impacts from noise during launches can extend over 6 mi (NASA 2019), so vibration will likely radiate from the launch pads in a similar fashion and dissipate with increasing distance from the launch site. To aid with controlling vibrations from launch at liquid-fueled LV launch pad a deluge system is used. Given that loggerhead nesting has been documented less than 1 mi from the launch pads and plovers are known to nest and feed within 6 mi of the launch site, vibrations may affect egg viability for plovers and loggerheads nesting within the new beach. Knot activity in the vicinity of Launch Complex 0 is low; therefore effects to knots from vibration are unlikely.

Rocket Exhaust

Effects on plover, knot, and loggerhead from liquid fueled ELV launches, solid fueled ELV launches, ELV static fires, sounding rocket launches, sounding rocket static fire testing, disposal of waste rocket motors, drone target launches

Rocket exhaust from Pad 0-B is directed over the Atlantic Ocean by a vent located in the base of the gantry. Exhaust from launches and static tests at Pad 0-A is directed over the Atlantic Ocean through a flame trench in the launch pad. Wildlife within 656 to 984 ft of the exhaust ports during engine ignition may be harmed or killed. Plovers, knots, or loggerheads exposed directly to the exhaust could be killed by hot gas or by caustic combustion products. To be exposed, birds would need to be flying through the path of the exhaust plume at the time of ignition. Rockets leave the pad within seconds and the contrail stays with the launch vehicle. The solid-fueled LV launch pad has a flame trench that directs the flame over the ocean. The liquid-fueled LV launch pad has a deluge system that that suppresses flames and vibrations on the pad. Given the distribution of knot and plover habitat north and south of the launch complex and the likelihood that individual plovers will move around while establishing breeding territories or feeding and a plover or knot will likely pass through the area during migration, plovers and knots may be harmed due to rocket exhaust, but the likelihood of this occurring is low. In 2013, a loggerhead nest was located just north of Pad 0-A suggesting that loggerheads may nest in proximity to the launch pads in the future and hatchlings or adults may be harmed by hot exhaust.

The combustion of solid fuel rocket boosters creates aluminum oxide. Aluminum oxide particles in the atmosphere are efficient scavengers of water vapor and hydrogen chloride, and these particles produce hydrochloric acid. The combination of atmospheric and oceanic dilution, the buffering capacity of the ocean, and the presence of salt-laden soils in the adjacent areas will prevent hydrochloric acid from impacting pH of habitats within the Action Area. Hydrogen chloride vapor may exist in hazardous quantities in the immediate vicinity of launch pad 0-B at the completion of a launch. "The rapid dissolution of hydrogen chloride in the ambient air would result in a decline of this concentration within 60 minutes to a nonhazardous level (ATCA 2012)" (NASA 2019). A plover or knot flying through the area could be exposed to a caustic cloud of such vapor; however the disturbance of the launch event itself will likely repel birds from the immediate area for some time after engine ignition. Therefore, hydrochloric acid is not expected to adversely affect plovers, knots, or loggerheads (NASA 2005, 2009).

Estimates of carbon monoxide concentrations on the beach at the south end of Wallops Island following a launch or static test at either pad in Launch Complex 0 are between 0.9 and 1.1 parts per million, depending on weather conditions. These are below human exposure thresholds and believed to be below observable effects thresholds in wildlife. Atmospheric mixing and conversion of carbon monoxide to carbon dioxide will quickly diminish these concentrations; therefore, the concentration of carbon monoxide is not expected to adversely affect plovers, knots, or loggerheads (NASA 2005, 2009).

Lighting

Effects from liquid fueled ELV launches, solid fueled ELV launches, ELV static fires, sounding rocket launches, sounding rocket static fire testing, drone target launches, UAS flights, piloted aircraft flights, construction, launch pad lighting

Plover and knot – Rockets staged at Launch Complex 0 are up lit with metal halide lighting for up to several weeks prior to and up to 24 hours following a launch. Other structures within the launch complex, as well as Payload Fueling Facility, Payload Processing Facility, and Horizontal Integration Facility, use amber light emitting diodes or low pressure sodium bulbs for exterior night lighting. Additional lighting may also be used during construction of new facilities. Most of the existing and new facilities are not located immediately adjacent to the beach, which limits the potential effects on listed bird species; however, they do contribute to elevated levels of ambient lighting with the proximity of several facilities to the beach habitat.

Anthropogenic lighting attracts migrating birds, especially during times of reduced visibility. Effects can range in intensity from collision with structures resulting in injury or mortality, to lesser effects including expenditure of energy or delay in arrival at breeding or wintering grounds (Gauthreaux and Belser 2006). The majority of Atlantic Coast piping plover migratory movements are thought to take place along a narrow flight corridor, including the outer beaches of the coastline, with rare offshore and inland observations (Service 1996). Plover visual acuity and maneuverability are known to be good (Burger et al. 2011), including night vision (Staine and Burger 1994), suggesting that plovers may be able to identify and avoid structures in their flight paths. Plover collisions with fixed structures in the coastal zone are rarely documented (Service 2008); however, inclement weather could increase attraction to structures and collision risk (Richardson 2000).

Migrating knots may be exposed to similar risks. Burger et al. (2011) report knot migration flights occurring at altitudes between 0.6 and 1.8 mi AGL, well above the structures on Wallops Island. The most serious risk is likely to occur when northbound long-distance migrants make landfall at foraging areas. Wallops Island is a known stopover site for northerly migrating knots; however, the high-use areas are located well north of the Wallops Island infrastructure that may pose a risk to birds landing to rest or forage, resulting in a low likelihood of collision. Southbound migrants are at comparatively less risk due to their farther offshore flight paths. Although visual acuity and maneuverability of knots are known to be good (Burger et al. 2011, Cohen et al. 2011), inclement weather conditions could increase collision risk due to attraction to lighted structures (Richardson 2000).

<u>Loggerhead</u> – Anthropogenic light sources have documented negative effects on sea turtles. Unshielded lights can deter females from crawling onto a beach to nest. Bright full-spectrum or white lighting within view from the beach can cause female sea turtles to abandon nest attempts (Witherington 1992). At hatching, juveniles emerge and seek the nearest available light source, which on an undeveloped beach is the horizon over the ocean. Bright full-spectrum or white lighting shining in the vicinity of a nest can disorient emerging hatchlings, leading them away from the ocean and leaving them more vulnerable to predation, desiccation, or crushing by vehicles (Witherington and Bjorndal 1991). Hatchlings that reach the surf can become disoriented by lighting and leave the surf (Witherington 1991, NMFS and Service 2007).

This type of lighting is present at both the launch pads and airstrips, however, only the launch pads are in close proximity to nesting habitat. Therefore, any adults or hatchlings in this area during the approximately 4 weeks/launch that night-time lighting is being implemented would be affected by lighting.

UAS flights are occasionally conducted at night in response to special circumstances or for hurricane monitoring. Safety lighting at the airstrip will be minimal intensity and downward shielded, and over flying UAS will not use running lights. Therefore, UAS flights are not likely to adversely affect loggerheads.

Disturbance

Effects on plover, knot, and loggerhead from facility security, recreational/ORV beach use, and miscellaneous activities on and education use of Wallops Island beach

WFF personnel and their families are allowed to use the north end of Wallops Island for recreation outside of NASA operations periods. Recreational use, miscellaneous maintenance activities and security patrols conducted on the beach have similar effects on listed species because they may involve operation of vehicles or heavy equipment on the beach, in addition to people on foot in areas where plovers, knots, or loggerheads may occur. Security patrols have been ongoing at WFF for a number of years, and have likely presented some level of disturbance to plovers and nesting loggerheads.

Plover – Effects of foot traffic to nesting plovers can range from relatively minor disturbance that temporarily interferes with normal breeding, feeding, and sheltering behavior causing harm or death of chicks, or sustained disturbance resulting in nest abandonment. Vehicle use on the beach can crush chicks and create ruts capable of trapping plover chicks where they can die or be eaten by a predator.

Closure of a plover nesting area will avoid these effects to the extent that the closure is observed; however, plovers may nest outside of the established closure area. In these cases, monitoring, placing nest exclosures, and posting signage will minimize effects to the identified nests. After hatching, young plovers are likely to move away from nesting areas, making them vulnerable to these effects throughout a much larger area. Even with surveys and monitoring conducted at a high frequency, young plovers may be killed or harmed due to their coloration causing them to blend in with the sand and their tendency to freeze when frightened in order to rely on this camouflage. Plovers that migrate along the barrier islands between wintering grounds and breeding grounds may also be impacted by human activity and vehicle use interfering with their ability to forage. Vehicles and human activity may make prey difficult to access by blocking habitat or compacting the sand. Additionally, noise may also discourage the use of the habitat.

Loggerhead – Security patrols and recreational use may inadvertently disturb nesting females, crush eggs within the nest, or crush, entrap, or disturb hatchlings attempting to leave the nest. Vehicle use on the beaches may compact beach sand and/or disturb female turtles attempting to nest, however, monitoring for turtle activity followed by erecting exclosures to protect nests will avoid adverse impacts due to the low level of nesting activity exhibited at Wallops Island.

Plover and loggerhead – Effects to plovers and loggerheads are likely to include an increased predation rate due to human activity. Human activity may result in trash on the ground, which could both attract predators and increase the carrying capacity of the predators due to increased food availability. The increased numbers of predators may increase risk of disturbance, nest loss, and adult mortality of plovers and increase losses of loggerhead eggs and nests. Plovers may expend more energy in predator surveillance and avoidance and that energy expenditure could decrease overall fitness. However, use of these sites for recreation and security patrols is generally light and not continuous; therefore effects to plovers and loggerheads are expected to be minimal.

Knot – Both recreational and operational uses of Wallops Island beach have the potential to disturb foraging and resting knots. The presence of vehicles on the beach has been shown to result in fewer individuals as compared to an area without the disturbance, as affected shorebirds shift their preferred habitat (Pfister et al. 1992). A study in Massachusetts suggests that knots may be more susceptible to human disturbance (based on pedestrian induced flight-initiation distance) than other species commonly found on the beach during spring migration (Koch and Paton 2014). In Virginia, Watts and Truitt (2015) demonstrated that the majority of knots are only present on the barrier islands for an approximately 4 to 5 week period in late spring.

