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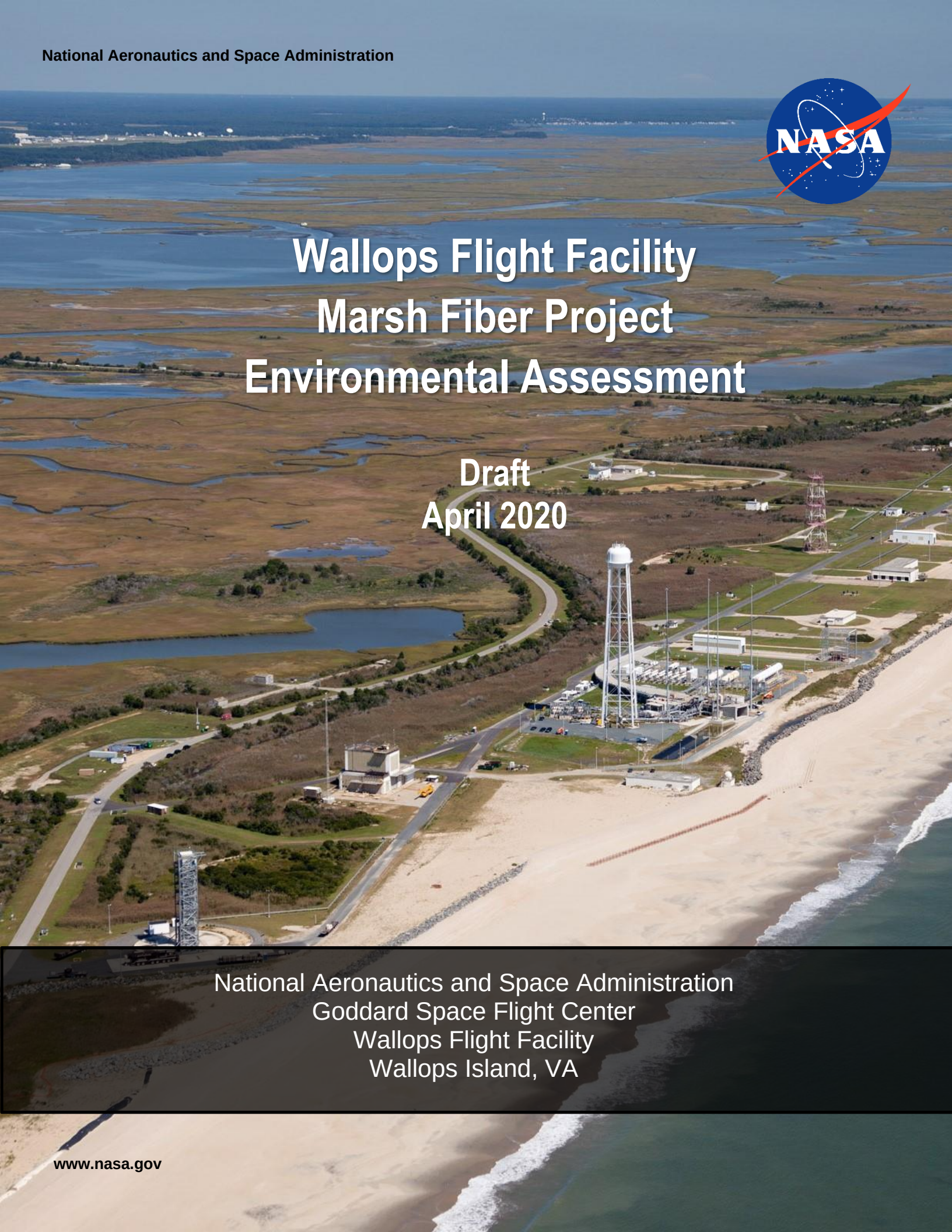

Wallops Flight Facility
Marsh Fiber Project
Environmental Assessment

Draft
April 2020

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

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Wallops Island, NASA Wallops Flight Facility, June 2012 – Photo Credit: NASA

DRAFT ENVIRONMENTAL ASSESSMENT
MARSH FIBER PROJECT

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GODDARD SPACE FLIGHT CENTER
WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA 23337

Lead Agency: National Aeronautics and Space Administration

Cooperating Agency: U.S. Fish and Wildlife Service

Proposed Action: Marsh Fiber Project

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Abstract

In accordance with the National Environmental Policy Act of 1969, NASA has prepared this Environmental Assessment (EA) to analyze the potential effects of installing approximately 4,000 meters (13,130 feet) of fiber optic cable from the U.S. Fish and Wildlife Service Wallops National Wildlife Refuge to the Mid-Atlantic Regional Spaceport Unmanned Aerial Systems Airstrip on Wallops Island. This EA is tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement*.

This EA analyzes the potential direct, indirect, and cumulative environmental effects of the Proposed Action and the No Action Alternative. Resources evaluated in detail include noise; air quality; hazardous materials and hazardous waste management; environmental compliance and restoration; munitions and explosives; health and safety; land use; land resources; water resources; vegetation; biological resources; transportation; infrastructure and utilities; socioeconomics; recreational resources; and cultural and traditional resources.

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EXECUTIVE SUMMARY

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) proposes to install a fiber optic cable, referred to as the "Marsh Fiber" from the U.S. Fish and Wildlife Service (USFWS) Wallops Island National Wildlife Refuge (Wallops NWR) to Wallops Island in Accomack County, Virginia. This Environmental Assessment (EA) provides a description of the current conditions of the project setting and evaluates the environmental consequences of the Proposed Action and the No Action Alternative.

PURPOSE AND NEED FOR THE PROPOSED ACTION

In the early 1990s, NASA installed a fiber optic cable through waterways and saltmarsh between the Main Base and Wallops Island. This subaqueous cable has been damaged and is no longer operable. NASA subsequently connected all circuits through an alternate fiber optic cable route from the WFF Main Base, along Atlantic Road, to Wallops Island. Having only one route of fiber optic communications puts the critical systems and missions of NASA and NASA's tenants on Wallops Island, including launch operations, at risk by not having redundancy (i.e., multiple cable systems in case one system fails) and diversity (i.e., non-congruous in case one system is impaired or cut) in communication pathways.

The primary purpose of the Proposed Action to provide a redundant and geographically diverse means of reliable fiber optic communications for NASA, DoD, and commercial systems on Wallops Island. Because the existing Atlantic Road cable system would remain in operation as the backup source of communication, installing a new primary fiber optic cable would ensure the reliability of command, mission, voice, video, and data services for systems on Wallops Island. A secondary purpose of the Proposed Action is to provide NASA and its tenants with expanded capacity of the data communication capabilities to support a robust and responsive information technology (IT) infrastructure system at WFF.

A new fiber optic cable is necessary to meet NASA Office of the Chief Information Officer requirement as well as NASA Range Safety requirements for diversity and redundancy of mission, facility, and corporate customer communication services. The new Marsh Fiber would also be easily accessible for repair, minimizing the potential for service disruptions. To support NASA and its tenants' missions, a new fiber optic cable that uses state-of-the-art technology is needed to meet the future demands for rapid and reliable communications by providing expanded bandwidth compared to the cable currently in use.

PROPOSED ACTION AND ALTERNATIVES

Under the Proposed Action, NASA would install a new fiber optic cable in three segments (Segment A, Segment B, and Segment C) between the NASA Boresight Antenna on the Wallops NWR and the Mid-Atlantic Regional Spaceport (MARS) Unmanned Aerial Systems (UAS) Airstrip on Wallops Island. NASA would install two segments of horizontal directional drilling (HDD), one under Watts Bay and the second under Ballast Narrows, with the boreholes exiting on

the edges of Walker Marsh, a tidal saltmarsh that lies between the WFF Main Base and Wallops Island. NASA would primarily use vibratory trenching employing low-pressure equipment to install the cable across Walker Marsh, and would use a small version of HDD to install the cable beneath three guts in Walker Marsh (a gut is a small creek in the marsh).

SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

According to the analysis in this EA, implementation of the Proposed Action would result in the following impacts on resources evaluated in this EA.

- **Short-term, no impacts or negligible adverse impacts**: air quality, hazardous and regulated materials and waste, worker and public health and safety, land use, special status species, infrastructure and utilities, archaeological resources
- **Short-term, minor adverse impacts**: noise, land resources, water resources, vegetation, wildlife, aquaculture, transportation, employment and income, recreation
- **Short-term, minor beneficial impacts**: employment and income
- **Long-term, no impacts:** land use, employment and income, archaeological resources
- **Long-term, negligible adverse impacts**: noise, air quality, hazardous and regulated materials and waste, worker health and safety, land resources, water resources, vegetation, wildlife, aquaculture, transportation, employment and income, recreation
- **Long-term, beneficial impacts**: public health and safety, infrastructure and utilities

Under the No Action Alternative, conditions at WFF would remain unchanged. Communications data would continue with the existing cable pathway along Atlantic Road; however, limitations on the data capacity would remain for future demands, and NASA and its tenants would remain at risk from a potential failure in service or unacceptable disruptions in communications data service. Under the No Action Alternative, there would be a potential for long-term adverse impacts on public health and safety.

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ACRONYMS AND ABBREVIATIONS

Ac	acre
APE	Area of Potential Effect
AQCR	Air Quality Control Region
BCC	Birds of Conservation Concern
BMP	Best Management Practice
BO	Biological Opinion
CAA	Clean Air Act
CDAS	Command and Data Acquisition Station
CEA	Cumulative Effects Analysis
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	Methane
Cm	centimeter
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2e	CO_2 equivalent
CWA	Clean Water Act
CZM	Coastal Management Program
dBA	A-weighted decibel
DoD	U.S. Department of Defense
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ELV	Expendable Launch Vehicle
EO	Executive Order
ESA	Endangered Species Act
ESC	Erosion and Sediment Control
FAA	Federal Aviation Administration
FCD	Federal Consistency Determination
FEMA	Federal Emergency Management Agency
Final Site-wide PEIS	NASA WFF Site-Wide Programmatic Environmental Impact Statement
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
FUDS	Formerly Used Defense Site
Ft	feet
ft^2	square feet
GHG	Greenhouse gas
GISS	Goddard Institute for Space Studies
GPR	Goddard Procedural Requirement
Ha	hectare
HAP	Hazardous Air Pollutant
HDD	Horizontal Directional Drilling
HDPE	High-density Polyethylene

ICP	Integrated Contingency Plan
IT	Information Technology
LOD	Limits of Disturbance
M	meter
m^2	square meter
MARS	Mid-Atlantic Regional Spaceport
MEC	Munitions and Explosives of Concern
MBTA	Migratory Bird Treaty Act
MEC	Munitions and Explosives of Concern
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act of 1969
NESDIS	National Environmental Satellite Data Information Service
NHPA	National Historic Preservation Action
NMFS	National Marine Fisheries Service
N_2O	Nitrous oxide
NO_2	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOTMAR	Notice-to-Mariner
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
OCIO	Office of the Chief Information Officer
OSHA	Occupational Health and Safety Administration
Pb	Lead
PJD	Preliminary Jurisdictional Determination
PM_{10}	Particulate matter less than 10 microns
PM_{25}	Particulate matter less than 25 microns
ppt	parts per thousand
SCSC	Surface Combat Surface Command
SO_2	Sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure
SRS	Sentinel Robotics Solutions
SWPPP	Stormwater Pollution Prevention Plan
TOYR	Time-of-year Restriction
USACE	United States Army Corps of Engineers
UAS	Unmanned Aircraft Systems
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife
USGS	United States Geological Survey
UXO	Unexploded Ordnance

VAC	Virginia Administrative Code
VACAPES	Virginia Capes Range Complex
V-CRIS	Virginia Cultural Resource Information System
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDHR	Virginia Department of Historic Resources
VDGIF	Virginia Department of Game and Inland Fisheries
VMRC	Virginia Marine Resources Commission
VSMP	Virginia Stormwater Management Program
Virginia Space	Virginia Commercial Space Flight Authority
WFF	NASA Goddard Space Flight Center's Wallops Flight Facility
WOTUS	Waters of the U.S.

1 Purpose and Need for Action

1.1 Introduction

The National Aeronautics and Space Administration (NASA) has prepared this Tiered Environmental Assessment (EA) in accordance with the National Environmental Policy Act of 1969 (NEPA) to analyze potential impacts on the environment resulting from the proposed installation of an underground fiber optic cable between Wallops Main Base and Wallops Island (Proposed Action). Installation would occur at NASA Goddard Space Flight Center's Wallops Flight Facility (WFF) in Accomack County, Virginia (**Figure 1-1**). The fiber optic cable, referred to as the "Marsh Fiber," would provide a reliable, secure, and rapid means of transmitting a diverse range of data to meet the current and future information technology (IT) demands to support the mission of NASA and its tenants at WFF.

This EA is tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement (Final Site-wide PEIS)* (NASA 2019a), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF. In accordance with the Council on Environmental Quality (CEQ) regulations at 40 CFR 1502.20, actions associated with the Proposed Action in the *Final Site-wide PEIS* may be tiered from that document by incorporating the *Final Site-wide PEIS* by reference, thereby eliminating duplicate discussions.

The Marsh Fiber project would consist of installing a new fiber optic cable along a pathway between the NASA Boresight Antenna area on the U.S. Fish and Wildlife's (USFWS) Wallops Island National Wildlife Refuge (Wallops NWR) and the Mid-Atlantic Regional Spaceport (MARS) Unmanned Aerial Systems (UAS) Airstrip on Wallops Island (**Figure 1-2**).