Therefore, although knots could be exposed to beach use-induced stressors in the Action Area, impacts will be for a short duration. In addition, the majority of north Wallops Island is closed to recreational use (NASA 2015b) during the plover nesting season (April 15 to August 31), corresponding to the location on Wallops Island where a majority of knots have been observed in recent years. Additionally, Schlacher et al. (2008) demonstrated *Donax* spp. mortality when exposed to vehicle traffic; however, vehicle use at Wallops Island is far less than the area studied and impacts are not expected to be significant. Therefore, the knot is not expected to be adversely affected by alterations to its foraging base from facility security, recreational/ ORV beach use or miscellaneous activities on or education use of Wallops Island beach.

Effects on plover, and knot from protected species management and shoreline reconstruction monitoring

Monitoring activities involve conducting frequent surveys, implementing area closures and posting signage, placing plover nest enclosures, and similar actions. The intent of monitoring activities is to reduce or avoid impacts to listed species by detecting them early. Movement by personnel through the habitat during monitoring efforts is not likely to adversely affect plovers and knots.

Effects on plover, knot, and loggerhead from seawall repair and post-renourishment work

The operation of heavy equipment and presence of personnel on the beach in conjunction with seawall repair will result in disturbance to plovers and knots using the area for foraging or passing through the area while moving among foraging areas. Any plovers or knots using these areas are expected to temporarily cease normal foraging, roosting, or flight behavior and fly to adjacent suitable areas where there is no disturbance, or alter their flight paths to avoid areas where activity is occurring. Similarly, during the nesting season loggerheads may be temporarily disturbed by onshore activities and move to other nearby areas where there is no disturbance. However, habitat quality for plovers and knots in degraded shoreline areas where seawall repair will be occurring is low, so these species are not expected and these effects are expected to be insignificant and discountable. Habitat quality for loggerheads is also expected to be low, but loggerheads may attempt to nest in these locations. See above for further discussion on effects of renourishment on loggerheads.

Operation of the dredge is limited to offshore areas and will not affect the shoreline beyond delivery of sand; therefore, it will not affect the species considered in this opinion under the Service's jurisdiction. Effects to loggerheads at sea are addressed separately through NASA's section 7 consultation with NMFS.

After each renourishment cycle, shortly after construction of the beach and dune, beachgrass planting (discussed above) and sand fence installation will be conducted on the seaward side of the dune adjacent to the new beach. Depending on timing of sand fence installation, the increased presence of people on the beach may result in disturbance to plovers and knots. This disturbance is expected to cause plovers and knots to flush and move to other areas. The installation of sand fencing is not expected to affect loggerheads because these activities will be conducted during the day and loggerheads are expected to be in close proximity to the beach during the night hours.

Once installed, the presence of sand fence may deter plover nesting close to the sand fence and may increase the risk of depredation by providing cover for predators in close proximity to plover nests. Migrating knots generally do not use the renourished beach for feeding and do not nest in Virginia; therefore, the presence of sand fence is not expected to affect knots. The sand fence is expected to allow movement of adult loggerheads above the berm and into the dune area and will not prevent them from returning to sea. If nests are located landward of the sand fence a small fraction of hatchling turtles may become trapped, particularly if the sand fence is not maintained or if debris entangled in the sand fence prevents hatchling movements.

Habitat Loss/Suitability

Effects from beach renourishment by offshore shoal

Plover – The addition of sand dredged from offshore shoal A or B may result in a beach similar in appearance to a natural beach, but significantly different in sand density and compaction, grain size and assortment, and beach-associated fauna, including invertebrates, and nutrients and chemical characteristics of the sand. Immediately following sand placement, the suitability of the renourished beach for plovers is expected to be significantly less than a natural beach of similar size and configuration due to loss of invertebrate prey.

Over time, the faunal characteristics of a natural beach are expected to return as the created beach is recolonized by beach-associated fauna and plants, and as wave action, wind, rain, and other natural forces weather the beach (National Research Council 1995). After recolonization of the beach by invertebrates, the beach may become higher quality foraging habitat for plovers than surrounding natural beaches because the beach will remain free from vegetation for a period of time (Melvin et al. 1991) and may be higher and wider than nearby eroding beaches. NASA monitoring data (NASA 2012b, 2013, 2014a, 2015b, 2016, 2017, 2018) shows that the number of plover nests is fairly consistent from year-to-year, suggesting that beach renourishment from an offshore shoal does not cause a decrease in the number of plover breeding territories on Wallops Island but that plovers may preferentially nest on north Wallops Island. Monitoring data shows that plovers nested on the renourished beach after 2 years (NASA 2014a, 2015b). Beach renourishment using sand excavated from an offshore shoal is expected to occur approximately once every 2 – 7 years. Due to nesting habitat on north Wallops Island no longer being available due to backpassing, renourishment in the template identified in Figure 3 will result in a reduction in nesting success and survival on Wallops Island.

Knot – The area of Wallops Island beach that historically hosted the greatest number of knots during the northern migration – the north "curve" – is rapidly accreting but overlaps the beach renourishment area (King et al. 2011). If sand is obtained from offshore shoal A or B and placed in the renourishment area outlined in the reinitiated action, then impacts are expected to be the same as those addressed in Table 7.

Loggerhead – Based on the large grain size of the sand from shoals A and B, the relatively long distance from the water line to the berm/dune interface where turtles would be expected to nest, and the placement of sand over and around the rock seawall for most of the project area, desiccation of the beach is expected because the sand will likely drain quickly, the rock seawall will interfere with maintaining a natural moisture gradient, and the area may be infrequently affected by waves inundating any nests impacting nest success. The sand color is expected to be similar to that which occurs on the beaches of the area because the material that occurs in the offshore shoals is eventually transported to the beaches and likely originates from the same material as that which occurs on the beach.

The gender of sea turtles is determined by temperature during the middle third of the incubation period, with only a few degrees separating the production of male and female hatchlings (Conant et al. 2009). Therefore, even slight differences in sand color, grain size, and moisture that affect sand temperatures and alter the ratio of males to females produced. The sand is expected to show less cohesiveness and lower shear strength than sand found on natural beaches, which may reduce the ability of nestlings to dig themselves out of the nest (egg chamber).

Plover, knot, and loggerhead – Following placement of sand from an offshore shoal on the beach and dune, some portion of this material will be transported onto natural beaches adjacent to the project area. Natural wind and current patterns are likely to transport sand to the north and deposit it on north Wallops Island and portions of CNWR, and also to the south, where it will be deposited on Assawoman Island. The amount and degree of deposition on these islands is dependent on environmental conditions (e.g., storms, wave action), effects of breakwaters, and other factors that may affect littoral sand transport. Over time, the deposition of the relatively large sand grains will affect mean sand grain size and other physical characteristics of these beaches. While the grain size of the two most recent renourishment matched the grain size on Wallops Island, there is potential for this to differ for future renourishments. These changes may either improve or reduce the suitability of unnourished beaches for plover nesting and foraging, knot foraging, and loggerhead nesting. The impacts of mismatched grain sizes were shown on Assateague Island, when sediment with a higher proportion of coarse grained sediment was used. The coarse sediment prevented the mobilization of the finer sediments, degrading habitat suitability for plovers (Schupp et al. 2013). These changes may shift the areas that plovers and knots use for foraging, or that plovers and loggerheads use for nesting but total area used by these species is not likely to change.

The sand placed on the renourished beach from the offshore shoal will initially be unsuitable for use by invertebrates and plants characteristic of natural beaches and much of the fauna on the beach will be killed or negatively impacted by the renourishment. The beach conditions are expected to be completely unsuitable for use by nesting plovers and loggerheads during the first year following sand placement, with limited amounts of suitable habitat available 1 year following placement, and returning to conditions similar to those that existed prior to placement by 3 years following placement.

Additive Effects of Proposed Activities

In addition to the effects of the proposed actions considered and described above, the additive effects of the different types of activities result in greater impacts than each activity conducted independently. For example, operations of UAS within the parameters described may result in infrequent disturbance and some launch operations, rocket tests, and monitoring may have similar effects. The combination of all of these activities, when considered together, results in more frequent disturbance and as a result we expect plovers and loggerheads to experience low levels of disturbance in the Action Area on a regular basis.

Frequent disturbance to plovers, knots, and loggerheads resulting from mission preparation and support may disturb the species to the extent that they avoid use of the south end of Wallops Island where mission-related activities are concentrated. If they avoid use of the area, listed species may not be subjected to the most intense and severe effects expected to occur during rocket launches. In addition, because the suitability of the newly created beaches is expected to be relatively low for a period following sand placement, use by plovers and loggerheads may be reduced and as a result some of the most severe effects resulting from launches may be reduced. However, because some nesting loggerheads and migrant plovers and knots use the beach only for limited periods of time, frequent disturbance and/or low habitat suitability is not expected to completely prevent the most severe effects from occurring.

CUMULATIVE EFFECTS

Cumulative effects are those "effects of future State or private activities, not involving federal activities, that are reasonably certain to occur within the action area" considered in this Opinion (50 CFR 402.02). The Service is not aware of any future state, tribal, local, or private actions that are reasonably certain to occur within the Action Area at this time; therefore, no cumulative effects are anticipated.

JEOPARDY AND ADVERSE MODIFICATION ANALYSIS

Section 7(a)(2) of the ESA requires that federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

Jeopardy Analysis Framework

"Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). The following analysis relies on 4 components: (1) Status of the Species, (2) Environmental Baseline, (3) Effects of the Action, and (4) Cumulative Effects. The jeopardy analysis in this Opinion emphasizes the rangewide survival and recovery needs of the listed species and the role of the Action Area in providing for those needs. It is within this context that we evaluate the significance of the proposed federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Analysis for Jeopardy

<u>Plover</u>
Impacts to Individuals – The proposed action includes impacts to nesting, foraging, and roosting habitat from the proposed SERP and activities described in the 2016 Wallops Flight Facility Update and Consolidation of Existing Biological Opinions that have not have changed, evaluated over a 15 year timeframe. As discussed in the Effects of the Action, potential effects of the action include effects to plovers present within the Action Area during spring migration and nesting season with some of the actions affecting plovers for subsequent migration and nesting seasons following initial construction. Effects generally include loss of nesting and foraging habitat, disturbance, habitat degradation, increased human activity, reduction in prey populations, and physical impacts such as crushing individuals. We anticipate that all individuals attempting to nest or forage on Wallops Island will be impacted -- ranging from 3-9 nesting pairs per year from 2010-2018 and 1-2 additional birds that nest in areas south of Wallops Island and forage on the south end of Wallops Island in the area near camera stand Z-100. The loss of habitat may cause individuals to seek out habitat elsewhere, resulting in additional competition for territories, and/or use of suboptimal habitat, resulting in decreased productivity and survival. While backpassing and renourishment activities will not begin prior to fledging of the 2019 season's chicks, effects will impact individuals returning to the area during the 2020 migration and nesting season and subsequent seasons depending on recovery time of the habitat. The habitat may remain suboptimal until the benthic community has recovered and sediment dynamics stabilize available nesting habitat on the island, which could take up to 6 years based on current models (Corps 2018a, 2018b). In summary, we anticipate impacts to individual plovers in either their annual survival or reproductive rates.

Impacts to Populations – As we have concluded that individual plovers are likely to experience impacts in their annual survival or reproductive rates, we need to assess the aggregated consequences of the anticipated impacts on the population to which these individuals belong. The nesting plover population on Wallops Island made up an average of 2.3% of nesting pairs, as of 2016, within the Southern RU. Loss of carrying capacity of breeding habitat on Wallops Island and loss of potential for growth in the abundance of breeding pairs from Wallops Island needed to attain recovery in this RU will continue for the life of the project. During this time, nesting will continue, but at a reduced frequency and at a lower number of nests in some years. Because the Wallops Island nesting population will not be permanently lost and represents a relatively minor (2.3%) portion of the nesting pairs in the Southern RU, we conclude that the effects from the proposed action will not result in permanent population declines in this RU.

Impacts to Species – To understand the consequences of population-level effects at the species level, we need to understand the RND needs of the species. Because recovery units have been designated for the plover, we first will assess the consequences of these impacts at the recovery unit level. As discussed in the Status of the Species, there are 4 recovery units – each with an overall productivity target and their own breeding pair target to either achieve or maintain over a 5 year period: Atlantic Canada, 400 pairs; New England, 625 pairs; New York-New Jersey, 575 pairs; Southern (DE-MD-VA-NC), 400 pairs (Service 1996). While the Southern RU status is classified as improving (Service 2017), declining productivity was observed in the 2016 and 2017 nesting seasons with a small increase in 2018 (Service 2019a). This project is not anticipated to change the Southern RU status as the nesting population on Wallops Island accounted for approximately 2.3% of nesting pairs within the RU, as of 2016. Wallops Island will continue to contribute to the Southern RU at a reduced amount that is not expected to impact the rangewide status of the species.

CONCLUSION

We considered the current overall improving rangewide status of the plover and the stable condition of the species within the Action Area (environmental baseline). We then assessed the effects of the proposed action and the potential for cumulative effects in the Action Area on individuals, populations, and the species as a whole. As stated in the Jeopardy Analysis, we do not anticipate any reductions in the overall RND of the plover. It is the Service's Opinion that the actions addressed in the Wallops Flight Facility Update and Consolidation of Existing Biological Opinions, as proposed, are not likely to jeopardize the continued existence of the plover.

<u>Knot</u>

Impacts to Individuals – The proposed action includes impacts to foraging and roosting habitat from the proposed SERP and activities described in the 2016 Wallops Flight Facility Update and Consolidation of Existing Biological Opinions that have not have changed, evaluated over a 15 year timeframe. As discussed in the Effects of the Action, potential effects of the action include effects to knots present within the Action Area during spring migration with some of the actions affecting knots for subsequent seasons following initial construction. Effects generally include loss of foraging and roosting habitat, disturbance, habitat degradation, and loss of prey species.. Flocks of knots ranging in size from 34-1,162 individuals have been documented on Wallops Island (NASA 2010b, 2011, 2012b, 2013, 2014a, 2015b, 2016, 2017, 2018). During some years of the 15-year Opinion timeframe, we anticipate that all individuals attempting to forage and roost on Wallops Island will be impacted and attempt to seek habitat elsewhere. Searching for alternative suitable habitat leads to increased energy expenditure from additional search times and increases exposure to predators. Additionally, suboptimal habitat may have more predators, thus increasing predation risk. Use of suboptimal habitat may also result in lower weight when reaching the Arctic leading to reduced reproductive success. While construction will not begin until after the 2019 spring knot migration, the effects stated above will impact individuals returning to the area during the 2020 spring migration and subsequent migration seasons. Following construction, the habitat may remain suboptimal until the benthic community returns and sediment dynamics stabilize, which could take up to 6 years based on current models (Corps 2018a, 2018b). In summary, we anticipate impacts to individual knots in either their annual survival or reproductive rates.

Impacts to Populations – As we have concluded that individual knots are likely to experience impacts in their annual survival or reproductive rates, we need to assess the aggregated consequences of the anticipated impacts on the population to which these individuals belong. While a rangewide population estimate is not available (Service 2019b), the Eastern Shore of Virginia has been known to support a population of approximately 7,000 knots with variation in numbers of individuals (Cohen et al. 2009, Karpanty et al. 2018). The knot flocks documented at Wallops Island of 34-1,162 individuals indicate that a maximum of 16.6% of migratory knots along the Eastern Shore are utilizing Wallops Island. It is unlikely that all 16.6% of knots will be affected every year from harm and decreased reproduction on their Arctic breeding grounds because knots are not foraging and roosting exclusively on Wallops Island during their spring migration and habitat will be available on Wallops Island, although not during all years and at a reduced level of quality, in some years during the Opinion timeframe. While the proposed action affects a single active foraging area along Virginia's Eastern Shore and impacts will be felt over multiple years, we conclude that the effects will not result in permanent population declines.

Impacts to Species – As we have concluded that knot populations are unlikely to experience reductions in fitness, there will be no harmful effects (i.e., there will be no reduction in RND) on the species as a whole.

CONCLUSION

We considered the current overall stable rangewide status of the knot and the variable condition of the species within the Action Area (environmental baseline). We then assessed the effects of the proposed action and the potential for cumulative effects in the Action Area on individuals, populations, and the species as a whole. As stated in the Jeopardy Analysis, we do not anticipate any reductions in the overall RND of the knot. It is the Service's Opinion that the actions addressed in the Wallops Flight Facility Update and Consolidation of Existing Biological Opinions, as proposed, are not likely to jeopardize the continued existence of the knot.

Loggerhead
Impacts to Individuals – The proposed action includes impacts to nesting habitat from equipment

staging, sand stockping, operation of equipment both day and night, sand mining, and renourishment from the proposed SERP and activities described in the 2016 Wallops Flight Facility Update and Consolidation of Existing Biological Opinions that have not have changed, evaluated over a 15-year timeframe. As discussed in the Effects of the Action, potential effects of the action include effects to loggerheads present within the Action Area during nesting season with some of the actions affecting loggerheads for subsequent nesting seasons following initial construction. Effects generally include loss of nesting habitat, disturbance, habitat degradation, and physical impacts such as crushing individuals. We anticipate that all individuals attempting to nest on Wallops Island will be impacted during some years of the 15-year Opinion timeframe. While construction will not begin prior to hatching of the 2019 seasons nests, the effects stated above will impact individuals returning to the area during the 2020 nesting season and subsequent seasons. Following construction, the habitat may remain suboptimal until sediment dynamics stabilize, which could take up to 6 years based on current models. In summary, we anticipate impacts to individual loggerheads in either their annual survival or reproductive rates.

Impacts to Populations – As we have concluded that individual loggerheads are likely to experience impacts in their annual survival or reproductive rates, we need to assess the aggregated consequences of the anticipated impacts on the population to which these individuals belong. From 1974-2017, 13 loggerhead nests and 22 false crawls were documented on Wallops Island. Nesting does not occur every year on Wallops Island and in 2010 all nests were laid by 1 female (NASA 2010b). Given that limited nesting occurs and that in some years nesting habitat will be available, we expect that the population level impacts from decreased reproduction, harm, and death will be relatively minor and will not occur every year. We conclude that the effects will not result in permanent population declines.

Impacts to Species – As we have concluded that loggerhead populations are unlikely to experience reductions in fitness, there will be no harmful effects (i.e., there will be no reduction in RND) on the species as a whole.

CONCLUSION

We considered the current overall declining rangewide status of the loggerhead and the stable condition of the species within the Action Area (environmental baseline). We then assessed the effects of the proposed action and the potential for cumulative effects in the Action Area on individuals, populations, and the species as a whole. As stated in the Jeopardy Analysis, we do not anticipate any reductions in the overall RND of the loggerhead. It is the Service's Opinion that the actions addressed in the Wallops Flight Facility Update and Consolidation of Existing Biological Opinions, as proposed, are not likely to jeopardize the continued existence of the loggerhead.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined in section 3 of the ESA as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering (50 CFR § 17.3). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by NASA so that they become binding conditions of any grant or permit issued to any applicant, as appropriate, for the exemption in section 7(o)(2) to apply. NASA has a continuing duty to regulate the activity covered by this incidental take statement. If NASA (1) fails to assume and implement the terms and conditions or (2) fails to require NASA to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of Section 7(o)(2) may lapse. To monitor the impact of incidental take, NASA must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE ANTICIPATED

Numeric Estimate of Anticipated Incidental Take/Use of Surrogate for Monitoring Take

The Service has used available data to quantify and numerically express anticipated incidental take of plovers, knots, and loggerheads. This numerical estimate provides a clear limit on the incidental take anticipated and authorized in this Opinion. However, based on the difficulties associated with monitoring take in terms of affected individuals, the Service also provides an additional, alternative means of monitoring take of plovers, knots, and loggerheads. This approach is most protective of plovers, knots, and loggerheads in that reinitiation is triggered if the incidental take from the project exceeds the number of plovers, knots, or loggerheads specified below or exceeds, in any amount or manner, the surrogates specified below.

50 CFR 402.14(i)(1)(i) states that surrogates may be used to express the amount or extent of anticipated take provided the Opinion or incidental take statement: (1) describes the causal link between the surrogate and take of the listed species; (2) describes why it is not practical to express the amount of anticipated take or to monitor take-related impacts in terms of individuals of the listed species; and (3) sets a clear standard for determining when the amount or extent of the taking has been exceeded.