The proposed Marsh Fiber project aims to provide a secure and upgraded communication pathway for WFF to ensure that NASA and its tenants have a reliable means of communication for a diverse range of systems including command, voice, video, and data services for government, academic, and commercial missions on Wallops Island. As the federal landowner, NASA would fund and authorize installation of the fiber optic cable on its property and USFWS property.

1.2 Location and Setting

WFF is located in northern Accomack County on the Eastern Shore of Virginia (**Figure 1-1**). Accomack County is bordered by Northampton County on the south, the state of Maryland on the north, the Atlantic Ocean on the east, and the Chesapeake Bay on the west. WFF consists of three (3) separate land areas in close proximity to each other: the Main Base, Mainland, and Wallops Island (**Figure 1-1** and **Figure 1-2**). Collectively, WFF covers approximately 2,670 hectares (ha) (6,600 acres [ac]). The Proposed Action would be implemented on USFWS-owned land under easement to NASA (the area around the Boresight Antenna), on privately-owned land, on land owned and managed by the Commonwealth of Virginia (Walker Marsh and the subaqueous bottom lands), and on NASA-owned land (at the UAS Airstrip).

Legend

- Wallops Flight Facility Boundary
- Virginia County Boundaries

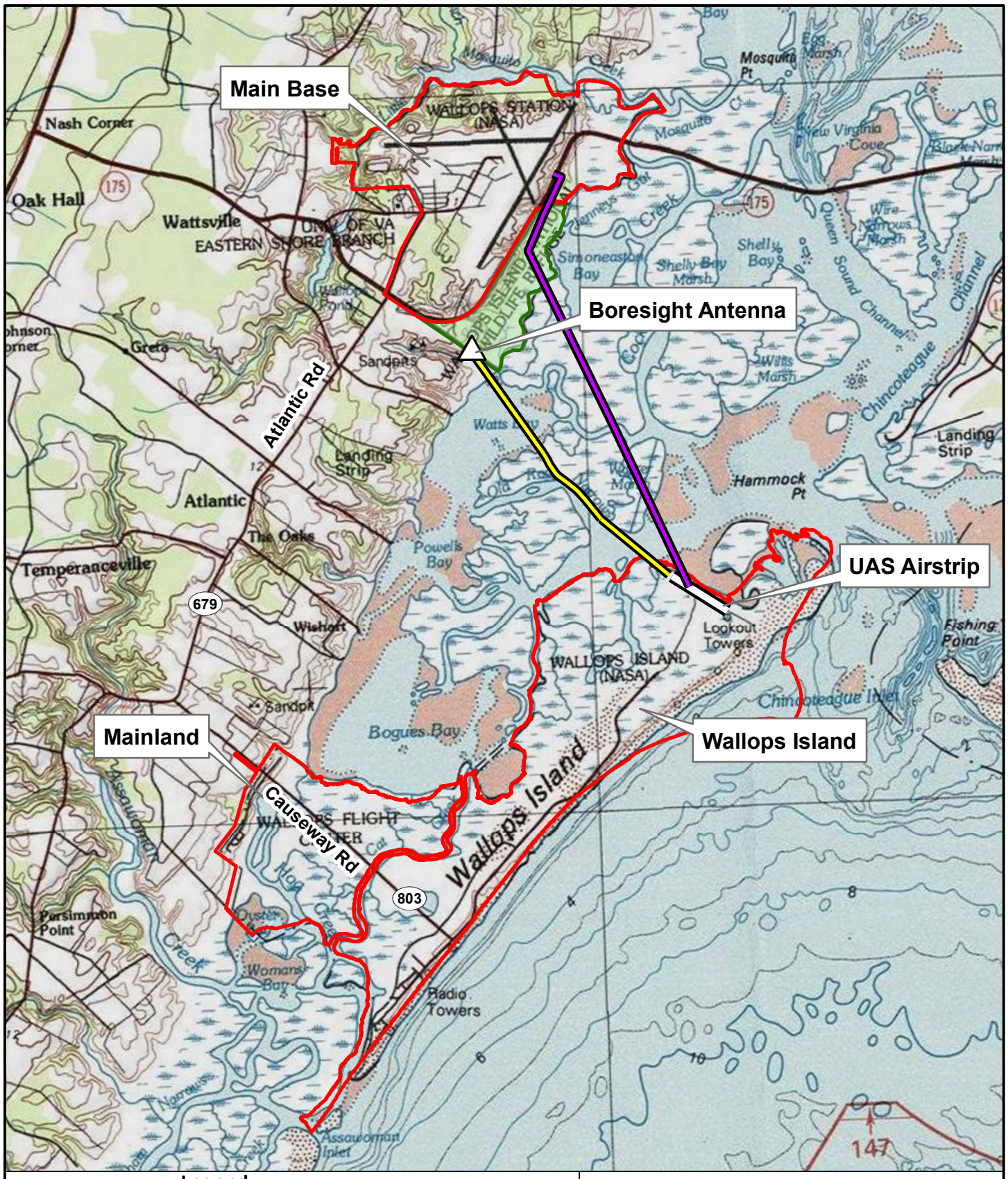
N

Sources: NASA, Esri World Street Basemap / Prepared by: 3e 19-756 MM
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 1-1
LOCATION AND BOUNDARIES OF WALLOPS FLIGHT FACILITY

0 4.5 9
Miles

NASA WFF Marsh Fiber EA



Legend

- Old Marsh Fiber Path
- Proposed Marsh Fiber Path
- Wallops Flight Facility Boundary
- Wallops Island National Wildlife Refuge

Sources: NASA, USFWS, Esri USA Topo Basemap / Prepared by: 3e 19-756 MM
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

N

FIGURE 1-2
PROPOSED ACTION AND TOPOGRAPHY
WALLOPS FLIGHT FACILITY

0 1.15 2.3
Miles

NASA WFF Marsh Fiber EA

1.2.1 Main Base

The Main Base encompasses approximately 810 ha (2,000 ac). Extensive marshland and creeks, which border the Main Base to the east, lead to Chincoteague Bay and Chincoteague Inlet. Little Mosquito Creek and its tributaries define the north and west borders of the Main Base. State routes 175 and 798 border the Main Base on the south and southeast, respectively.

1.2.2 Mainland

Approximately seven miles of public roads through the unincorporated town of Atlantic, Virginia, connect the Main Base to the Mainland. The Mainland is approximately 485 ha (1,200 ac) in area. Extensive marshland borders the Mainland to the east, while farmlands border the area to the south, west, and north.

1.2.3 Wallops Island

Wallops Island is a barrier island located along Virginia's coast. The 2-mile long Wallops causeway bridge, owned and maintained by NASA, connects Wallops Island to the Mainland. Encompassing approximately 1,375 ha (3,400 ac) and surrounded by water, the Island is approximately 11 kilometers (7 miles) long by 2.4 kilometers (1.5 miles) wide. The Atlantic Ocean borders Wallops Island to the east, and Chincoteague Inlet delineates the northern coastline. Marshland, interlaced with small creeks, covers the entire western approach to Wallops Island. The north end of Assawoman Island abuts the southern tip of Wallops Island resulting in the two being a single landmass.

1.3 NASA's Mission

For over 70 years, WFF has flown thousands of research vehicles in the quest for information on the flight characteristics of airplanes, launch vehicles and spacecraft, as well as to increase knowledge of the Earth's upper atmosphere and the near space environment. WFF supports aeronautical research, science technology, and education by providing NASA centers and other U.S. government agencies access to resources such as special use (i.e., controlled/restricted) airspace, research runways, and launch pads. WFF regularly provides launch support for the commercial launch industry, either directly or through MARS, a commercial spaceport on Wallops Island. WFF facilitates a wide array of U.S. Department of Defense (DoD) research, development, and training missions, including target and missile launches, and aircraft development. The flight programs and projects supported by WFF range from small sounding rockets, unmanned scientific balloons and UAS, manned aircraft, and orbital tracking to next-generation launch vehicle development, expendable launch vehicles (ELVs), and small and medium classed orbital spacecraft. WFF conducts many of these programs from the Main Base research airport, the MARS UAS airstrip, or the Wallops Island launch range.

Services provided by WFF include technical expertise, project oversight and management, engineering, fabrication, testing, meteorological studies, hydrospheric and biospheric sciences, and operational support. Additionally, WFF supports numerous companies that utilize the research airport for flight test and training activities. WFF also assists the scientific community with mobile campaigns and provides commercial and other government activities with mobile range equipment.

1.4 NASA Facilities, Tenant Facilities, and Other Onsite Organizations

1.4.1 Overview of Facilities at WFF

The Main Base includes runways, aircraft hangars, office buildings, dormitories, and industrial shops. Most administrative, technical, and facility support functions occur on the Main Base. In addition, there are water and sewage treatment plants, U.S. Navy administration and housing for the Surface Combat Systems Center (SCSC), Coast Guard housing, National Oceanic and Atmospheric Administration (NOAA) buildings, and other miscellaneous structures.

NASA and its partners utilize the Mainland and Wallops Island sites for testing and launch activities, Navy training, and research facilities. The Mainland facilities include storage buildings, radar antennas and transmitter systems, and associated buildings. The southern end of Wallops Island houses the launch complexes integration facilities, and associated structures. Northern Wallops Island facilities include the MARS UAS airstrip, blockhouses, assembly shops, dynamic balancing facilities, tracking facilities, and other related support structures. The Navy's AEGIS, Wallops Island Engineering Test Center, and Ship Self Defense System Facilities are in the middle of Wallops Island. Restricted airspace managed by NASA overlies all of Wallops Island, Mainland, and the Main Base (NASA 2019a).

NASA has several long-term tenants and customers that use the WFF research airport and Wallops Island launch range, its facilities, and airspace. Each tenant relies on NASA for institutional and programmatic services, but also has its own missions. Tenant activities are as follows.

1.4.2 Mid-Atlantic Regional Spaceport

The Virginia Commercial Space Flight Authority (Virginia Space) holds and maintains an active Launch Site Operator License with the Federal Aviation Administration (FAA) to operate the MARS launch site at Wallops Island. MARS provides facilities and services for NASA, DoD, and commercial launches of payloads into space. Activities include launch vehicle and payload preparation, integration and testing, pre-launch operations, launch range integration, and launch and post-launch operations. Virginia Space manages the operations of the North Wallops Island UAS Airstrip, which is approximately 914 meters (m) (3,000 feet [ft]) long by 23 m (75 ft) wide, for commercial testing.

1.4.3 United States Navy

The Navy's SCSC is WFF's largest partner. Wallops Island is home to the unique replica of an Aegis cruiser and its combat systems on which naval officers and enlisted personnel train, test concepts, and solve operational problems. Other technical missions include Lifetime Support Engineering, In-Service Engineering, Systems Level Operations, and maintenance training. The U.S. Navy Ship Self Defense System Facility on Wallops Island conducts research, development, testing, and evaluation elements of shipboard systems, and integration and demonstrations of new shipboard systems. WFF also provides drone and missile launch support for the U.S. Navy. The Aegis facility and operational naval forces use drones and missiles for target tracking training.

In addition to the SCSC activities at WFF, the U.S. Navy's Fleet Forces Command maintains a presence at the WFF airfield to rehearse landing on simulated aircraft carrier decks established on two of WFF's runways. Occasionally, the Navy bases its operations at WFF for several weeks at a time to fulfill training requirements.

The U.S. Navy's Virginia Capes Range Complex (VACAPES) is an area of the ocean adjacent to Wallops Island extending 287 kilometers (155 nautical miles) into the Atlantic Ocean, and consists of surface and subsurface areas as well as restricted airspace used for training activities by the Navy and other branches of the DoD. The Navy has authority to restrict access by non-military vessels and aircraft to all or portions of the VACAPES when conducting training.

1.4.4 United States Coast Guard (USCG)

The USCG Sector Field Office Station, Aids to Navigation Team, and Electronic Systems Detachment Chincoteague are stationed on Chincoteague Island. The USCG maintains housing units on the Main Base for personnel assigned to the Chincoteague Station. Search and rescue helicopters and other aircraft associated with USCG also use the WFF as a base of operations. During emergencies such as hurricanes or Chincoteague Island closure, NASA provides the USCG space for a secondary command center and hangar space for boat/vehicle storage.

1.4.5 National Oceanic and Atmospheric Administration (NOAA)

The NOAA National Environmental Satellite Data Information Service (NESDIS) operates environmental satellites, which collect data on atmospheric, oceanic, and terrestrial environmental conditions. NOAA distributes these data to various organizations to prepare short-term and long-range meteorological forecasts, monitor important environmental parameters, provide information critical to aviation and maritime safety, aid search and rescue missions, and assist in national defense and security. NOAA NESDIS satellites track the movement of storms, volcanic ash, and icebergs; measure cloud cover; measure temperature profiles in the atmosphere and temperature of the ocean surface; collect infrared and visual information; and measure atmospheric ozone levels. The Wallops Command and Data Acquisition Station (CDAS), a 29-acre facility operated by NOAA NESDIS at the Main Base, gathers the data from NESDIS satellites via radio downlinks

utilizing various antennas (including four that are operated remotely from the Wallops Command and Data Acquisition Station), some of which are also capable of transmitting data.

1.5 Purpose and Need

1.5.1 Background for Purpose and Need

In the early 1990s, NASA installed a fiber optic cable via a direct route through waterways and saltmarsh between the Main Base and Wallops Island. This original Marsh Fiber cable was buried underneath land, including under the saltmarsh, and was laid on the subaqueous bottom where the route crossed through bays and open water. The cable was exposed to damages and movement from dredge fishing operations as well as waves and tides. Prior breaks in the cable have been spliced together, although its subaqueous location made repair difficult. These splices have subsequently failed and have rendered the cable inoperable. The location of the abandoned cable is shown on **Figure 1-2**.