In situations where some data exists that may be used to calculate a numerical estimate of take for a species but there are challenges associated with measuring take in terms of individuals, the Service has used surrogates as an additional means of monitoring take. In those instances, project effects outside of a specifically defined amount of affected surrogate serves as a trigger indicating that the numerical take estimate may have been exceeded and reinitiation is required.

Plover – Numeric Estimate of Anticipated Incidental Take

The numerical estimates of incidental take below were calculated using plover productivity data from Wallops Island. From 2012-2018 average productivity, represented by the number of chicks fledged per pair each year, was 1.05 chicks fledged/pair. The number of nests each year ranged from 3 to 9 with an average of 5.4 nests/year.

Backpassing and Renourishment – Plovers have been documented using 3.1 linear mi of beach habitat on Wallops Island for nesting and foraging. Of these 3.1 linear mi of habitat, 1.8 linear mi will be removed via sand mining, which includes operation of heavy equipment (day and night) and presence of additional personnel, and will take up to 6 years to return to its current habitat quality and quantity. The remaining 1.3 linear mi of habitat will be renourished, rendering it unusable during renourishment due to operation of heavy equipment (day and night) and presence of additional personnel or suboptimal post-renourishment due to burial and loss of benthic organisms for approximately 1 year.

Since the 3.1 linear mi of habitat will be unusable or suboptimal for 1 year, we expect that all adults and chicks will be incidentally taken (5 nests/year x 2 adults/nest = 10 adults) + (5 pairs x 1.05 chicks fledged/pair = 5.25 = 5 chicks) + (2 foraging adults), for a total of 17 birds (12 adults and 5 chicks). Additionally, on average 71% of nests (71% of 5 nests = 3.55 = 4 nests) are laid each year in the 1.8 linear mi where sand is to be excavated. To account for the additional 5 years needed for this area to recover to current habitat quality and quantity, take of 50% of all adults and chicks is anticipated in the first 2 years after backpassing as birds return to the area and no nesting or foraging habitat is available (4 nests x 2 adults/nest = 8 adults) + (4 pairs x 1.05 chicks fledged/pair = 4.20 = 4 chicks) and (8 adults + 4 chicks x 50% = 6 birds x 2 years = 12 birds). No take is anticipated in the last 3 years due to gradual return of habitat.

As backpassing and renourishment, which includes operation of heavy equipment (day and night) and presence of additional personnel, are expected to occur again in 10 years, 20 adults (12 adults in year 1 + 4 adults in year 2 + 4 adults in year 3) and 9 chicks (5 chicks in year 1 + 2 chicks in year 2 + 2 chicks in year 3) are expected to be taken when this action occurs again. Over the 15-year Opinion timeframe, the Service expects a total of 58 plovers (40 adults and 18 chicks) to be incidentally taken due to backpassing and renourishment.

Renourishment using an offshore shoal will take place every 2-7 years between backpassing events. We are assuming that renourishment will occur in 2-year intervals during the 15-year Opinion timeframe. Twenty-nine percent of nests are laid each year in the 1.2 linear mi section of the north end of the renourishment area. We expect that all adults and chicks in this area will be incidentally taken with each renourishment event (29% of 5 nests = 1.45 = 1 nests) (1 nests x 2 adults/nest = 2 adults) (1 pair x 1.05 chicks fledged/pair = 1.05 = 1 chick) + (2 foraging adults).

Using a 2-year interval, we are assuming 6 renourishment events during the 15-year Opinion timeframe (6 renourishment events x 4 adults per event = 24 adults) (6 renourishment events x 1 chick per event = 6 chicks). Over the 15-year Opinion timeframe, the Service expects a total of 30 plovers (24 adults and 6 chicks) to be incidentally taken due to renourishment using an offshore shoal. The anticipated take is described in Table 9.

Recreational Beach Use – Recreational beach use, including foot traffic and vehicle use, occurs each year. Incidental take of 1 pair (2 adults) and 1 nest (1 pair x 1.05 chicks fledged/pair = 1.05 = 1 chick) is anticipated each year. Over the 15-year Opinion timeframe, the Service expects 30 adults and 15 chicks to be incidentally taken due to recreational beach use. The anticipated take is described in Table 9.

Rocket Launches and Flights – From 2012-2018, nesting plovers on Wallops Island laid an average of 3.58 eggs/pair. Incidental take of 1 pair (2 adults) and 1 nest (1 pair x 1.05 chicks fledged/pair = 1.05 = 1 chick or 1 pair x 3.58 eggs/pair = 3.58 = 4 eggs) is anticipated each year from the effects of launch-related activities immediately adjacent to the beach, resulting from intense sound, exposure to rocket exhaust and contaminants, collision with aircraft, and similar launch activities. Over the 15-year Opinion timeframe, the Service expects 30 adults and 15 chicks or 60 eggs to be incidentally taken due to rocket launches and flights. The anticipated take is described in Table 9.

Plover – Surrogate for Monitoring Take

It is not practical to monitor take-related impacts in terms of individual plovers for the following reasons: the species has a small body size making it difficult to locate, which makes encountering dead or harmed individuals unlikely; species losses may be masked by annual fluctuations in numbers; take may occur offsite; failure to reproduce or a decrease in nesting productivity may not be detected if an individual moves to a neighboring island; some forms of take are non-lethal harm that is not detectable. Detecting mortality or harm of plovers (especially chicks), particularly on beaches where vehicles are being operated, is extremely difficult. Cryptic coloration is the species' primary defense mechanism, evolved to cope with natural predators, and nests, adults, and chicks blend with beach surroundings. Newly hatched chicks stand 2.5 inches high, weigh less than a quarter ounce, blend with the beach substrate, and often respond to approaching vehicles, pedestrians, and perceived predators by "freezing" in place to take advantage of their natural camouflage. Dead chicks may be covered by wind-blown sand, ground into the sand by other passing vehicles, washed away by high tides, or consumed by scavengers.

Backpassing and Renourishment – Linear miles of beach habitat where plovers nest and forage is being used as a surrogate to express the extent of authorized take for the plover related to backpassing and renourishment activities, which includes operation of heavy equipment (day and night) and presence of additional personnel, because it is not practical to monitor take-related impacts in terms of individuals. Beach habitat alteration that occurs through excavation and placement of 1.3 MCY of sand, and the associated equipment and personnel needed to complete this activity, will directly and indirectly cause the anticipated incidental take of plovers within the bounds of the identified 3.1 linear mi of beach habitat.

The 3.1 linear mi of beach habitat includes the 1.2 mi section of the renourishment area and the 1.8 mi sand excavation area from building V-10 to the northern extent of the sand excavation area and a 0.1 linear mi section of the renourishment area in front of camera stand Z-100, all areas are bordered on the east and west by MLW and the secondary dune, respectively (Figure 9). The 3.1 linear mi of beach habitat sets a clear, enforceable standard, and beach habitat alteration related to backpassing and renourishment activities outside of that specific area exceeds take. The anticipated take is described in Table 9.

Recreational Beach Use – Linear miles of beach habitat where plovers nest and forage is being used as a surrogate to express the extent of authorized take for the plover related to recreational use activities, particularly operation of ORVs, because it is not practical to monitor take-related impacts in terms of individuals. Beach habitat alteration that occurs through foot traffic and vehicle use recreational beach use will directly and indirectly cause the anticipated incidental take of plovers within the bounds of the identified 1 linear mi of beach habitat.

The 1 linear mi of beach habitat is bounded to the south by the northern extent of the sea wall and extends 1 mi north to the plover closure area bordered on the east and west by MLW and the secondary dune, respectively (Figure 10). The 1 linear mi of beach habitat sets a clear, enforceable standard, and beach habitat alteration related to recreational use activities outside of that specific area exceeds take. The anticipated take is described in Table 9.

Rocket Launches and Flights – The number of launches and flights per year is being used as a surrogate to express the extent of authorized take for the plover related to ongoing operations, including rocket launches, UAVs, piloted aircraft, and launch-related activities immediately adjacent to the beach, because it is not practical to monitor take-related impacts in terms of individuals. The noise, vibration, and exhaust that occurs as a result of the launches or flights will directly and indirectly cause the anticipated incidental take of plovers because the effects, although short-term, can be severe enough to kill individuals.

The 121 launches per year includes liquid fueled ELVs, solid fueled ELVs, sounding rockets, sounding rocket static fires, and drone target launches and incorporates a 10% buffer. The 71,500 flights per year includes UAS and piloted aircraft flights with a 10% buffer. Launches take place at Pads 0-A, 0-B, 1, 2, and the south UAS airstrip flat pad. Flights take place at Wallops Main Base, South Wallops Island, North Wallops Island, and adjacent air space. The locations for each specific action and frequency of each launch are detailed in Table 1. The 121 launches per year and 71,500 flights per year (as detailed in Table 1) set a clear, enforceable standard, and additional launches or flights exceeds take. The anticipated take is described in Table 9.

Knot – Numeric Estimate of Anticipated Incidental Take

Backpassing – Incidental take was calculated using average knot flock size estimates from 2012-2018 on Wallops Island. From 2012-2018 average flock size was 180 adults. Knots have been documented using 1.5 linear mi on Wallops Island for foraging. All of this habitat will be completely removed by sand excavation, which includes operation of heavy equipment (day and night) and presence of additional personnel, and will not return to its current habitat quality and quantity for 6 years, rendering the habitat unavailable or suboptimal. The Service expects all knots in an average flock will be incidentally taken for 1 year following sand excavation (180 adults x 1 year = 180 adults), the following 2 years 50% of an average flock will be incidentally taken due to suboptimal habitat conditions ([180 adults/2] x 2 years = 180 adults). No take is anticipated in the last 3 years due to gradual return of habitat. As backpassing, which includes operation of heavy equipment (day and night) and presence of additional personnel, is anticipated to occur again in 10 years the Service expects a total of 720 knots ([180 adults + 180 adults] x 2 = 720) to be incidentally taken during the 15-year Opinion timeframe. The anticipated take is described in Table 9.

Rocket Launches and Flights – Incidental take of 2 adult knots per year is anticipated from the effects of launch-related activities immediately adjacent to the beach, resulting from intense sound, exposure to rocket exhaust and contaminants, collision with aircraft, and similar launch activities. Over the 15-year Opinion timeframe, the Service expects 30 adult knots to be incidentally taken due to rocket launches and flights. The anticipated take is described in Table 9.