Prior to complete failure of the old Marsh Fiber cable, NASA connected all circuits through an alternate fiber optic cable system to ensure the facilities on Wallops Island had continuous fiber optic service. This alternate cable is routed from the Main Base, along the right-of-way adjacent to Atlantic Road, and across the causeway (Route 803) to Wallops Island. This alternate route consists of three operational cables that are bundled into one cable system. The existing Atlantic Road cable system would remain in operation as the redundant source of a fiber optic cable for command and communication.

A robust, reliable, secure, and redundant fiber optic communications pathway is critical to support NASA's mission, WFF tenant missions, and facility network communications services. Having only one route of fiber optic communications puts the critical systems and missions described in Sections 1.3 and 1.4 of this EA, including launch operations, at risk. This single cable system does not provide redundancy (i.e., multiple cable systems in case one system fails) or diversity (i.e., non-congruous in case one system is impaired or cut) in communication pathways. Redundancy and diversification of communication systems are NASA Office of the Chief Information Officer (OCIO) requirements as well as a NASA Range Safety requirement for command and destruct operations and system operability. Having only a single pathway requires a NASA OCIO waiver.

Additionally, the existing cable system is not likely to meet the future IT needs of NASA and its tenants on Wallops Island as technology in data communications progresses and the demand for highspeed data and a large bandwidth increases. A new, second fiber optic cable system accessing Wallops Island from the north across the saltmarsh would serve as the primary fiber optic cable route. The new Marsh Fiber would provide redundancy; diversification; increased data capacity due to an upgrade in materials, technology, and reliability; and security compared to the abandoned marsh cable route and the existing fiber optic cable system along Atlantic Road.

1.5.2 Purpose

The primary purpose of the Proposed Action is to provide a redundant and reliable means of fiber optic communications for NASA, DoD, and commercial systems on Wallops Island. Because the existing Atlantic Road cable system would remain in operation as the backup source of communication, installing a new primary fiber optic cable would ensure the reliability of command, mission, voice, video, and data services for systems on Wallops Island. Implementing the Proposed Action would put NASA WFF in compliance with NASA OCIO and NASA Range Safety requirements for redundancy and diversification in system operations.

Additionally, NASA would install the new Marsh Fiber with the most current fiber optic technology. A secondary purpose of the Proposed Action is to provide NASA and its tenants with expanded capacity of the data communication capabilities to support a robust and responsive IT infrastructure system at WFF. A new fiber optic cable would provide a rapid and secure means of data transmittal in line with current technology that is easily accessed for repair.

1.5.3 Need

The Proposed Action is needed because WFF only has one operational fiber optic cable providing communications data from the Main Base to Wallops Island. Having a single means of fiber optic communications puts NASA, its tenants, and the public around WFF at risk for unacceptable disruptions to launch command and IT services if the existing Atlantic Road cable were to become damaged or fail. A new Marsh Fiber is critical to meet NASA OCIO and Range Safety requirements for diversity and redundancy of mission, facility, and corporate customer communication services. The new Marsh Fiber would also be easily accessible for repair, minimizing the potential for service disruptions.

Additionally, from telemetry and meteorology to cameras and sensors, missions and facilities are increasingly requiring faster speeds and greater capacity (bandwidth) for uploading and downloading of acquired data. Therefore, to support NASA and its tenants' missions, a new fiber optic cable that uses state-of-the-art technology is needed to meet the future demands for rapid and reliable communications by providing expanded bandwidth compared to the cable currently in use.

1.6 Cooperating Agencies

As defined in 40 CFR § 1508.5, and further clarified in subsequent CEQ memoranda, a cooperating agency can be any federal, state, tribal, or local government which has jurisdiction by law or special expertise regarding any environmental impact involved in a proposal or a reasonable alternative.

NASA, as the proponent for the Marsh Fiber project, is the lead agency for preparation of this EA. Because the proposed Marsh Fiber path would be installed in the Wallops Island National Wildlife Refuge (see **Figure 1-2**), which is owned and managed by the USFWS, the USFWS is a cooperating agency on this EA.

2 Description of the Proposed Action and Alternatives

2.1 Introduction

This chapter describes NASA's Proposed Action to install a new fiber optic cable between the Wallops NWR and Wallops Island at the WFF. Section 2.2 describes the alternatives considered to implement the Proposed Action, the process NASA used to screen the alternatives and the alternatives NASA eliminated from further consideration in the EA. Section 2.3 and Section 2.4 presents the Proposed Action and No Action Alternative, respectively. Section 2.5 describes the NEPA process and public participation.

The need to compare the Proposed Action with alternatives arises from the requirement in Section 102(2)(E) of NEPA, as amended (42 USC 4332), that EAs include a brief discussion of alternatives (40 CFR § 1508.9).

2.2 Alternatives

In Section 2.2, NASA presents the following elements used for the development and selection of alternatives:

- Criteria used to screen the alternatives to identify which meet the purpose and need of the action
- Alternatives initially considered
- Construction methods common among the alternatives
- Results of the screening evaluation applied to the alternatives
- Alternatives dismissed from analysis in the EA
- Alternatives carried forward for analysis in the EA

2.2.1 Screening Criteria

NASA applied the following screening criteria to assess which alternatives meet the purpose and need for the proposed action. A feasible alternative must meet all screening criteria to be carried forward for analysis in the EA.

2.2.1.1 *Criterion 1: Provides Geographic Diversity and Redundancy*

The new cable pathway must be geographically separated from the existing cable route along Atlantic Road to provide the required diversity and redundancy. The new cable must be separated by enough distance from the existing cable as to not be susceptible to disruptions or damage from human activities and natural disasters that may affect the Atlantic Road cable.

2.2.1.2 *Criterion 2: Technically Feasible*

The maximum length of conduit inner-duct and fiber optic cable that can be installed via the HDD method is approximately 1,830 linear m (6,000 linear ft). Installation lengths greater than that are not technically feasible owing to the high potential for degradation of the inner-duct and the fiber optic cable. Given the weight of that length of cable, the cable tensile strength, and the force needed to pull the cable over that length, installation of a fiber optic cable over a distance greater than 1,830 m (6,000 ft) could stress individual fiber optic strands to the point of failure.

2.2.1.3 *Criterion 3: Meets Protection Requirements*

The new fiber optic cable must be protected from human activities (such as digging) and natural disasters that could result in physical damage leading to service disruptions.

2.2.1.4 *Criterion 4: Minimizes Disturbances to Sensitive Environmental Resources*

The new cable should be located along a route and installed using techniques that minimize disturbances to sensitive resources such as wetlands, dunes, and indigenous and transient wildlife to the maximum extent practicable.

2.2.1.5 *Criterion 5: Is Readily Accessible for Repair*

The new cable should be readily accessible to allow for timely repairs. The ability to remove and repair segments of the cable without repairing/replacing the entire cable is a necessity.

2.2.2 Alternatives Considered

NASA considered seven alternatives for the Proposed Action as listed below and illustrated in **Figure 2-1**. Section 2.2.4 presents the results of the screening criteria evaluation. Section 2.2.5 describes each of the action alternatives and presents the logic for removing individual alternatives from further consideration. Section 2.3 presents the Proposed Action, including the methods of installation and the construction staging and limits of disturbance (LOD). Section 2.4 presents the No Action Alternative.

Alternative One	• Install Cable Underground in Open Trench via Atlantic Road
Alternative Two	• Install Cable Along Overhead Power Lines via Atlantic Road
Alternative Three	• Install Cable from Boresight Antenna to UAS Airstrip With Three HDD Segments
Alternative Four	• Install Cable from Boresight Antenna to UAS Airstrip With Two HDD Segments
Alternative Five	• Install Cable from Boresight Antenna to UAS Airstrip With a Single HDD Segment
Alternative Six	• Install Cable under Watts Bay and Ballast Narrows with HDD • Install Cable Across Walker Marsh via Open Trenching • Install Cable Across the Open Water Guts in Walker Marsh via Jetting Method
Alternative Seven	• Install Cable under Watts Bay and Ballast Narrows with HDD • Install Cable Across Walker Marsh via Vibratory Trenching • Install Cable Beneath the Open Water Guts in Walker Marsh via Mini HDD
Alternative Eight	• No Action Alternative

Figure 2-1 provides a visual representation of the profile view of action alternatives Three through Seven.

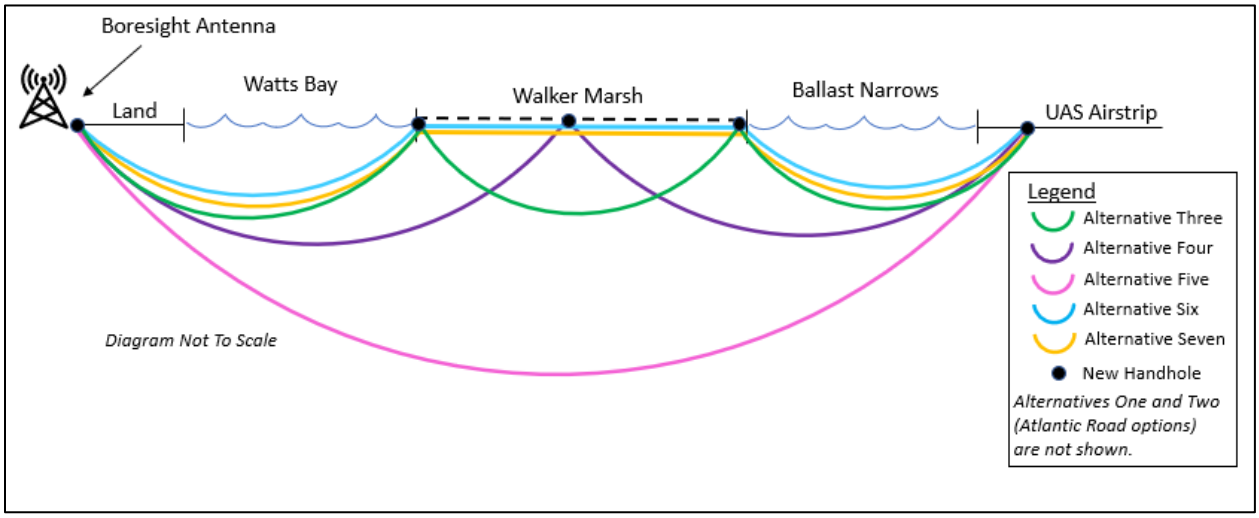


Figure 2-1 Profile View of Action Alternatives Three through Seven

2.2.3 Construction Methods Common Among the Alternatives

Under Alternatives Three through Seven, NASA would use HDD to install the fiber optic cable for all or most of the cable pathway. Under all five of these alternatives, NASA would install the cable via HDD under Watts Bay and Ballast Narrows.

NASA would install the cable across Walker Marsh via vibratory trenching across the ground surface of the saltmarsh and would cross the open water guts by jetting (Alternative Six) or a smaller version of HDD (Alternative Seven).

To distinguish between the larger and smaller methods of HDD throughout the EA, NASA will refer to the larger HDD method as "Maxi HDD" and the smaller HDD as "Mini HDD." The differences in Mini versus Maxi HDD include the size of equipment used, size of borehole, installation method details, length of cable installed, as well as the size of the staging and access areas.

For Alternatives Three through Seven, Maxi HDD is proposed for cable installation under Watts Bay, Ballast Narrows. For this project, Maxi HDD would be used to install cable lengths between 610 m (2,000 ft) and 1,830 m (6,000 ft) and at a borehole depth of approximately 18 to 26 m (60 to 85 ft). Mini HDD refers to the installation beneath the open water guts in Walker Marsh in Alternative Seven. Mini HDD would be used to install cable lengths of 61 m (200 ft) or less and at a borehole depth of less than 6 m (20 ft) below ground surface.

New handhole enclosures would be required at various cable access points for all alternatives. The number of handholes would depend on the alternative. General descriptions for the Mini HDD and Maxi HDD methods and the method for installing handholes are provided below.

2.2.3.1 *Horizontal Directional Drilling (HDD)*

HDD is a technique commonly used to install utilities such as cables, conduits, and pipes under environmentally sensitive areas or infrastructure. HDD is a boring method where a borehole is drilled along an engineered design path. Depending on the diameter of the borehole required and geologic conditions, a pilot hole may be drilled first, then gradually enlarged to accommodate the conduit or pipe being installed.

Maxi HDD Method

For the Proposed Action, the size of the borehole diameter and the softness of the geologic materials would allow the borehole to be drilled without a pilot hole using sacrificial 6 and 5/8 inch diameter steel drill pipe that would be left in place as the outermost conduit encasing the inner-duct and fiber optic cable. Two high-density polyethylene (HDPE) 3.8-centimeter (cm) (1.5-inch) diameter conduits (inner-duct) would then be installed through the sacrificial drill pipe. A transmitter or steering tool located near the drill head would track the exact location, depth, alignment and percent slope of the drilling operation. The alignment of the drill head would be adjusted to the pre-engineered path as drilling progresses. The HDD borehole would reach a depth

of approximately 18 to 26 m (60 to 85 ft) below the subaqueous bottoms of Watts Bay and Ballast Narrows.

Photo 2-1 shows an example of an HDD rig at an entry borehole. **Figure 2-2** is a conceptual cross-sectional view of the HDD method.

Photo 2-1. Example of Maxi HDD equipment drilling a borehole. *Credit: Crofton Diving*

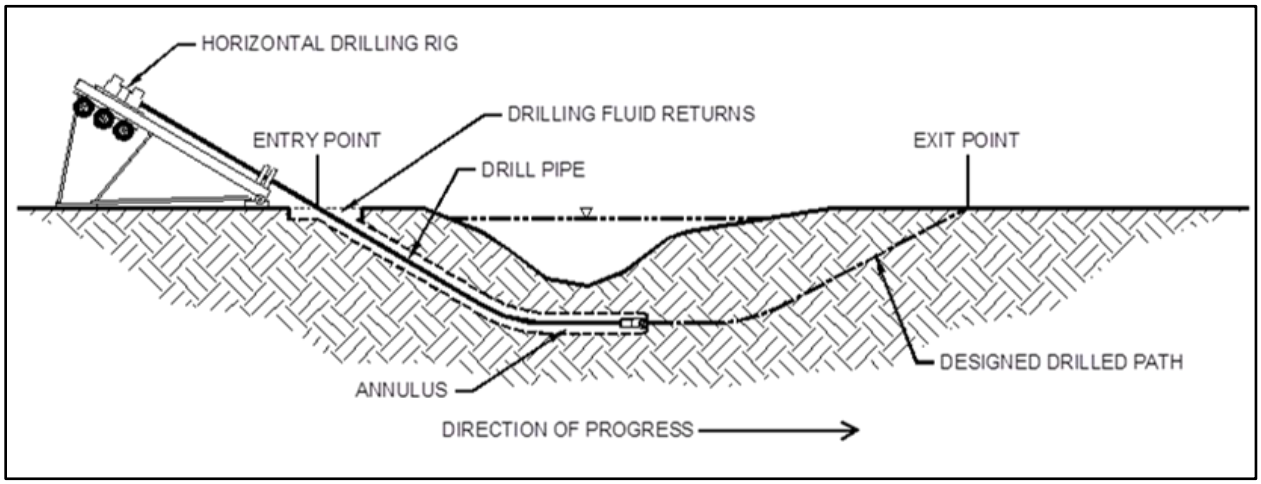


Figure 2-2 Overview of HDD Method. *Courtesy J.D. Hair & Associates, Inc.*

Minor excavation of the drill entry locations would be necessary to align the HDD rig and to contain drilling fluids during drilling. Depending on the borehole diameter and length, most HDD requires the use of a viscous fluid known as drilling fluid (also called "drilling mud") that is pumped through the drill pipe to the drill bit to facilitate the removal of cuttings (i.e., soil and rock particles), stabilize the bore hole, cool the cutting head, and lubricate the passage of the pipe/conduit.

The drilling mud consists mainly of a bentonite clay/water mixture (slurry) that is conditioned with various polymers and additives to achieve optimal density and viscosity of the drilling fluids to remove drill cuttings, lubricate the drill bit, and maintain the integrity of the borehole (acts as a sealant of the borehole walls). The drilling mud carries the cuttings back through the borehole to the entrance pit at the drill rig.

At the entrance pit, the cuttings-laden drilling mud is recycled through a machine called a reclaimer that separates excess solids by removing the drill cuttings from the drilling mud and reconditions the drilling mud to the proper viscosity and density of the fluid for reuse. The HDD operation would maximize the recirculation and reuse of drilling mud to minimize waste disposal.

A fluorescent, non-toxic dye is typically added to the drilling fluid during drilling beneath water bodies so that any "frac-outs" can be easily detected. A frac-out occurs when drilling mud is released through fractured rock or overburden into the surrounding rock/soil and travels toward the surface. Borehole pressure must be maintained throughout the drilling process or the hole would collapse. Therefore, once started, HDD drilling would continue 24 hours a day until the hole is completed, thereby maintaining a constant borehole pressure and proper lubrication, which would both dissipate if drilling were stopped. NASA would conduct the HDD operation in a manner that avoids the discharge of water, drilling mud, and cuttings outside the HDD entry and exit work areas during the installation process.

Given the depth and length of each of the Maxi HDD sections, a large amount of equipment and materials would be deployed in the immediate vicinity of the HDD entry hole to support the drilling operation and manage the solids and liquids generated from the drilling operation. Supporting equipment would include a drilling mud recycling system, sand and silt separators/shakers, mud cleaner, centrifugal pumps, mud tanks, excavators, generators, lighting system, drill pipe, inner-conduit, and fiber optic cable. Excess solids removed by the reclaimer from the recirculated drilling mud would be temporarily stored on site in containers prior to offsite transport and proper disposal.

Based on preliminary design work, a typical list of equipment needed to complete the Maxi HDD installations is provided below:

- One to three excavators (Caterpillar 325® model or equivalent)
- One 100-kilowatt portable generator with fuel tank
- American Augers DD-440® Maxi Rig (HDD rig) with 440,000 pounds of pull back (or equivalent)
- Tulsa Iron Rig MCS 1000® bentonite mixing, recycling and pumping system with mud pump (or equivalent)
- American Augers MC-500® Mud Pump and 500 gallon per minute mud cleaning (reclaimer) system (or equivalent)
- Two Mud Scalpers (RMS brand); 2,200 and 3,300 gallons (or equivalent)

- Flatbed trailer(s) holding drill pipe
- Multiple conduit and cable spools
- Two to three 20-cubic-yard capacity roll-off boxes (temporary solids storage)
- Several portable light towers
- Several shipping containers used to store miscellaneous tools, equipment, and materials

The minimum total work area for the Maxi HDD at the entry site would be approximately 930 square meters (m^2) (10,000 square feet [ft^2]) for land- or water-based installations. For land-based operations, additional work area of 465 to 1,858 m^2 (5,000 to 20,000 ft^2) would be required for personnel vehicles and for trucks to deliver materials and remove waste cutting containers.

For water-based Maxi HDD drilling operations at Walker Marsh (under Alternative Three only), some of the work equipment listed above would be deployed on multiple barges that would be anchored a short distance from the HDD entry pit. However, much of the equipment would need to be deployed close to the entry pit and therefore, placed directly on the saltmarsh. Additional complications and challenges for water-based HDD operations are discussed under Alternative Three in Section 2.2.5.

Mini HDD Method

For the Mini HDD operations on Walker Marsh, which would be up to 61 m (200 ft) long and less than 6 m (20 ft) deep, smaller and fewer pieces of equipment would be required compared to the Maxi HDD operations. Typically, a small track-mounted and self-contained Mini HDD rig would be used to complete the operation. Mini HDD installations for small utilities can be completed without drilling mud. For these types of installations, the pull-back method is usually employed. The pull-back method involves drilling the borehole (with or without a pilot hole) to the required diameter. The drill bit and collar are removed at the exit pit, and the pipe or conduit is attached to the drill pipe. The pipe or conduit is then pulled back through the borehole to the entry pit.

HDPE conduit can be delivered and deployed from large spools. The borehole would be large enough to accommodate two 3.8-cm (1.5-inch) HPDE conduits and would be installed a minimum of 0.9 m (3 ft) beneath the bottom of the guts. Total land disturbance is typically less than 93 m^2 (1,000 ft^2).

2.2.3.2 *HDD Exit and Handhole Enclosures*

Under Alternatives Three, Four, Six, and Seven (all but the single-segment HDD [Alternative Five]), HDD boreholes would exit on Walker Marsh. HDD personnel and a barge with containment equipment would be pre-staged at the Maxi HDD exit point(s) immediately prior to when the HDD drill is anticipated to come to the surface. Once the HDD drill surfaces, the HDD contractor would immediately implement a containment system with turbidity curtains and/or silt fence around the exit hole to contain sediment and drilling mud.

Since Maxi HDD installations would use sacrificial drill pipe that would be left in place as the outer conduit, only the drill bit and collar would be removed from the drill pipe. For the Mini HDD installations under the guts, the entire drill string would be removed and the conduit pulled back through the borehole. Under Alternative Five (a single HDD segment), the HDD exit hole would be on land at the west end of the UAS Airstrip, and the HDD contractor would implement similar containment measures.

To access the fiber optic cable where the segments connect, NASA would excavate a small pit to a depth of 1.4 m (4.5 ft) and install a concrete polymer handhole enclosure. **Figure 2-3** shows an example of the type of handhole enclosure that would be used. The proposed handhole enclosure would be approximately 2.4 m long by 1.2 m wide and 1.2 m deep (8 ft long by 4 ft wide and 4 ft deep) and would be large enough to access the cable by hand for repair. Each handhole would have an area of approximately 2.9 m^2 (32 ft^2) and volume of 3.5 m^3 (128 ft^3). The handhole enclosure would be installed around the HDD conduit and anchored in place with a layer of gravel and geotextile fabric surrounding the structure where it contacts the soil. Handhole enclosures would also be installed at the HDD entry points for connection of the new fiber optic cable to the existing land-based fiber optic cable.

2.2.4 Screening Criteria Evaluation

Results of the screening evaluation applied to the proposed alternatives are shown in **Table 2-1**. Descriptions of the alternatives and results of the screening for each of the eliminated alternatives are discussed in Section 2.2.5.

Alternatives that met the screening criteria, and therefore meet the Purpose and Need, are carried forward in the EA. Alternatives that did not meet the screening criteria are dismissed from further consideration.

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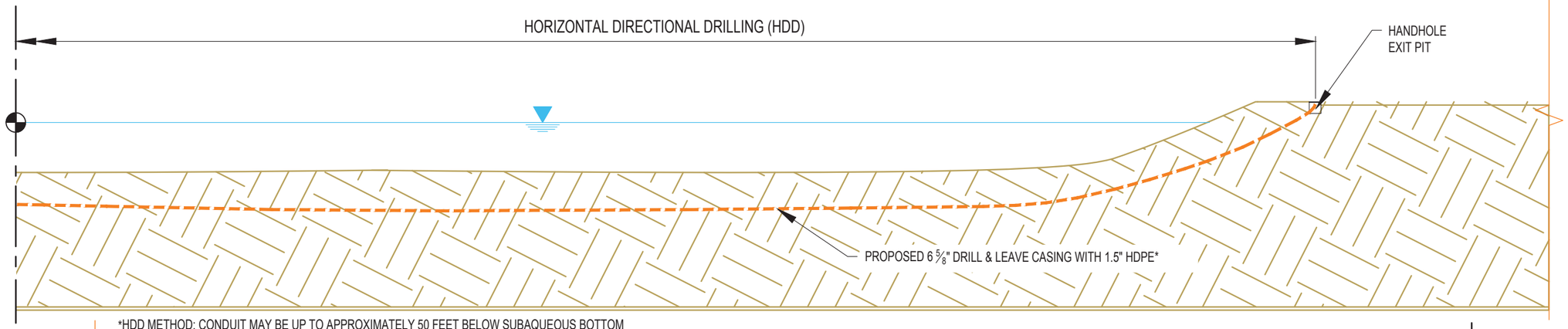
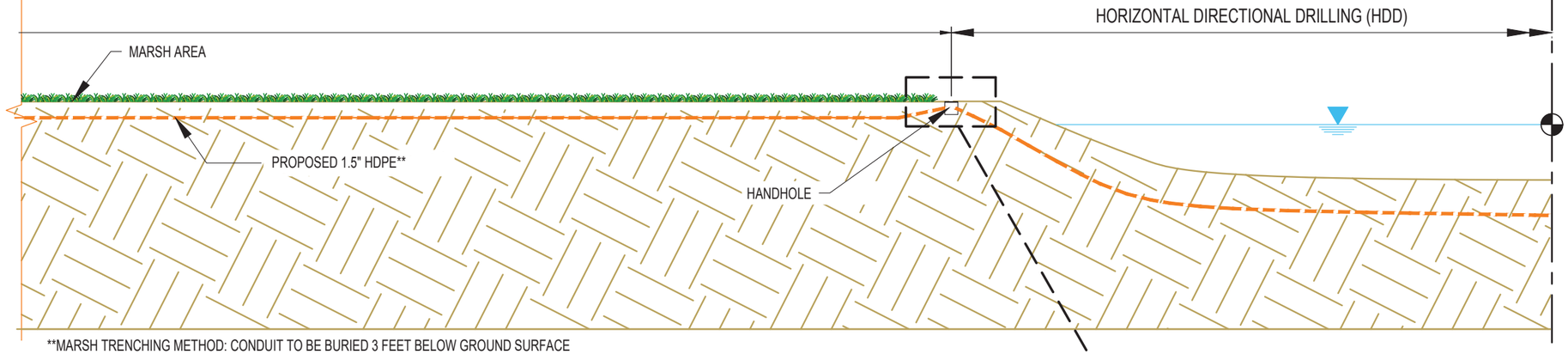
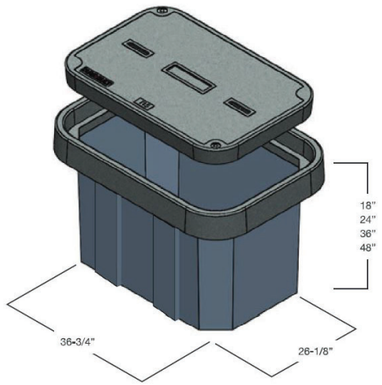


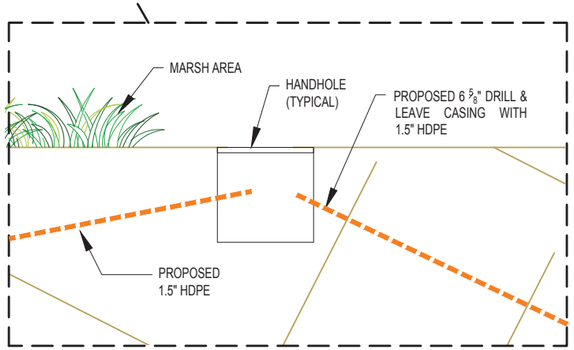
*HDD METHOD: CONDUIT MAY BE UP TO APPROXIMATELY 50 FEET BELOW SUBAQUEOUS BOTTOM



**MARSH TRENCHING METHOD: CONDUIT TO BE BURIED 3 FEET BELOW GROUND SURFACE



EXAMPLE OF HAND-HOLE ENCLOSURE; OLDCASTLE® ENCLOSURE SOLUTIONS



ENLARGED DETAIL AT HANDHOLES (TYPICAL)