Knot – Surrogate for Monitoring Take

It is not practical to monitor take-related impacts in terms of individual knots for the following reasons: the species has a small body size making it difficult to locate, which makes encountering dead or harmed individuals unlikely; species losses may be masked by annual fluctuations in numbers; take may occur offsite; failure to reproduce or a decrease in nesting productivity may not be detected; the form of take is a non-lethal harm that is not detectable; finding a dead or impaired individual or quantifying a decrease in nesting productivity in the Arctic breeding area attributable to the action is unlikely; since individuals may move to other locations in an attempt to forage, quantifying exactly how many individuals have been impacted is not realistic.

Backpassing – Linear miles of beach habitat where knots forage is being used as a surrogate to express the extent of authorized take for the knot related to backpassing activities, which includes operation of heavy equipment (day and night) and presence of additional personnel, because it is not practical to monitor take-related impacts in terms of individuals. Beach habitat alteration that occurs through excavation of 1.3 MCY of sand, and the associated equipment and personnel needed to complete this activity, will directly and indirectly cause the anticipated incidental take of knots within the bounds of the identified 1.5 linear mi of beach habitat.

The 1.5 linear mi of beach habitat includes the portion of Wallops Island that will be excavated from building V-100 to the northern extent of the sand excavation area bordered on the east and west by MLW and the secondary dune (Figure 9). The 1.5 linear mi of beach habitat sets a clear, enforceable standard, and beach habitat alteration related to backpassing activities outside of that specific area exceeds take. The anticipated take is described in Table 9.

Rocket Launches and Flights – The number of launches and flights per year is being used as a surrogate to express the extent of authorized take for the knot related to ongoing operations, including rocket launches, UAVs, piloted aircraft, and launch-related activities immediately adjacent to the beach, because it is not practical to monitor take-related impacts in terms of individuals. The noise, vibration, and exhaust that occurs as a result of the launches or flights will directly and indirectly cause the anticipated incidental take of knots because the effects, although short-term, can be severe enough to kill individuals.

The 121 launches per year includes liquid fueled ELVs, solid fueled ELVs, sounding rockets, sounding rocket static fires, and drone target launches and incorporates a 10% buffer. The 71,500 flights per year includes UAS and piloted aircraft flights with a 10% buffer. Launches take place at Pads 0-A, 0-B, 1, 2, and the south UAS airstrip flat pad. Flights take place at Wallops Main Base, South Wallops Island, North Wallops Island, and adjacent air space. The locations for each specific action and frequency of each launch are detailed in Table 1. The 121 launches per year and 71,500 flights per year (as detailed in Table 1) set a clear, enforceable standard, and additional launches or flights exceeds take. The anticipated take is described in Table 9.

Loggerhead – Numeric Estimate of Anticipated Incidental Take

Backpassing and Renourishment – Incidental take was calculated using loggerhead nesting activity within the Action Area from 1974-2017 (Table 5). The interval of 5 years was selected based on the infrequent nesting exhibited on Wallops Island (Table 6). Incidental take of 1 adult loggerhead and 1 nest (128 hatchling turtles or eggs) is anticipated every 5 years from the effects of backpassing and renourishment activities, resulting from habitat removal and alteration, equipment staging, sand stockpiling, and operation of heavy equipment (day and night). Over the 15-year Opinion timeframe, the Service expects 3 adults and 384 hatchlings or eggs to be incidentally taken due to backpassing and renourishment activities. The anticipated take is described in Table 9.

Rocket Launches – Incidental take of 1 adult loggerhead and 1 nest (128 hatchling turtles or eggs) is anticipated every 5 years from the effects of launches and launch-related activities immediately adjacent to the beach, resulting from lighting, vibration, intense sound, and exposure to rocket exhaust and contaminants. Over the 15-year Opinion timeframe, the Service expects 3 adults and 384 hatchlings or eggs to be incidentally taken due to rocket launches. The anticipated take is described in Table 9.

Loggerhead – Surrogate for Monitoring Take

It is not practical to monitor take-related impacts in terms of individual loggerheads for the following reasons: harmed females may return to the water which makes encountering dead or harmed individuals unlikely; species losses may be masked by annual fluctuations in numbers; take may occur offsite; failure to reproduce or a decrease in nesting productivity may not be detected if an individual moves to a neighboring island to nest or fails to nest; the form of take is a non-lethal harm that is not detectable; vulnerable hatchlings may be eaten by predators before detection.

Backpassing and Renourishment – Linear miles of beach habitat where loggerheads nests is being used as a surrogate to express the extent of authorized take for the loggerhead related to backpassing and renourishment activities, including operation of heavy equipment (day and night), because it is not practical to monitor take-related impacts in terms of individuals. Beach habitat alteration that occurs through excavation and placement of 1.3 MCY of sand, and the associated equipment and personnel needed to complete this activity, will directly and indirectly cause the anticipated incidental take of loggerheads within the bounds of the identified 5.5 linear mi of beach habitat.

The 5.5 linear mi of beach habitat includes the 1.8 mi sand excavation area and the 3.7 mi of beach habitat where sand will be placed. This beach habitat begins 1,500 ft north of the Wallops Island-Assawoman Island property boundary and extends north to the northern extent of the sand mining area bordered on the east and west by MLW and the secondary dune, respectively (Figure 9). The 5.5 linear mi of beach habitat sets a clear, enforceable standard, and beach habitat alteration related to backpassing and renourishment activities outside of that specific area exceeds take. The anticipated take is described in Table 9.

Rocket Launches – The number of launches per year is being used as a surrogate to express the extent of authorized take for the loggerhead related to ongoing operations, including rocket launches, and launch-related activities immediately adjacent to the beach, because it is not practical to monitor take-related impacts in terms of individuals. The noise, vibration, and exhaust that occurs as a result of the launches will directly and indirectly cause the anticipated incidental take of loggerheads because the effects, although short-term, can be severe enough to kill individuals.

The 121 launches per year includes liquid fueled ELVs, solid fueled ELVs, sounding rockets, sounding rocket static fires, and drone target launches and incorporates a 10% buffer. Launches take place at Pads 0-A, 0-B, 1, 2, and the south UAS airstrip flat pad. The locations for each specific action and frequency of each launch are detailed in Table 1. The 121 launches per year (as detailed in Table 1) set a clear, enforceable standard, and additional launches exceeds take. The anticipated take is described in Table 9.

Table 9. Amount and type of anticipated incidental take.

Species	Amount of Take Anticipated (surrogate)	Initial Amount of Take Anticipated (individuals)	Frequency of Take	Duration of Biological Opinion	Total Amount of Anticipated Take (individuals)	Life Stage when Take is Anticipated	Type of Take	Take is Anticipated as a Result of
Plover	3.1 linear miles of beach habitat alteration (backpassing and renourishment; renourishment from offshore shoal)	20 adults and 9 chicks (backpassing and renourishment)	2 times during Opinion term	15 years	40 adults and 18 chicks	Adults, Chicks	Harm, Kill	• Loss of nesting and foraging habitat due to sand mining. • Reduced reproduction and feeding associated with noise, loss of prey species, and loss or alteration of habitat due to compaction and removal. • Direct effects to individuals and loss of prey species due to contaminants. • Increased vulnerability to predators. • Additional energy expenditure seeking available habitat elsewhere.
		4 adults and 1 chick (renourishment from offshore shoal)	6 times during Opinion term	15 years	24 adults and 6 chicks	Adults, Chicks	Harm, Kill	• Reduced reproduction and feeding associated with noise, loss of prey species, and loss or alteration of habitat due to compaction and removal. • Direct effects to individuals and loss of prey species due to contaminants. • Increased vulnerability to predators. • Additional energy expenditure seeking available habitat elsewhere.
Plover	121 launches/year and 71,500 flights/year (rocket launches and flights)	2 adults and 1 chick or 4 eggs	every year	15 years	30 adults and 15 chicks or 60 eggs	Adults, Chicks, Eggs	Harm, Kill	• Deafening of individuals due to noise generation, causing disorientation, impairment of normal behaviors, increased vulnerability to predators, and physiological stress. • Collision with aircraft. • Noise generation interrupting feeding and sheltering, causing birds to flush from nest resulting in predation or abandonment of eggs/chicks and additional energy expenditure by adults. • Vibration disturbing individuals causing normal behavior to temporarily cease and decreasing egg viability. • Direct exhaust exposure, causing death. • Lighting attracting migrating individuals, causing diversion of flight and increased collision risk.
Plover	1 linear mile of beach habitat alteration (recreational beach use)	2 adults and 1 chick	every year	15 years	30 adults and 15 chicks	Adults, Chicks	Harm, Kill	• Vehicle use on recreational beach can crush chicks and young plovers outside of closed plover nesting area and cause adults to abandon nests.
Knot	1.5 linear miles of beach habitat alteration	360 adults	2 times during Opinion term	15 years	720 adults	Adults	Harm	• Loss of foraging habitat due to sand mining. • Reduced reproduction (due to lack of weight gain) and feeding associated with noise, loss of prey

	(backpassing)							species, and loss or alteration of habitat due to compaction and removal. • Direct effects to individuals and loss of prey species due to contaminants. • Increased vulnerability to predators. • Additional energy expenditure seeking available habitat elsewhere.
Knot	121 launches/year and 71,500 flights/year (rocket launches and flights)	2 adults	every year	15 years	30 adults	Adults	Harm, Kill	• Deafening of individuals due to noise generation, causing disorientation, impairment of normal behaviors, increased vulnerability to predators, and physiological stress. • Collision with aircraft. • Noise generation interrupting feeding and sheltering. • Lighting attracting migrating individuals, causing diversion of flight and increased collision risk.
Loggerhead	5.5 linear miles of beach habitat alteration (backpassing and renourishment; renourishment from offshore shoal)	1 adult and 128 hatchlings or eggs	every 5 years	15 years	3 adults and 384 hatchlings or eggs	Adults, Hatchlings, Eggs	Harm, Kill	• Compaction of sand by equipment. • Injure or crush nesting females and hatchlings. • Loss of nesting habitat due to sand excavation and renourishment. • Females deterred from nesting by staged equipment and sand stockpile.
Loggerhead	121 launches/year (rocket launches)	1 adult and 128 hatchlings or eggs	every 5 years	15 years	3 adults and 384 eggs or hatchlings	Adults, Hatchlings, Eggs	Harm, Kill	• Deafening of individuals due to noise generation, causing disorientation, impairment of normal behaviors, increased vulnerability to predators, and physiological stress. • Vibration disturbing individuals causing normal behavior to temporarily cease and decreasing egg viability. • Lighting causing disorientation of hatchlings and behavioral effects on nesting adults.