FIGURE 2-3

INSTALLATION METHOD DIAGRAMS

NASA WALLOPS FLIGHT FACILITY MARSH FIBER EA

Sources: Crofton Diving Corporation NASA WFF Marsh Fiber Upgrade Proposal
Prepared by: 3e 19-756 MM

Table 2-1. Screening Criteria Evaluation							
Criterion	**Alternative**						
	One	**Two**	**Three**	**Four**	**Five**	**Six**	**Seven**
	Atlantic Road Underground via Open Trench	Atlantic Road Overhead Lines	Three Maxi HDD Segments	Two Maxi HDD Segments	Single Maxi HDD Segment	Two Maxi HDD Segments; Open Trench, Jetting	Two Maxi HDD Segments; Vibratory Trench, Mini HDD
Criterion 1: Provides Redundancy	No	No	Yes	Yes	Yes	Yes	Yes
Criterion 2: Technically Feasible (Engineering)	Yes	Yes	Yes	No	No	Yes	Yes
Criterion 3: Meets Protection Requirements	No	No	Yes	Yes	Yes	Yes	Yes
Criterion 4: Minimizes Disturbances of Sensitive Resources	Yes	Yes	No	No	No	No	Yes
Criterion 5: Readily Accessible for Repair	Yes	Yes	Yes	No	No	Yes	Yes
Carried Forward in EA	**No**	**No**	**No**	**No**	**No**	**No**	**Yes**

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2.2.5 Alternatives Considered but Not Carried Forward

Six of the seven action alternatives for the proposed Marsh Fiber project were dismissed from further consideration because they failed to meet the Purpose and Need and/or criteria necessary to be considered practicable alternatives. The six alternatives considered but dismissed and rationale for dismissing the alternatives is presented below.

2.2.5.1 *Alternative One: Install Cable Underground via Atlantic Road Route*

Alternative One involves burying the fiber optic cable in an underground trench along the same route that the existing cable follows from the WFF Main Base, along Atlantic Road, and across the Wallops Island causeway. Even if NASA installed the new cable on the opposite side of the road where the existing route is buried, both existing and new cables could be damaged in the same event (such as erroneous digging by a public or private entity). Therefore, since Alternative One would install the fiber optic cable along the same route as the existing cable and, consequently, would not provide geographic diversity or redundancy, this route was dismissed from further consideration under Criterion 1. Additionally, because the cable would be along a roadway where digging is likely to occur (e.g., to repair or install other underground utilities, repairs or reconstruction of the roadway), this alternative would not meet protection requirements in Criterion 3. For these reasons, NASA dismissed Alternative One from further consideration.

2.2.5.2 *Alternative Two: Install Cable Along Overhead Power Lines via Atlantic Road Route*

Alternative Two involves stringing the fiber optic cable overhead by attaching it to existing power/communications poles along the same route that the currently active cable follows, albeit underground, from the WFF Main Base, along Atlantic Road, and across the Wallops Island causeway. Additional new poles may be required. The overhead line would be exposed to events such as hurricanes and nor'easters, which have traditionally resulted in downed overhead utility poles and lines. Installing the cable as an overhead line would not meet the required level of protection from physical damage and would not provide geographic diversity or redundancy since it would be installed along the same route as the existing cable. Therefore, NASA dismissed this alternative from further consideration based on Criterion 1 and Criterion 3.

2.2.5.3 *Alternative Three: Install Cable from Boresight Antenna to UAS Airstrip with Three Maxi HDD Segments*

Alternative Three would consist of installing the fiber optic cable in three Maxi HDD segments across the entire proposed path from the Boresight Antenna to the UAS Airstrip. The western segment from the Boresight Antenna to the west side of Walker Marsh would be approximately 5,700 feet long; the middle segment beneath Walker Marsh would be approximately 1,250 m (4,100 ft) long; and the eastern segment from the UAS Airstrip to the east side of Walker Marsh

approximately 1,190 m (3,900 ft) long. NASA would construct two handholes in Walker Marsh to connect the three sections and provide long-term access for repair.

For Alternative Three, the HDD equipment and construction materials would be placed at the Boresight Antenna, UAS Airstrip, on Walker Marsh, and on two or more barges that would be staged in Ballast Narrows adjacent to the Walker Marsh entry pit. Much of the equipment would be used directly on the saltmarsh in a work area that would need to be protected from wave action and water intrusion.

Details about the methods, LODs, and potential effects of Alternative Three are described below.

- To create a relatively "dry," approximately 930 m^2 (10,000 ft^2) work area on the saltmarsh, sheet piles, port-o-dams, or sandbags, and construction perimeter dewatering would be required.
- An approximately 12 by 30 m (40 by 100 ft) area between the anchored barges and the saltmarsh work area would be disturbed for equipment and material transfer.
- The HDD work and staging would result in approximately 0.14 ha (0.35 acre) of disturbance to Walker Marsh vegetation and substrate where HDD drilling operations would occur. The saltmarsh vegetation within this footprint would be impacted to varying degrees, some of which would include temporary removal of vegetation for excavation of the entry and exit holes or crushed under the weight of equipment and materials (e.g., sheet piles, piping, machinery). Synthetic composite matting would be used where practicable; however, the weight of the equipment and materials would preclude use of matting in some areas (i.e., the matting would be pressed below the ground surface). Depending on the degree of disturbance, saltmarsh vegetation would be expected to grow back in the next one to two growing seasons. Disturbed areas would be seeded and/or replanted following construction. Saltmarsh restoration would be partially dependent on the degree of ground disturbance to the saltmarsh substrate and root mat.
- An approximately 102 m^2 (1,100 ft^2) entry pit would be excavated into the saltmarsh. The entry pit would be protected from collapsing by installing excavation structures such as sheet piles. Sheet piles would also be installed around the entry pit to keep marsh water out of the slurry pit and prevent the release of slurry to the environment. Installation and removal of the sheet piles would result in substantial disturbance of saltmarsh vegetation and substrate.
- De-watering would likely be needed to manage water intrusion through upwelling of water into the pit. Construction de-watering water would be managed (contained or treated prior to discharge) to prevent release to the environment.
- Disturbance of the subaqueous bottom would occur due to anchoring of multiple barges to support Maxi HDD operations. One moored barge would be required to support the HDD drill. A second barge would be required for the recovery and reclamation equipment to

capture the drilling mud and bentonite. A third barge may be needed to stage the HDD pipe and casing. Additionally, boats would be needed to transfer personnel and smaller equipment from the mainland (launching from Assateague Island).

- Due to the challenges of working conditions in the saltmarsh, there is a higher probability for an inadvertent release of drilling mud (i.e., bentonite). If a release were to occur, the potential for adverse effects on the environment would be elevated (compared to a release in upland areas) because the operations would occur in a sensitive saltmarsh close to tidal waterways. Any release would directly enter aquatic systems where it would be substantially more difficult to control and remediate. Therefore, extra material handling would be required to manage the drilling fluids and cuttings.

Based on the large footprint of activities in Walker Marsh, the potential for direct adverse impacts on special status species habitat (eastern black rail), sensitive aquatic and saltmarsh environments, and relatively high risk (compared to other alternatives) of a pollutant (principally drilling mud and petroleum products) release to the environment where control and countermeasures are very difficult to implement, Alternative Three was dismissed from further consideration based on Criterion 4.

2.2.5.4 *Alternative Four: Install Cable from Boresight Antenna to UAS Airstrip with Two Maxi HDD Segments*

Alternative Four consists of installing the fiber optic cable in two Maxi HDD segments across the entire proposed path from the Boresight Antenna to the UAS Airstrip. The western segment would be approximately 2,360 m (7,740 ft) long and the eastern segment approximately 1,800 m (5,910 ft) long. NASA would construct a single handhole in the middle of Walker Marsh to connect the two sections and provide access for repair. The HDD equipment and staging required at the single handhole in Walker Marsh would result in direct impacts on the saltmarsh.

The construction sequence would be similar for each Maxi HDD. The first activity would consist of drilling a pilot hole from either upland location (Boresight Antenna or the UAS Airstrip) and mobilizing a support barge equipped with a large excavator to the exit point on Walker Marsh. Once the pilot hole is complete, the drill head assembly would be removed, and the sacrificial drill pipe left in the boreholes as the outer protective casing. The HDPE conduit inner-duct and the fiber optic cable would then be pulled through the sacrificial casing and connected at a handhole enclosure on Walker Marsh.

Alternative Four was principally dismissed from further consideration based on Criterion 2 and Criterion 4. As discussed under Criterion 2, there is the potential for degradation of the conduit inner-duct and fiber optic cable from pulling more than 1,830 linear m (6,000 linear ft) of conduit and fiber optic cable. Additionally, that length of conduit and fiber optic cable cannot be put on a reel without resulting in degradation from the stress and force required to wrap it around and then pull it from the reel. Therefore, NASA would need to string it out on the ground, which would result in a substantial laydown area at the HDD entry points. As there would not be enough linear

space along the UAS Airstrip, this laydown area would continue across wetlands into primary dunes where the laydown action and weight of materials and the subsequent movement of the pulled piping could adversely affect those sensitive environments, thereby violating Criterion 4. There is not enough space available at the Boresight Antenna to lay out this length of conduit and cable.

There would be a handhole in the middle of Walker Marsh where the two Maxi HDD segments connect. This handhole would provide access to the cable for repair; however, long sections of the buried cable would remain difficult to reach. Therefore, Alternative Four was also dismissed based on Criterion 5.

2.2.5.5 *Alternative Five: Install Cable from Boresight Antenna to UAS Airstrip with a Single Maxi HDD Segment*

Under Alternative Five, NASA would install a single Maxi HDD boring, approximately 13,600 feet in length, along the entire cable path from the Boresight Antenna on Wallops NWR to the UAS Airstrip on Wallops Island. The construction contractor would place two large capacity Maxi HDD rigs at each end of the project. The drills would meet in the middle and the drill from the UAS Airstrip would follow the other back through to the Boresight Antenna area. One length of pipe, approximately 4,145-m-long (13,600-ft-long), would be strung along the UAS Airstrip through wetlands and down the primary dune line for the Wallops Island Beach. The pipe would be preloaded with HDPE conduit and the fiber optic cable. Drilling operations would begin after the conduit and fiber optic cable have been preloaded and the casing made into one continuous section.

This alternative was dismissed due to the potential for degradation of the conduit inner-duct and fiber optic cable, as described under Criterion 2. The weight of materials and the subsequent movement of the pulled piping across the wetlands and primary dune would adversely affect those sensitive environments, therefore violating Criterion 4. Alternative Five was also dismissed from further consideration based on Criterion 5 since there would be no access points to the fiber optic cable for repair.

2.2.5.6 *Alternative Six: Install Cable from Boresight Antenna on Wallops NWR to UAS Airstrip with Two Maxi HDD Segments, Open Trenching Across Walker Marsh, and Jetting in Walker Marsh Guts*

Under Alternative Six, NASA would install the Marsh Fiber using a combination of Maxi HDD (Ballast Narrows and Watts Bay), and open trenching and water jetting (Walker Marsh). NASA would use Maxi HDD to install the cable from the Boresight Antenna to the west side of Walker Marsh, and to install the cable from the UAS Airstrip to the east side of Walker Marsh. The western HDD segment would be approximately 1,710 m (5,600 ft) long, and the eastern HDD segment would be approximately 1,160 m (3,800 ft) long.

The 1,190 m (3,900 ft) segment across Walker Marsh would be completed through a combination of open trenching across vegetated portions of the saltmarsh, and jetting to install the cable in the subaqueous bottom of three open water guts on the saltmarsh.

Open trenching on Walker Marsh would involve excavating a trench using a small backhoe bucket on tracked equipment referred to as a "marsh buggy," placing the HDPE conduit, and backfilling the trench. The trench itself would be approximately 30 cm (12 inches) wide and just over 0.9 m (3 ft). The width of disturbance along the route of open trenching would be approximately 4.3 m (14 ft) wide to accommodate the marsh buggy.

To install the cable under three open water guts, NASA would use jetting equipment within the water. Workers diving or wading, as needed, would use hand jets to open a narrow furrow beneath the cable, which would allow the cable, encased in conduit, to drop into the furrow, and the disturbed sediments would settle back over the cable. This would fill the furrow and restore the subaqueous bottom to its original grade. The cable would be buried 3 feet below the subaqueous bottom. To connect the conduit installed in the ground surface with the cable in the subaqueous bottom of the guts, NASA would gradually increase the depth of the open trench in the areas surrounding the guts to approximately 2.1 m (7 ft) below ground surface.

Open trenching under Alternative Six would result in more direct and indirect adverse impacts on the saltmarsh when compared to vibratory trenching, which is proposed in Alternative Seven. With vibratory trenching, there is no excavation of soils; instead, a hydraulic motor causes a blade to vibrate in an up-and-down motion in the soil (Section 2.3). The vibration helps loosen the soil, and the pipe is pulled through the narrow channel that the blade creates. The predominant advantage of vibratory trenching is that less soil would be disturbed through displacement.

When evaluating both alternatives, NASA determined that Alternative Seven (vibratory trenching and Mini HDD) was environmentally preferred compared to Alternative Six (open trenching and jetting). Therefore, NASA dismissed Alternative Six from further consideration under Criterion 4.