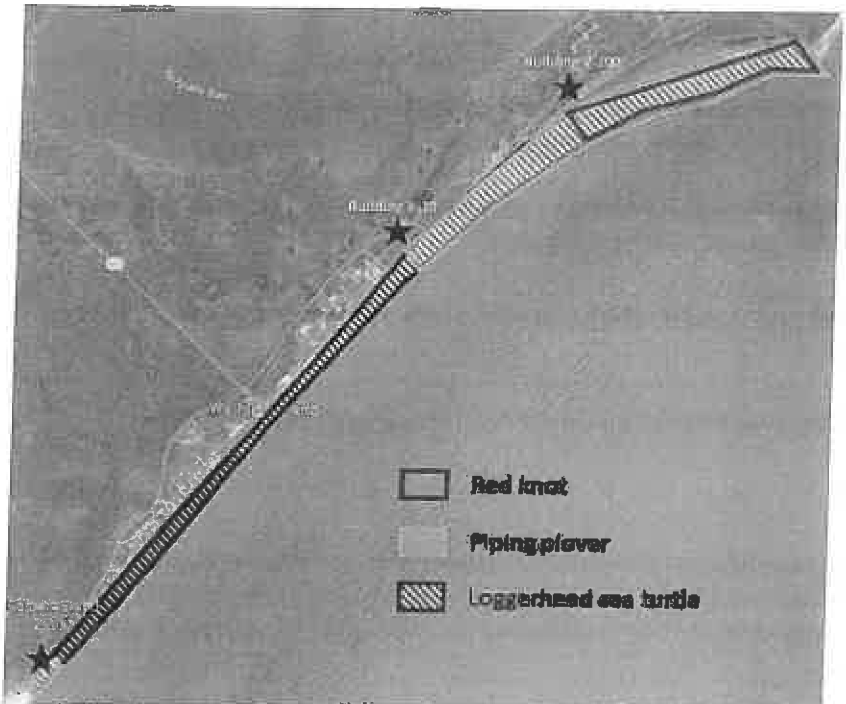


Figure 9. Visual representation of surrogates related to backpassing and renourishment activities with building and camera stand locations represented by blue stars.

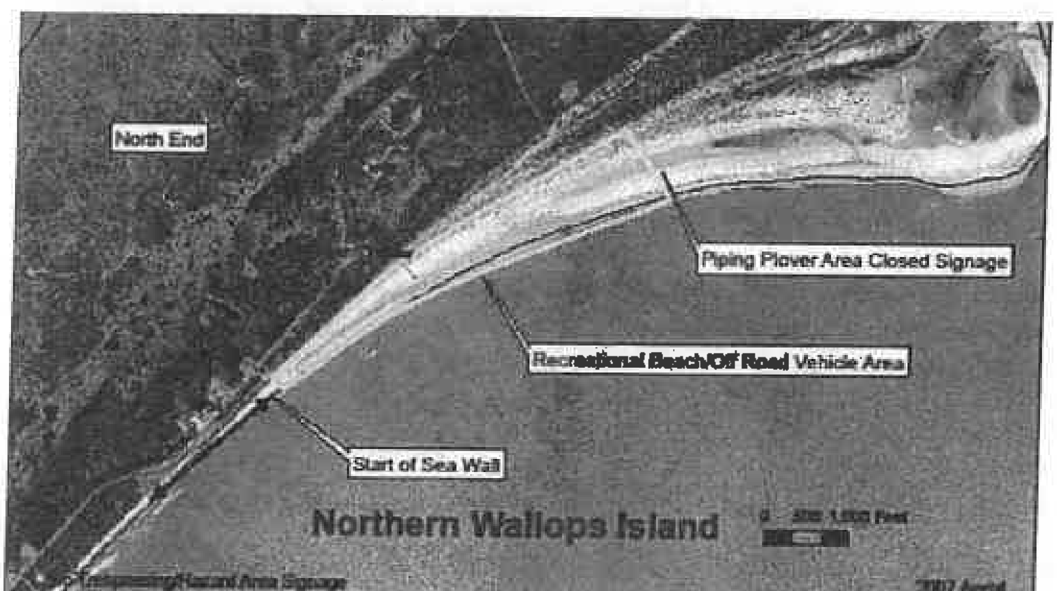


Figure 10. Visual representation of recreational beach surrogate area. Map provided in 2019 Protected Species Monitoring Plan (NASA 2019).

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of plovers, knots, and loggerheads.

1. Provide information to individuals involved in project construction on how to avoid and minimize effects to plovers, knots, and loggerheads.

2. Actively manage habitats and human activity to avoid and minimize impacts to plovers, knots, and loggerheads.

3. Monitor the effects of the proposed action on plovers, knots, and loggerheads.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of Section 9 of the ESA, NASA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

1. Prior to initiation of on-site work, notify all prospective employees, operators, and contractors about the presence and biology of the plover, knot, and loggerhead; special provisions necessary to protect these species; activities that may affect these species; and ways to avoid and minimize these effects. This information can be obtained by reading species-related information in this Opinion or a fact sheet containing this information can be created and provided by NASA.

2. Minimize foot traffic throughout beach habitat during construction.

3. Inspect all vehicles for leaks immediately prior to work in beach habitat. Repair any leaks and clean construction vehicles thoroughly to remove any residual dirt, mud, debris, grease, motor oil, hydraulic fluid, coolant, or other hazardous substances from construction vehicles. Inspections, repairs, cleaning, and/or servicing will be conducted either before the vehicle, equipment, or machinery is transported into the field or at the work site within the staging area. All wash-water runoff and/or harmful materials will be appropriately controlled to prevent entry into the beach habitat, including the dune area.

4. Develop a training and familiarization program for all security personnel conducting patrols in areas where listed species may occur. This training program shall include basic biological information about all listed species and be sufficient to allow personnel to tentatively identify the species and its likely habitat to allow them to incorporate appropriate avoidance and minimization measures into their activities.

MONITORING AND REPORTING REQUIREMENTS

1. Notify the Service regarding the projected and actual start dates, progress, and completion of the project and verify that the 5.4 miles of beach habitat alteration was not exceeded and all conservation measures were followed. Provide a report containing this information by December 31 of each year throughout the 15-year duration of this Opinion to the Virginia Field Office at emily_argo@fws.gov.

2. Provide an annual report summarizing the survey and monitoring efforts, location and status of all occurrences of listed species recorded, and any additional relevant information to the Service in digital format, at the email address provided below by December 31 of each year throughout the 15-year duration of this Opinion.

3. Following launches of rockets, conduct surveys for injured, dead, or impaired plovers, knots, and loggerheads. These surveys must be conducted as soon as safety permits following launches. The survey protocols are outlined in the WFF protected Species Management Plan. Post-launch beach surveys will be conducted between March 15 and November 30 of every year to coincide with plover and loggerhead nesting seasons. The survey area will include the beach within 1,000 ft, to the north and south, of the respective launch pad for sounding and orbital-class ELV rocket launches. Provide reports of survey results to the Service in digital format, at the email address below, within 15 business days of each launch event.

4. Care must be taken in handling any dead specimens of proposed or listed species to preserve biological material in the best possible state. In conjunction with the preservation of any dead specimens, the finder has the responsibility to ensure that evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. The finding of dead specimens does not imply enforcement proceedings pursuant to the ESA. The reporting of dead specimens is required to enable the Service to determine if take is reached or exceeded and to ensure that the terms and conditions are appropriate and effective. Upon locating a dead specimen, notify the Service's Virginia Law Enforcement Office at 804-771-2883 and the Service's Virginia Field Office at the phone number provided below or at 804-693-6694.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Fund demographic studies to evaluate project impacts to plovers and knots on Wallops Island and surrounding islands along Virginia's Eastern Shore.

2. Invest in habitat mapping to better understand changes in available nesting and foraging habitat to plovers and knots along Virginia's Eastern Shore.

3. Support habitat restoration efforts for plovers and knots.

4. Work with resource managers in the surrounding area by participating in monitoring and data collection efforts as well as partnerships to ensure species and habitats on Wallops Island are actively incorporated in efforts to improve our understanding of the dynamics of nesting shorebirds and other species along Virginia's Eastern Shore.

5. Develop an integrated habitat conservation and management plan for Wallops Island. Due to the significance of the area for the conservation of migratory birds and other species, nearly all habitats that occur on WFF provide value to these species. Active efforts to manage habitat, including activities such as control of non-native invasive plants, may significantly improve the value of these areas as habitat.

6. Collect data on the characteristics of beaches and habitat where sea turtle nests and plover nests occur and share this information with the Service, VDGIF and area resource managers, and work with other interested parties to develop protocols for data collection and analysis throughout Virginia to improve our understanding of plover and sea turtle habitat characteristics.

7. Transition security from frequent roving patrols to a closed circuit television system to minimize beach access to the maximum extent practicable.

For the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the reinitiation request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

If you have any questions regarding this Opinion, or our shared responsibilities under the ESA, please contact Emily Argo of this office at (804) 824-2405, or via email at emily_argo@fws.gov.

Sincerely,

Cynthia A Schulz

Date: 2019.06.07 10:29:13 -04'00'

Cindy Schulz
Field Supervisor
Virginia Ecological Services

Enclosures

cc: Corps, Norfolk, VA (Attn: Tom Walker)
Corps, Norfolk, VA (Attn: Teri Nadal)
FAA, Washington, D.C. (Attn: Daniel Czelusniak)
Service, Chincoteague Island, VA (Attn: Kevin Holcomb)
Service, Chincoteague Island, VA (Attn: Nancy Finley)
VDGIF, Richmond, VA (Attn; Ernie Aschenbach)
VDGIF, Machipongo, VA (Attn: Ruth Boettcher)
VDNH, Richmond, VA (Attn: Rene Hypes)

LITERATURE CITED

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CONSULTATION HISTORY

05-10-2010	The Service issued NASA a non-jeopardy 2010 Opinion for expansion of WFF and ongoing operations (Service 2010a).
07-30-2010	The Service issued NASA a non-jeopardy programmatic 2010 Opinion on the SRIPP (Service 2010b).
09-22-2011	The Service provided concurrence on NASA's no effect determination for construction of a UAS airstrip at the northern portion of the island. The Service provided a not likely to adversely affect determination for several species associated with the operation of the new airstrip.
9-11-2014	The Service provided concurrence on the Navy's not likely to adversely affect determinations for installation and operation of a 5-inch powder gun and electromagnetic railgun at WFF.
11-20-2014	The Service provided concurrence on NASA's not likely to adversely affect determination for relocation of the 50k sounding rocket launcher and construction of a new flat pad to support sounding rocket launches.
08-18-2015	The Service received NASA's request to reinitiate formal consultation on the 2010 Opinions (Service 2010a, 2010b).
09-28-2015	The Service acknowledged receipt of NASA's request to initiate formal consultation.
10-16-2015	A Service biologist conducted a site visit of the project areas.
12-22-2015	The Service provided NASA our non-jeopardy 2015 Opinion (Service 2015c).
01-20-2016	The Service received NASA's request for revisions to the 2015 Opinion.
06-22-2016	The Service provided NASA our revised non-jeopardy 2016 Opinion (Service 2016).
12-12-2017	The Service received an email from NASA indicating the addition of breakwaters in the nearshore environment.
09-28-2018	The Service received a request for concurrence from NASA that increasing the volume of sand to be excavated from Wallops Island and the addition of nearshore breakwaters were covered by the 2016 Opinion.

10-02-2018 to
12-13-2018 The Service and NASA exchanged emails and phone calls regarding scope of work, information needs, and reinitiation.

12-14-2018 The Service received NASA's request for reinitiation of the 2016 Opinion.

12-22-2018 to
01-25-2019 Due to a lapse in appropriations Service employees were furloughed and not authorized to work on this consultation.

12-17-2018 to
03-19-2019 The Service and NASA exchange emails and phone calls regarding project details, timeframe of consultation, and monitoring requests.

03-20-2019 The Service acknowledged receipt of NASA's request to reinitiate formal consultation.

03-29-2019 The Service attended a stakeholder meeting at NASA WFF with representatives from the Virginia Department of Conservation and Recreation, VDGIF, CNWR, and Corps.

04-03-2019 to
05-08-2019 The Service and NASA exchanged emails regarding project details.

APPENDIX A

Table 7. Analysis of effects of reinitiated actions on plover, knot, and loggerhead

Construction Activity	Environmental Impact or Threat	Stressors	Stressor Pathway	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Avoidance and Minimization Measures	Comments
Piping Plover										
dune plantings in renourishment area	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	Plants will be installed between October 1 and March 31 of any given year.	Planting will occur along newly created dunes.
equipment staging	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	Establish upland areas for equipment and material staging – to be discussed with contractor (potentially daily).	Equipment will not be staged in areas used by plovers/plover habitat.
sand stockpile	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	none	Sand will not be stockpiled in areas used by plovers/plover habitat.
operation of equipment (day and night)	habitat degradation; reduction in prey population; disturbance	compaction of habitat; chemical contaminants; loss of prey; altered flight path; nest abandonment; increased predation; increased vehicular traffic on adjacent roadway	driving through habitat; release of small amounts of fuel, oil, lubricants, and other contaminants; equipment noise	nesting and foraging habitats; prey; population; individuals (adults and chicks)	decreased reproduction; harm	breeding; feeding; sheltering	reproduction, numbers	LAA	Sand harvesting will not begin until after the last plover chick has fledged, and will continue until 1.3 MCY of sand has been harvested. Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting plovers. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status.	Even with the application of avoidance and minimization measures, sand compaction by equipment may cause burial and suffocation of invertebrate prey species, resulting in loss of available prey. The habitat may be degraded due to sand compaction, making it difficult for birds to access prey and/or causing a loss of available prey. Individuals are expected to cease normal foraging and seek available habitat elsewhere. Searching for alternative suitable habitat leads to increased energy expenditure from additional search times and increased exposure to predators. Expending additional energy searching for and reaching suboptimal habitat that may have limited food resources does not allow plovers to maintain

									Work activities will be suspended within 1,000 ft of the nest until plover chicks have fledged.	optimal body condition, resulting in decreased nest productivity or inability to nest. The use of suboptimal habitat may lead to nesting on less suitable habitat, such as on a narrower beach more vulnerable to flooding, and decreased nest or brood attendance by adults could increase predation of nests and/or chicks. If the habitat is less suitable foraging opportunities may be limited and decrease chick survival. If birds seek nesting habitats elsewhere, they will also face competition for territories with birds already established there, potentially leading to lower productivity and possibly adult survival from reduced food availability. Operation of equipment may result in releases of small amounts of fuel, oil, lubricants, and other contaminants. While we do not expect contaminant releases to occur frequently, these substances may adhere to feathers, which would impact the bird's ability to move or result in contaminant ingestion from preening, harming the birds. Contaminant releases could also result in impairment or death of prey species reducing prey availability and quality, causing the birds to spend additional time foraging increasing the time they are vulnerable to predators. Both nesting and migratory plovers occur in the Action Area and would be impacted as described above. A 1,000 ft buffer will be placed around each known nest location, likely

										encompassing the foraging area of any adults and chicks from the buffered nest. Plovers foraging outside the 1,000 ft buffer will be disturbed by equipment noise. Individuals are expected to cease normal foraging, nesting, or flight behavior. They may alter their flight path, seek available habitat elsewhere and/or abandon nesting attempts, all of which expends additional energy and increases their vulnerability to predators as discussed above.
presence of additional personnel	increased human activity/disturbance	nest abandonment; increased predation	human presence and noise	population; individual	decreased reproduction; harm	feeding; breeding; sheltering	reproduction; numbers	LAA	Work activities will be suspended within 1,000 ft of the nest until plover chicks have fledged.	A 1,000 ft buffer will be placed around each known nest location, likely encompassing the foraging area of any adults and chicks from the buffered nest. Plovers foraging outside the 1,000 ft buffer will be disturbed by noise. Noise may discourage use of habitat causing adults to abandon nesting attempts or migratory plovers to leave the area. This will cause plovers to expend additional energy seeking available habitat elsewhere. The effects of this have been discussed in the operation of equipment row.
sand excavation	habitat degradation	altered habitat; loss of prey; increased predation	removal of occupied nesting habitat; removal of occupied foraging habitat; prey removal	prey, habitat, population, individuals	harm; kill	breeding; feeding; sheltering	reproduction; numbers; distribution	LAA	Sand harvesting will not begin until after the last plover chick has fledged and will continue until 1.3 MCY of sand has been harvested. Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting plovers. Any nests	Sand excavation will not begin until after chicks from 2019 nests have fledged. However, removal of nesting habitat will result in lack of nesting and/or adults expending additional energy seeking available habitat elsewhere. The effects of this have been discussed in the operation of equipment row. After sand excavation, the remaining beach would be much narrower, have

									discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until plover chicks have fledged.	a steeper initial profile, be more vegetated, and have different physical properties (e.g., sand grain characteristics, drainage). This profile would be unsuitable for plover foraging, reducing overall carrying capacity for breeding plovers. Sand removal would result in impairment or death of prey species and these invertebrate food sources may take multiple seasons to recover to pre sand excavation levels. We expect that beach habitat will be unsuitable for plovers for at least 2 consecutive nesting seasons following sand excavation. Return of previous beach topography that provided foraging and nesting habitat is expected to take up to 6 years to return to its current habitat quality and quantity.
renourishment	temporary loss of nesting habitat, temporary loss of foraging habitat	altered habitat; loss of prey	change in nesting habitat quality; burial of prey species	prey; habitat; individuals	harm	breeding; feeding	reproduction; numbers; distribution	LAA	Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting plovers. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft	The northernmost portion of the renourishment area provides nesting and foraging habitat, while a small section at the southern end provides foraging habitat. Placement of sand would result in the burial of prey species. Following sand placement, the suitability of the renourished beach as foraging habitat for migrating plovers is expected to be reduced due to loss of invertebrate prey. The reduced habitat suitability will result in plovers expending additional energy seeking available habitat elsewhere. The effects of additional energy expenditure have been discussed in the operation of equipment row.

									of the nest until plover chicks have fledged.	Compaction of the sand is expected to occur as a result of the use of heavy equipment during renourishment. The amount of equipment use and the associated degree of compaction is unknown, but due to the need to contour the beach to design specifications, compaction is expected to occur. This would result in changes in beach topography that reduce habitat quality for nesting plovers. Loss of nesting habitat will result in lack of nesting and/or adults expending additional energy seeking available habitat elsewhere, the effects of which have been discussed in the operation of equipment row. We expect that beach habitat will be unsuitable for plover foraging for 1 year following renourishment.
breakwater construction	disturbance	nest abandonment ; increased predation	noise	population; individual (all life stages)	annoyed to decreased reproduction; harm	breeding; feeding; sheltering	reproduction; numbers; distribution	LAA	none	Breakwaters will be constructed in the nearshore environment and the associated noise would discourage use of habitat causing adults to abandon nests or nesting attempts. This will result in lack of nesting and/or adults expending additional energy seeking available habitat elsewhere, the effects of which have been discussed in the operation of equipment row. The breakwaters would change the beach topography, causing tombolos to form and reducing the rate of recovery of the nesting and foraging habitat. The effects of the reduced rate of recovery on plovers has been discussed in the sand excavation row.