2.2.6 Alternatives Carried Forward for Analysis in this EA

NASA will carry the following alternatives forward in the EA for analysis:

- **Alternative Seven (the Proposed Action)**: Install the fiber optic cable from the Boresight Antenna on Wallops NWR to the UAS Airstrip with two Maxi HDD segments, vibratory trenching across Walker Marsh, and Mini HDD across three guts in Walker Marsh.
- **No Action Alternative**: The No Action Alternative reflects the status quo, in which a new fiber optic cable would not be installed, and NASA and its tenants would continue using the existing fiber optic cable.

Compared to alternatives with longer segments of Maxi HDD, the Proposed Action would require smaller sized HDD machinery/equipment at each upland borehole entry and exit point, thus minimizing the footprint of disturbance. Vibratory trenching across Walker Marsh and Mini HDD

segments across the open water guts would result in temporary impacts on tidal wetlands that could be mitigated through replanting of marsh vegetation. The use of low-ground-pressure equipment, which would carry both the vibratory trencher and the Mini HDD equipment, would have substantially less impact than if HDD equipment were placed on the saltmarsh or compared to an open cut/fill trench method.

The Proposed Action (Alternative Seven), and the No Action Alternative are described in Sections 2.3, and 2.4, respectively.

2.3 Proposed Action

Under the Proposed Action, NASA would install a new fiber optic cable in three segments (Segment A, Segment B, and Segment C) between the Boresight Antenna on the Wallops NWR and the MARS UAS Airstrip on Wallops Island. NASA would use the following methods to install the cable:

- **Maxi HDD** to install the fiber optic cable under Watts Bay (with an exit on the west edge of Walker Marsh), and under Ballast Narrows (with an exit on the east edge of Walker Marsh).
- **Vibratory trenching** using low-pressure equipment across the saltmarsh and between the guts in Walker Marsh.
- **Mini HDD** beneath three open water guts in Walker Marsh.

Figure 2-4 illustrates the methods that would be used under the Proposed Action. **Figure 2-5** shows the Proposed Action elements.

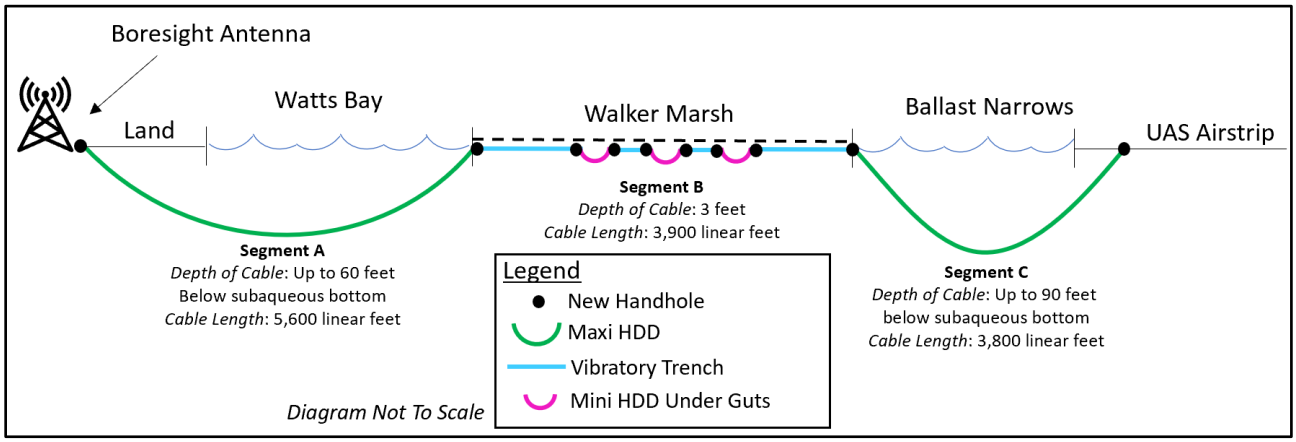


Figure 2-4 Profile View Illustration of the Proposed Action


Main Base
Simoneaston Bay
Shelly Bay
Shelly Bay Marsh
Cockle Creek
Willis Marsh
Cedar Creek
Boresight Antenna
Segment A
Watts Bay
Walker Marsh
Segment B
Segment C
Ballast Narrows
Powells Bay
Ballast Tump
Wallops Island
UAS Airstrip
Wallops Flight Facility
Legend
New Handhole
Fiber HDD Path
Existing Handhole
Fiber Vibratory Trench Path
Wallops Flight Facility Boundary
Wallops Island National Wildlife Refuge
Sources: NASA, USFWS, VGIN VBMP 2017 Orthoimagery / Prepared by: 3e 19-756 MM
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
FIGURE 2-5
PROPOSED ACTION ELEMENTS
N
0
2,500
5,000
Feet
NASA WFF Marsh Fiber EA

2.3.1 Methods of Installation

2.3.1.1 *Maxi HDD*

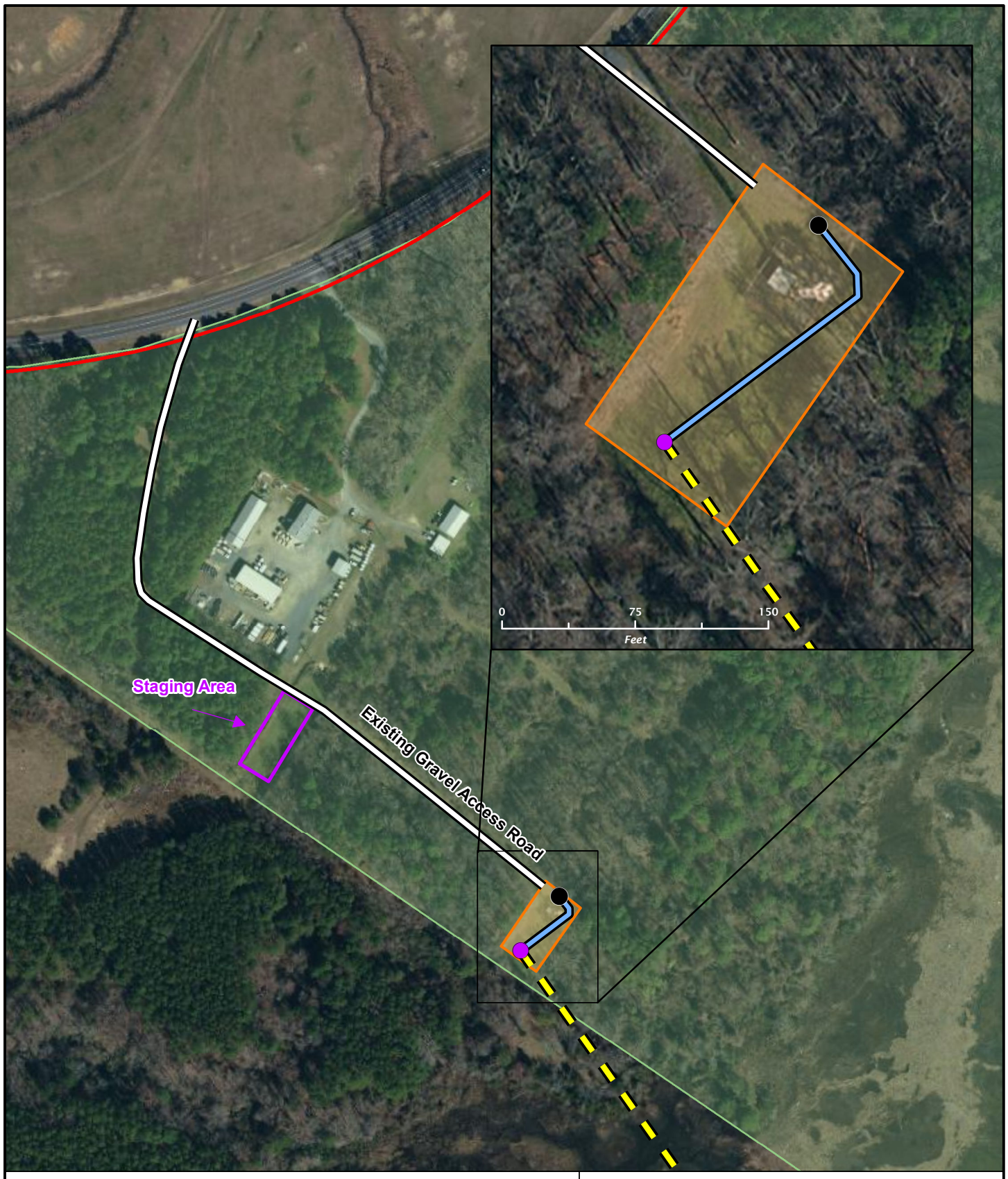
NASA would install a fiber optic cable using the Maxi HDD method for Segments A and C as shown on **Figure 2-6** and **Figure 2-7**. Segment A would be approximately 1,710 linear m (5,600 linear ft) and Segment C would be approximately 1,160 linear m (3,800 linear ft). Maxi HDD equipment would be placed at the west end of Segment A near the Boresight Antenna, and at the east end of Segment C near the UAS Airstrip. The HDD boring would start at each end of the proposed project, with the exit points on each side of Walker Marsh where the new handholes that would be placed. The Maxi HDD borehole would be approximately 18 to 20 cm (7 to 8 inches) in diameter and would reach a depth of approximately 18 m (60 ft) below the subaqueous bottom for Segment A and up to 27 m (90 ft) below the subaqueous bottom for Segment C. The steel casing would be 16.8 cm (6.625 inches) in diameter and would house two 3.8 cm (1.5 inch) HDPE conduits within. Refer to Section 2.2.3 for additional information about the HDD method including a discussion of drilling mud and containment measures.

2.3.1.2 *Vibratory Trenching*

Vibratory trenching would employ a small piece of machinery (a low ground pressure marsh buggy) with a vibratory plow attachment; examples are shown in **Photo 2-2** and **Photo 2-3**. During use, the long, slender plow blade extends into the ground, and the plow's motor rapidly vibrates the blade vertically. Low ground pressure equipment is designed to minimize the pressure of the machinery where it sits on the ground surface, which would minimize the compaction of soils in the saltmarsh. A reel would unload the HDPE conduit into the ground behind the blade as the trench is cut.

Photo 2-2. Marsh buggy.

Photo 2-3. Vibratory plow attachment.



Legend

- Existing Handhole
- New Handhole
- Fiber HDD Path
- Open Trench
- WFF Boundary
- Access Road
- Wallops NWR
- HDD Work Area

Sources: NASA, USFWS, VGIN VBMP 2017 Orthoimagery / Prepared by: 3e 19-756 MM
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 2-6
PROPOSED ACTION BORESIGHT ANTENNA AREA OF DISTURBANCE

0 300 600
Feet

N

NASA WFF Marsh Fiber EA

Legend

- Existing Handhole
- New Handhole
- Fiber HDD Path
- Open Trench
- Access Path
- Access Road
- HDD Work Area
- WFF Boundary

Sources: NASA, VGIN VBMP 2017 Orthoimagery / Prepared by: 3e 19-756 MM
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 2-7
PROPOSED ACTION UAS AIRSTRIP
AREA OF DISTURBANCE

N

0 600 1,200
Feet

NASA WFF Marsh Fiber EA

The opening created by the plow would be extremely narrow (3.8 cm [1.5 inches]), resulting in very little damage to the ground surface, and eliminating the need for backfilling. Use of the vibratory plow attached to the marsh buggy would result in the following disturbances to the marsh:

- Direct disturbance of 3.8 cm (1.5 inches) wide to a depth of a little over 0.9 m (3 ft) below ground surface from the vibratory plow blade and installation of the conduit.
- Indirect disturbance up to approximately 15 cm (6 inches) wide on both sides of the vibratory plow blade centerline where soils would be lightly disturbed through vibration (i.e., a 30-cm [12-inch]-wide swath of indirect disturbance).
- Direct disturbance in a path up to 4.3-m (14-ft)-wide along the vibratory plow trench (extending up to 2.2 m [7 ft] on both sides of the vibratory plow trench centerline) where the marsh buggy would be driving over soils and compaction/disturbance of vegetation could occur.

The entire length of the vibratory trench across Walker Marsh would be approximately 1,140 m (3,730 ft). This distance was calculated between the two eastern and western Maxi HDD handholes, with the areas where Mini HDD would be employed surrounding the three guts on Walker Marsh subtracted.

All trenching equipment would be transported to Walker Marsh via barge. The marsh buggy and associated equipment would access the marsh using the temporary access areas shown on the eastern and western sides of the marsh (**Figure 2-8**). Personnel may be transported daily by barge or boat to the Walker Marsh access areas.

2.3.1.3 *Mini HDD*

To install the cable beneath the three open water guts in Walker Marsh, a Mini HDD track rig (**Photo 2-4**) would be loaded onto the marsh buggy and positioned on one side of each gut. A borehole would be drilled under the gut without the use of drilling mud and reamed to the required diameter. NASA would install a 15-cm (6-inch) HDPE conduit.

Photo 2-4. Mini HDD Rig.

The LOD for the Mini HDD work areas would start 9 m (30 ft) away from the edge of the guts, and each would be 15 by 8 m (50 by 25 ft) (**Figure 2-8** and **Figure 2-9**). There would be six Mini HDD work areas–one for each side of the three guts. No future access to the cable would be required; therefore, no handholes would be installed in association with the Mini HDD.

The drill head and collar would be removed at the exit point and the conduit inner duct pulled back through the borehole to the entry pit. The cable would then be pulled through the relatively short length of conduit inner-duct. Cuttings would be removed from the borehole at the entry pit and placed on the marsh buggy for off-site transfer and disposal.