Red Knot										
Construction Activity	Environmental Impact or Threat	Stressors	Stressor Pathway	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Avoidance and Minimization Measures	Comments
dune plantings in renourishment area	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	Plants will be installed between October 1 and March 31 of any given year.	Planting will not take place in areas used by knots/knot habitat.
equipment staging	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	Establish upland areas for equipment and material staging – to be discussed with contractor (potentially daily).	Equipment will not be staged in areas used by knot/knot habitats.
sand stockpile	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	none	Sand will not be stockpiled in areas used by knots/knot habitat.
renourishment	temporary loss of foraging habitat	altered habitat; loss of prey	change in nesting habitat quality; burial of prey species	prey; habitat; individuals	harm	breeding; feeding	reproduction; numbers; distribution	NLAA	Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting plovers and loggerheads. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until plover	Since sand will not be placed in habitat used for knot foraging, this activity is not likely to adversely affect foraging knots.

									chicks have fledged and/or loggerheads have hatched.	
operation of equipment (day and night)	habitat degradation; physical impacts to individuals; reduction in prey population; disturbance	compaction of habitat; chemical contaminants; loss of prey; altered flight path; increased predation; increased vehicular traffic on adjacent roadway	release of small amounts of fuel, oil, lubricants, and other contaminants; equipment noise	foraging habitats; prey; population; individuals (all life stages)	harm	feeding; sheltering	numbers	LAA	Sand harvesting will not begin until after the last plover chick has fledged or the last loggerhead has hatched, whichever is later, and will continue until 1.3 MCY of sand has been harvested. Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting plovers and loggerheads. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until plover chicks have fledged and/or loggerheads have hatched.	While activities will not be conducted within 1,000 ft of documented plover or turtle nests, which may overlap with areas used by knots, knots foraging outside the 1,000 ft buffer will be disturbed by equipment noise. Individuals are expected to cease normal foraging or flight behavior. They may alter their flight path or seek available habitat elsewhere. Searching for alternative suitable habitat leads to increased energy expenditure from additional search times and increases exposure to predators. Use of suboptimal habitat may also result in lower weight when reaching the Arctic leading to reduced reproductive success. Even with the application of avoidance and minimization measures, sand compaction by equipment may cause burial and suffocation of invertebrate prey species, resulting in loss of available prey. The habitat may be degraded due to sand compaction, making it difficult for birds to access prey and/or causing a loss of available prey. Individuals are expected to cease normal foraging and seek available habitat elsewhere, the effects of which are discussed above. Operation of equipment may result in releases of small amounts of fuel, oil, lubricants, and other contaminants. While we do not expect contaminant

										releases to occur frequently, these substances may adhere to feathers, which would impact the bird's ability to move or result in contaminant ingestion from preening, harming the birds. Contaminant releases could also result in impairment or death of prey species reducing prey availability and quality, causing the birds to spend additional time foraging increasing the time they are vulnerable to predators.
presence of additional personnel	increased human activity/disturbance	altered flight path; increased predation	human presence and noise	population; individuals	harm	feeding; breeding; sheltering	reproduction; numbers	LAA	Work activities will be suspended within 1,000 ft of the nest until chicks have fledged and/or loggerheads have hatched.	While activities will not be conducted within 1,000 ft of documented plover or turtle nests, which may overlap with areas used my knots, knots foraging outside the 1,000 ft buffer will be disturbed by noise. Noise may discourage use of habitat causing adults to abandon foraging or migratory knots to leave the area. This will cause knots to expend additional energy seeking available habitat elsewhere. The effects of additional energy expenditure on knots has been discussed in the operation of equipment row.
sand excavation	habitat degradation	altered habitat; loss of prey; increased predation	removal of occupied foraging habitat; prey removal	prey, habitat, population, individuals	harm	feeding; sheltering	numbers; distribution	LAA	Sand harvesting will not begin until after the last plover chick has fledged or the last loggerhead has hatched, whichever is later, and will continue until 1.3 MCY of sand has been harvested. Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops	After sand excavation, the remaining beach would have a steeper initial profile, be more vegetated, and have different physical properties (e.g., sand grain characteristics, drainage). This profile would be unsuitable for knot foraging. Sand excavation would result in impairment or death of prey species and these invertebrate food sources may take multiple seasons to recover to pre sand harvesting levels.

									Island beach for nesting plovers and loggerheads. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until plover chicks have fledged and/or loggerheads have hatched.	We expect that beach habitat will be unsuitable for knots for at least 2 consecutive seasons following sand excavation. Return of previous beach topography that provided foraging habitat is expected to take up to 6 years to return to its current habitat quality and quantity.
breakwater construction	disturbance	increased predation	noise	population; individual	harm	feeding; sheltering	numbers; distribution	LAA	none	Breakwaters would be constructed in the nearshore environment and the associated noise would discourage use of habitat causing adults expending additional energy seeking available habitat elsewhere. The breakwaters would also change the beach topography, causing tombolos to form and reducing the rate of recovery of the foraging habitat. The reduced habitat suitability will result in knots expending additional energy seeking available habitat elsewhere. The effects of the reduced rate of habitat recovery and additional energy expenditure have been discussed above.
Loggerhead Sea Turtle										

Construction Activity	Environmental Impact or Threat	Stressors	Stressor Pathway	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Avoidance and Minimization Measures	Comments
dune plantings in renourishment area	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	Plants will be installed between October 1 and March 31 of any given year.	Plants will not be installed when habitat is actively used by sea turtles and presence of plants will not impact sea turtle during subsequent nesting seasons.
presence of additional personnel	neutral	none	n/a	n/a	n/a	n/a	n/a	NE	Work activities will be suspended within 1,000 ft of the nest until sea turtles have hatched.	Work activities will be taking place a sufficient distance from documented nests to avoid impacts related to foot traffic.
breakwater construction	habitat degradation	change in habitat quality	habitat alteration	population; individual	harm	breeding	reproduction; numbers; distribution	NLAA	none	The breakwaters would change the beach topography, causing tombolos to form and reducing the rate of recovery of the nesting habitat. Little information is available about the impacts of tombolos on nesting sea turtles, but stabilization of beach topography (if not significantly different from the natural topography) may support maintenance of loggerhead nesting habitat following renourishment activities.
equipment staging	habitat degradation	prevention of habitat access; increased predation	equipment blocking access to habitat	individuals (adults, hatchlings)	harm; kill	breeding	reproduction; numbers	LAA	Establish upland areas for equipment and material staging – to be discussed with contractor (potentially daily). Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting plovers and loggerheads.	Equipment staging areas may be modified daily and may not always be established in an upland area. Any equipment staged on the sand/beach may present an obstacle to nesting loggerheads causing them to return to the ocean instead of nesting or expend additional energy to find a suitable nesting site, resulting in a reduction in nesting success.

									Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until loggerheads have hatched.	Hatchlings may encounter equipment on the beach at night during hatching if they travel outside of the 1,000 ft buffer, causing them to spend more time reaching the ocean, leaving them vulnerable to predators, which increases the likelihood of harm or death.
sand stockpile	habitat degradation	prevention of habitat access; increased predation	equipment blocking access to habitat	individuals (adults, hatchlings)	harm; kill	breeding	reproduction; numbers	LAA	Work activities will be suspended within 1,000 ft of the nest until loggerheads have hatched	Any sand stockpiled on the beach may present an obstacle to nesting loggerheads causing them to return to the ocean instead of nesting or expend additional energy to find a suitable nesting site, resulting in a reduction in nesting success. Hatchlings may encounter the stockpile on the beach at night during hatching if they travel outside of the 1,000 ft buffer or a nest is laid after the stockpile has been established and, therefore, is within the 1,000 ft buffer. This will cause hatchlings to spend more time reaching the ocean, leaving them vulnerable to predators, which increases the likelihood of harm or death.
operation of equipment (day)	habitat degradation	altered habitat	compaction of habitat	nesting habitats; population; individuals	harm	breeding	reproduction, numbers	LAA	Sand harvesting will not begin until after the last loggerhead has hatched and	Equipment will compact sand, making sand less desirable for nesting loggerheads. Compaction can reduce the ability of females to excavate an

									will continue until 1.3 MCY of sand has been harvested. Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting loggerheads. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until loggerheads have hatched.	egg chamber, resulting in a reduction in nesting success.
operation of equipment (night)	habitat degradation; physical impacts to individuals	prevention of habitat access; compaction of habitat; direct physical impacts; crushing of individuals	blocking access to nesting habitat; compaction of habitat; driving over sea turtles adults and hatchlings	nesting habitats; individuals (hatchlings and adults)	harm; kill	breeding	reproduction; numbers	LAA	Sand harvesting will not begin until after the last loggerhead has hatched and will continue until 1.3 MCY of sand has been harvested. Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting loggerheads. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project	During nesting season, any equipment on the beach may present an obstacle to nesting loggerheads causing them to return to the ocean instead of nesting or to expend additional energy to find an alternate suitable nesting site, resulting in a reduction in nesting success. Hatchlings may be crushed by equipment if they travel beyond the 1,000 ft buffer or encounter ruts left by equipment, causing them to spend more time reaching the ocean, leaving them vulnerable to predators, which increases the likelihood of harm or death. Equipment will compact sand, making sand less desirable for nesting sea turtles by reducing the ability of

									personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until loggerheads have hatched.	females to excavate an egg chamber, resulting in a reduction in nesting success.
sand excavation	habitat degradation	altered habitat	removal of occupied nesting habitat	habitat, population, individuals	harm	breeding	reproduction; numbers; distribution	LAA	Sand harvesting will not begin until after the last loggerhead has hatched and will continue until 1.3 MCY of sand has been harvested. Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting loggerheads. Any nests discovered would be immediately exclosed and geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until loggerheads have hatched.	Removal of nesting habitat may result in lack of nesting or expenditure of additional energy to find a suitable nesting site. We expect that beach habitat in the sand excavation area will be unavailable for loggerheads for at least 2 consecutive nesting seasons following sand excavation. Return of previous beach topography that provided nesting habitat is expected to take up to 6 years to return to its current habitat quality and quantity.
renourishment	temporary loss of nesting habitat	altered habitat	change in nesting habitat quality	habitat; individuals	harm	breeding	reproduction; numbers; distribution	LAA	Starting March 15 of any year, a biological monitor will conduct a daily survey of the whole of Wallops Island beach for nesting loggerheads. Any nests discovered would be immediately exclosed and	Nesting has been documented in the renourishment area and changes in beach topography and sand compaction may reduce habitat quality. The amount of equipment use and the associated degree of compaction is unknown, but due to the need to contour the beach to design

									geolocated. The biological monitor will coordinate directly with onsite project personnel to ensure they are aware of nesting status. Work activities will be suspended within 1,000 ft of the nest until loggerheads have hatched.	specifications, compaction is expected to occur. This would result in changes in beach topography that reduce habitat quality for nesting loggerheads by reducing the ability of females to excavate an egg chamber. Nest failure and reduced rates of hatchling emergence are expected to occur for up to 2 years after sand placement. Directly in front of the riprap protecting the launch pads nesting habitat is not available and renourishment will increase available nesting habitat along this stretch of Wallops Island where nesting has been documented historically.