2.3.1.4 *Handhole Enclosures*

To provide multiple points of access to the fiber optic cable for repair, NASA would install a total of four new handhole enclosures: one on each side of Walker Marsh, one at the Boresight Antenna, and one at the west end of the UAS Airstrip (**Figure 2-6**, **Figure 2-7**, and **Figure 2-8**). Section 2.2.3 provides a description of handhole installation. The enclosure and equipment to install the handholes in the marsh would be transported to the marsh via barge. The barge would remain in place at one end of the marsh and would serve as a staging area for the cable and conduit. The same barge would move to the other side of the marsh to complete the work for the second new handhole.

2.3.1.5 *Open Trenching on Uplands*

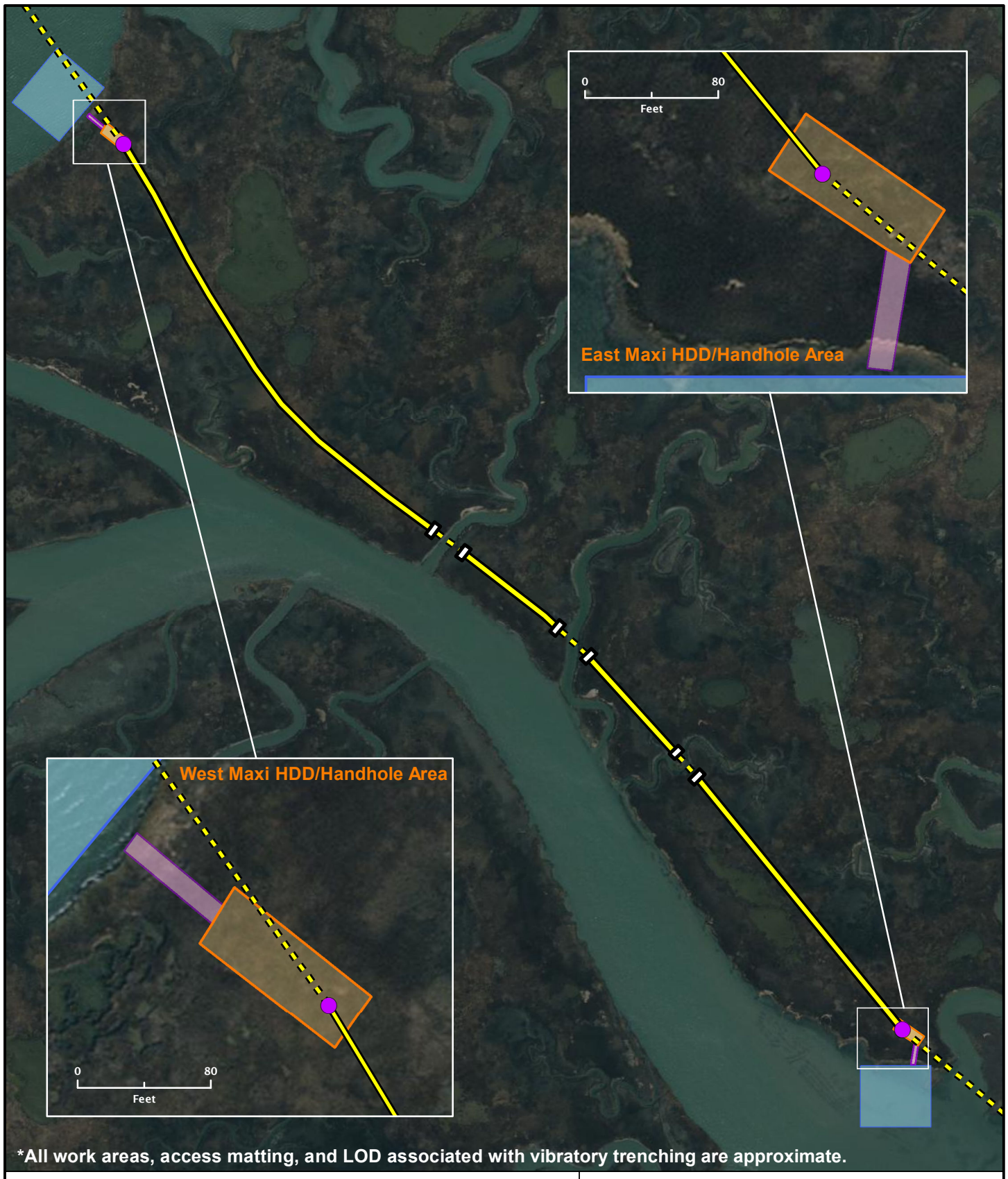
NASA would use open trenching to install approximately 45 m (150 ft) of cable in the upland area adjacent to the Boresight Antenna, and to install approximately 45 m (150 ft) of the cable in the work area adjacent to the UAS Airstrip (**Figure 2-6** and **Figure 2-7**.). Soil excavated from the trench would be temporarily stored along the path of, and adjacent to, the open trench. The trench would be open for a few hours, and then it would be immediately backfilled.

2.3.2 Construction Staging and Limits of Disturbance

2.3.2.1 *HDD Entry Points at the Boresight Antenna and UAS Airstrip*

The Maxi and Mini HDD borehole entry and exit work areas would be used as temporary staging areas for materials and equipment. Another approximately 1,170 m^2 (12,600 ft^2) staging area would be established near the Boresight Antenna work area in a previously disturbed area that is currently maintained by mowing. For the strings of pipe needed at the UAS Airstrip site, the construction contractor would have trucks with the piping on standby along roadways until required. Work areas, staging, and access routes to the work areas are shown on **Figure 2-6**, **Figure 2-7**, and **Figure 2-8**.

The HDD work areas would include space for the Maxi HDD equipment, rolls of HDPE conduit and fiber optic cable, sections of sacrificial piping, and parking for personnel and construction vehicles.



Legend

- Fiber Vibratory Trench Path
- New Handhole
- Fiber HDD Path
- Barge Area
- Maxi HDD Work Area
- Access Matting
- Mini HDD Work Area

Sources: NASA, VGIN VBMP 2017 Orthoimagery / Prepared by: 3e 19-756 MM
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 2-8
WALKER MARSH OVERVIEW AND MAXI HDD AREAS OF DISTURBANCE

0 450 900
Feet

N

NASA WFF Marsh Fiber EA

Legend

= = = Marsh Fiber HDD Path

Marsh Fiber Vibratory Trench Path

Limit of Disturbance Along Vibratory Trench Path for Marsh Buggy

Mini HDD Work Area

Sources: NASA, VGIN VBMP 2017 Orthoimagery / Prepared by: 3e 19-756 MM
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 2-9
WALKER MARSH MINI HDD
AREAS OF DISTURBANCE

0 175 350
Feet

N

NASA WFF Marsh Fiber EA

The Maxi HDD work and staging would result in the following approximate LODs:

- Boresight Antenna–0.28 ha (0.68 acre)
- UAS Airstrip–0.13 ha (0.33 acre)

Access to the Boresight Antenna HDD work area would be via an existing gravel road. Access to the UAS Airstrip would be via an existing paved road that terminates at the UAS Airstrip, then along the paved airstrip taxiway to the HDD work area. NASA would coordinate activities associated with the Marsh Fiber project with use of the UAS Airstrip to eliminate the potential for safety hazards and conflicts with airstrip operations.

2.3.2.2 *Walker Marsh*

Access to the marsh work areas would be via barge and boats, with a single barge in place at one end of the marsh and serving as a staging area for equipment, conduit material, handholes, and the fiber optic cable. The same barge would move to the other side of the marsh to complete the work for the second new handhole. Personnel may be transported daily to the work site via barge or boat to the access area shown on **Figure 2-8**.

The barge would transport the marsh buggy and vibratory trenching equipment, which would be offloaded at the approximate areas shown on **Figure 2-8**. The construction contractor may use a spud barge, which is a type of barge that is moored by using pilings or "spuds" to provide a solid work platform in which to work from. Two to four spuds may be used if this type of barge is employed. The exact number and location of the moorings would be determined at the beginning of construction. Mooring locations would be selected based on avoiding impacts to oyster beds, the draft of the barges, water depth, and proximity to shoreline. The moorings would be removed following construction.

Interlocking composite mats, similar to the example matting shown in **Photo 2-5**, are designed for use in soft or saturated grounds, or sites covered in several feet of water, to create access over sensitive soils such as saltmarshes. These mats reduce impacts on marsh soils and vegetation by minimizing rutting and root damage that can result from tracked vehicle movements.

Composite mats do not absorb, retain, or release chemicals or liquids, and do not absorb water. The mats are non-conductive, avoiding problems with static electricity and eliminating the risk of rot, insect damage, warping, or breakage.

NASA would place matting on the ground where equipment, conduit material, and fiber optic cables would be transported between the shore and the HDD work area. Composite matting is designed to minimize effects to the saltmarsh from workers and equipment accessing the HDD work area. Depending on localized soil and vegetation conditions along the vibratory trench pathway, matting would also be used, as needed, to minimize impacts on soil and vegetation from the marsh buggy.

Photo 2-5. Example of matting to be used on Walker Marsh.

The approximate LOD associated with work on Walker Marsh under the Proposed Action are shown in **Table 2-2**. Final impact areas would be based on construction plans.

Table 2-2. Limits of Disturbance on Walker Marsh under the Proposed Action

Area	Area in Meters/Feet	Area in Hectares/Acres
Access Area from Shoreline to Maxi HDD Work Area – West Side of Walker Marsh	82 m^2 (882 ft^2)	0.01 ha (0.02 ac)
Access Area from Shoreline to Maxi HDD Work Area – East Side of Walker Marsh	98 m^2 (1,052 ft^2)	0.01 ha (0.02 ac)
Maxi HDD Work Area – West Side of Walker Marsh	372 m^2 (4,000 ft^2)	0.04 ha (0.09 ac)
Maxi HDD Work Area – East Side of Walker Marsh	372 m^2 (4,000 ft^2)	0.04 ha (0.09 ac)
Marsh Buggy LOD Along Vibratory Trench Path[a]	4,850 m^2 (52,220 ft^2)	0.49 ha (1.20 ac)
Mini HDD Work Areas Around Guts[b]	502 m^2 (5,400 ft^2)	0.05 ha (0.12 ac)
Total LOD at Walker Marsh	**6,276 m^2 (67,555 ft^2)**	**0.63 ha (1.55 ac)**

[a]LOD along vibratory trench is 4.3 m (14 ft) wide by 1,140 m (3,730 ft) long

[b]There are six Mini HDD work areas with dimensions of 15 m (50 ft) by 8 m (25 ft) each, totaling 697 m^2 (7,500 ft^2). The area of the 4.3-m (14-ft) wide marsh buggy LOD within the Mini HDD work areas is subtracted so as not to be counted twice (4.3 m [14 ft] by 8 m [25 ft] = 195 m^2 [2,100 ft^2]), resulting in 7,500 ft^2 minus 2,100 ft^2 = 5,400 ft^2 total LOD.

Note: Handhole LODs are included in the LOD for Maxi HDD Work Areas

2.3.2.3 *Total Area of Disturbance*

The potential limits of land disturbance associated with the Proposed Action, including work in the upland areas at the Boresight Antenna, the UAS Airstrip, and on Walker Marsh, are shown in **Table 2-3**.

Table 2-3. Total Limits of Disturbance under the Proposed Action

Area	Area in Meters/Feet	Area in Hectares/Acres
Boresight Antenna LOD	2,780 m^2 (29,940 ft^2)	0.28 ha (0.68 ac)
UAS Airstrip LOD	1,320 m^2 (14,200 ft^2)	0.13 ha (0.33 ac)
Walker Marsh LOD	6,275 m^2 (67,555 ft^2)	0.63 ha (1.55 ac)
Total LOD for the Proposed Action	**10,375 m^2 (111,695 ft^2)**	**1.04 ha (2.56 ac)**

2.3.3 Construction Schedule

NASA anticipates that the entire Marsh Fiber project would be completed in three months, with approximately one month of that work attributed to completing the portion of the project on Walker Marsh. Boat and barge transit in the waters surrounding Walker Marsh would occur during, before, and after the 30-day construction period at Walker Marsh for mobilization and demobilization.

2.4 No Action Alternative

CEQ regulations (40 CFR Part 1502.14(d)) for implementing NEPA require analysis of a No Action Alternative. "No Action" means that implementing the Proposed Action would not occur. The resulting environmental effects from taking No Action would be compared to the effects of implementing the Proposed Action. Under the No Action Alternative, WFF would not install the Marsh Fiber. Communications data would continue with the existing cable pathway along Atlantic Road. This path is being used for launch operations, which includes flight safety capabilities such as command destruct of payloads that pose a danger if something goes wrong.

Limitations on the data capacity (as described in Section 1.3.2) would persist and hinder future demands, and only a single fiber optic cable would connect the WFF Main Base and Wallops Island, placing NASA and its tenants at risk from a potential failure in service or unacceptable disruptions in communications data service. Under the No Action Alternative, NASA would not be in compliance with NASA-OCIO and NASA Range Safety requirements for geographically diverse and redundant launch operations systems.

2.5 National Environmental Policy Act Guidance and Public Participation

This EA was prepared in accordance with the requirements of NEPA of 1969; the CEQ regulations implementing NEPA (40 CFR 1500-1508); and NASA Procedural Requirements 8580.1 *Implementing the National Environmental Policy Act* as promulgated in 14 CFR § 1216.3. In preparing this environmental analysis, NASA used the process described below.

1. ***Outreach to government stakeholders***–NASA sent consultation and coordination letters to federal, state, and local government agencies requesting comment on the Proposed Action. The responses NASA received are attached in Appendix D.

2. ***Prepare a draft EA***–The first comprehensive document for public and agency review is the draft EA. The EA examines the environmental impacts of the Proposed Action and No Action Alternative.

3. ***Announce that the draft EA has been prepared***–Advertisements have been placed in three newspapers local to WFF–the *Chincoteague Beacon,* the *Eastern Shore News,* and the *Eastern Shore Post*–notifying the public of the availability of the draft EA. Due to the current situation with COVID 19 and the Governor of Virginia's Executive Order 55 (*Temporary Stay at Home Order*), NASA will not hold a public meeting, nor will a hard copy of the EA be placed in local libraries. All public libraries and the WFF Visitor Center, where EAs are typically made available for review, will be closed during this EA public comment period. The EA will be posted on the World Wide Web at *https://code200-external.gsfc.nasa.gov/250-WFF/Marsh_Fiber_EA*. In lieu of the public meeting, NASA will post a presentation that may be viewed at any time during the public comment period; this presentation will be available at the internet address listed above.

4. ***Provide a public comment period***–Federal, state, and local agencies and members of the public are hereby invited to provide written comments on the Draft EA over a 30-day period. Electronic versions of the project presentation will be available to the public on the project website. Written comments on the analysis and findings presented in the draft EA will be accepted throughout the 30-day public comment period.

5. ***Prepare a final EA***–Following the public comment period, NASA will prepare the final EA. The draft EA will be revised as appropriate based on comments received during the public comment period. The final EA provides the NASA decision-maker with a comprehensive review of the Proposed Action and the potential environmental impacts. The final EA will be made available at the following libraries: Island Library, Chincoteague, Virginia and the Eastern Shore Public Library, Accomack, Virginia. The final EA will also be made available on the World Wide Web at: *https://code200-external.gsfc.nasa.gov/250-WFF/Marsh_Fiber_EA*.

6. ***Issue a Finding of No Significant Impact (FONSI) or Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS)***–The final step in the process is either a signed FONSI if the EA analysis supports this conclusion, or a determination that an EIS would be required for the Proposed Action. Advertisement of the signed FONSI (as well as availability of the final EA) will

be published in the *Chincoteague Beacon*, the *Eastern Shore News*, and the *Eastern Shore Post*. If a determination to prepare an EIS were made, a NOI would be published in the Federal Register.

2.6 Summary of Potential Environmental Impacts

The potential environmental impacts from implementation of the Proposed Action and the No Action Alternative are summarized in **Table 2-4** below.

Table 2-4. Summary of Potential Environmental Impacts

Resource	EA Section	Proposed Action	No Action Alternative
Noise	3.1	Noise from construction activities would be minor, short-term, and localized. No long-term impacts.	No impacts.
Air Quality	3.2	Negligible short-term impacts during construction. No long-term impacts.	No impacts.
Hazardous and Regulated Materials and Waste	3.3	Established procedures for managing hazardous and regulated materials and waste at WFF would be implemented along with a Frac-Out Contingency Plan. With implementation of site-specific plans and adherence to existing WFF plans and procedures, impacts would be negligible. No long-term impacts.	No impacts.
Health and Safety	3.4	With appropriate public notification of work at Walker Marsh, implementation of applicable health and safety measures, short-term impacts would be negligible. No long-term impacts.	Potential long-term adverse impacts in the event of failure of the existing and only fiber optic cable to Wallops Island during a launch operational emergency.
Land Use	3.5	Land use compatibility would not be affected. No short-term or long-term impacts.	No impacts.
Land Resources	3.6	Minor, localized long-term impacts on soils from excavation; short-term impacts from ground disturbances. Soils at Boresight Antenna and UAS Airstrip have been previously disturbed; measures would be taken to minimize adverse impacts on soils at Walker Marsh. No long-term impacts on soils, topography, or geology.	No impacts.
Surface Waters and Stormwater Management	3.7.1	Short-term minor impacts during construction with implementation of erosion and sediment control measures, Clean Water Act (CWA) permit requirements, a Frac-Out Contingency Plan, and adherence to stormwater permit requirements. Stormwater infrastructure inadvertently disturbed	No impacts.

Table 2-4. Summary of Potential Environmental Impacts			
Resource	**EA Section**	**Proposed Action**	**No Action Alternative**
		during construction would be repaired. Short-term impacts on the subaqueous bottom of Ballast Narrows, Watts Bay, and Walker Marsh gut from barge anchoring and marsh buggy crossings of guts.	
Groundwater	3.7.2	No short-term or long-term impacts with implementation of spill control and clean-up measures, de-watering during construction, and a Frac-Out Contingency Plan.	No impacts.
Wetlands	3.7.3	No wetlands at Boresight Antenna or UAS Airstrip that would be affected by Proposed Action. Temporary indirect and direct impacts (0.68 ha [1.68 ac]) and permanent impacts (0.0014 ha [64 ft^2]) on wetlands at Walker Marsh. NASA would obtain CWA permits, mitigate temporary impacts by restoring disturbed areas and replanting, and complete required compensatory mitigation for permanent impacts.	No impacts.
Floodplains	3.7.4	Proposed activities would occur in the floodplain; however, NASA would remove any items from floodplain if a weather event is predicted that could cause flooding. No ongoing floodplain disturbance once construction activities are completed. Therefore, no short-term or long-term impacts.	No impacts.
Coastal Zone	3.7.5	Project would be consistent to the maximum extent practicable with the enforceable policies of Virginia's Coastal Zone Management (CZM) Program. NASA will submit a Federal Consistency Determination (FCD) to the Virginia Department of Environmental Quality (VDEQ) for review and concurrence.	No impacts.
Sea-Level Rise	3.7.6	The proposed project would have no or negligible potential to contributed to sea-level rise, and would be negligibly impacted by sea-level rise. NASA would implement adaptive management strategy to minimize potential effects from sea-level rise on project infrastructure.	No impacts.
Vegetation	3.8	Short-term adverse impacts from removal of vegetation and disturbances; impacts would be minimized with use of synthetic matting at Walker Marsh and mitigated by replanting areas where vegetation would be disturbed. Approximately 12	No impacts.

Table 2-4. Summary of Potential Environmental Impacts			
Resource	**EA Section**	**Proposed Action**	**No Action Alternative**
		m^2 (128 ft^2) of vegetation would be lost in areas where handholes would be installed.	
Wildlife	3.9	Minor short-term impacts from disturbances during installation activities. Permanent loss of habitat in area of handholes (12 m^2 [128 ft^2]); long-term impacts would be negligible.	No impacts.
Aquaculture	3.10	Minor short-term impacts by not being able to harvest intermittently during a period of up to 90 days, and from disturbances of the subaqueous bottom in the guts and in the nearshore areas of Walker Marsh where barges and boats would anchor.	No impacts.
Special Status Species	3.11	With implementation of time-of-year restrictions and avoidance and minimization measures, no direct impacts on special status species; minor short-term impacts from human presence and equipment at Walker Marsh on special status avian species and Essential Fish Habitat (EFH). No long-term impacts.	No impacts.
Transportation	3.12	Minor short-term impacts from presence of boats and barges in waters surrounding Walker Marsh and on roads from transport of workers and equipment. No long-term impacts.	No impacts.
Infrastructure and Utilities	3.13	Short-term adverse impacts on UAS Airstrip operations. Long-term beneficial impacts from new fiber optic cable by providing redundant, reliable communications infrastructure to Wallops Island.	Would not meet the purpose and need of providing redundant, reliable communications infrastructure to Wallops Island.
Employment and Income	3.14	Short-term negligible beneficial impacts from construction employment/worker spending; short-term and long-term negligible impacts from potential disruption of commercial fishing.	No impacts.
Recreation	3.15	Minor short-term impacts during 30-day installation at Walker Marsh while portion of the Marsh is closed and from boat/barge traffic in surrounding waters. Intermittent impacts for up to 90 days in areas surrounding Walker Marsh during mobilization and demobilization to Walker Marsh. No long-term impacts.	No impacts.

Table 2-4. Summary of Potential Environmental Impacts			
Resource	**EA Section**	**Proposed Action**	**No Action Alternative**
Archaeological Resources	3.16	No archaeological resources anticipated in the project footprint; in the event undocumented resources are identified, NASA would immediately halt work. No effects on historic properties.	No impacts.
Cumulative Effects	5.0	Minor cumulative impacts due to loss of upland vegetation and non-tidal wetlands. Mitigation would be provided to compensate for all wetland losses.	No cumulative impacts.

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3 Affected Environment and Environmental Consequences

In accordance with NEPA requirements, this EA presents a focused analysis of the geographic areas and environmental and human resources potentially affected by the Proposed Action and the No Action Alternative. The results of the analysis are presented in a comparative fashion that allows decision makers and the public to differentiate the alternatives.

CEQ regulations for implementing NEPA (40 CFR Parts 1500-1508) also require the discussion of impacts in proportion to their significance, with only enough discussion of non-significant issues to show why more study is not warranted. NEPA analyses should consider, but not analyze in detail, those areas or resources not potentially affected by a proposed action. The analysis in this EA considers the current conditions of the affected environment and compares those to conditions that might occur should WFF implement the Proposed Action or the No Acton Alternative.

The geographic area for this EA includes upland areas on the Wallops NWR near the Boresight Antenna, upland areas near the UAS Airstrip, Walker Marsh, and the marine environment surrounding Walker Marsh.

Resources Considered but Eliminated from Detailed Analysis

Numerous resources were considered in the *Final Site-wide PEIS*. Resources analyzed in this EA are presented in **Table 3-1**. Table 3-1 also presents resources that were analyzed in the *Final Site-wide PEIS* that do not warrant further consideration in this EA because the resource is not present within the affected environment, has not measurably changed, or would not be notably affected by the Marsh Fiber project.

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Table 3-1. Resources Considered in this EA			
Resource		**Analyzed in in this EA?**	**If *Yes*, EA Section If *No*, Rationale for Elimination**
Physical Environment	Noise	Yes	Section 3.1
	Air Quality	Yes	Section 3.2
	Hazardous and Regulated Materials and Waste	Yes	Section 3.3
	Toxic Substances, Environmental Compliance and Restoration Program, Storage Tank Management	No	No buildings, storage tanks, or historic Areas of Concern in the project area
	Munitions and Explosives of Concern (MEC)	Yes	Section 3.3
	Health and Safety	Yes	Section 3.4
	Land Use	Yes	Section 3.5
	Land Resources	Yes	Section 3.6
	Water Resources		
	Surface Waters	Yes	Section 3.7.1
	Stormwater Management (combined with Surface Waters for this EA)	Yes	Section 3.7.1
	Groundwater	Yes	Section 3.7.2
	Wetlands	Yes	Section 3.7.3
	Marine Waters	No	Marine waters are defined as the Atlantic Ocean in *Final Site-wide PEIS* and would not be directly affected by the proposed project. Estuarine and tidal waters are presented in Section 3.7.1, Surface Waters
	Floodplains	Yes	Section 3.7.4
	Coastal Zone	Yes	Section 3.7.5
	Sea-Level Rise	Yes	Section 3.7.6
Biological Environment	Vegetation	Yes	Section 3.8
	Submerged Aquatic Vegetation	No	Nearest submerged aquatic vegetation is 4.8 kilometers (3 miles) north of project and would have no potential to be affected by Proposed Action (VIMS 2019)
	Wildlife (Terrestrial, Aquatic, and Avian)	Yes	Section 3.9
	Special-Status Species (Terrestrial, Aquatic, and Avian)	Yes	Section 3.11
	Marine Mammals	No	Marine mammals are not anticipated to be present in shallow waters of the project area
	Migratory Birds	Yes	Section 3.11
	Essential Fish Habitat	Yes	Section 3.11

Resource		Analyzed in Detail in this EA?	If *Yes*, EA Section If *No*, Rationale for Elimination
Social and Economic Environment	Airspace Management	No	Project would not affect airspace
	Transportation		
	Roads	Yes	Section 3.12
	Rails	No	Project would not affect or use rails
	Water	Yes	Section 3.12
	Infrastructure and Utilities		
	Potable Water	No	Project is not near potable water source and would not involve use of potable water
	Wastewater Treatment	No	Project does not involve wastewater treatment
	Electric Power	No	Project does not involve electrical power infrastructure
	Communication	Yes	Section 3.13
	Waste Collection and Disposal Services	Yes	Section 3.3
	Socioeconomics		
	Population	No	Project has no potential to result in changes to population
	Employment and Income	Yes	Section 3.14
	Housing	No	Project has no potential to result in loss or addition of housing
	Environmental Justice (Including Protection of Children)	No	Project has no potential to affect communities outside of WFF or the Wallops NWR
	Visual Resources	No	Project would not result in changes to the viewshed
	Recreation	Yes	Section 3.15
Cultural Resources	Archaeological Resources	Yes	Section 3.16
	Architectural Resources	No	Project has no potential to affect architectural resources

3.1 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. A-weighting of decibels (dBA) 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. A sound level of 0 dBA is the approximate threshold of human hearing. By contrast, normal speech has a sound level of approximately 60 dBA. Sound levels between 110 and 130 dBA are felt as pain. Levels exceeding 140 dBA could involve tissue damage to the ear (Berglund and Lindvall 1995).

Noise is regulated under the Noise Control Act of 1972, as amended by the Quiet Communities Act of 1978, which sets forth the policy of the U.S. to promote an environment for all citizens that is free from noise that jeopardizes human health and welfare. The Accomack County Code provides noise threshold guidelines based on the different zoning districts within the County. Accomack County thresholds do not apply to commercial or industrial operations except if noise from those operations emanates beyond the boundaries of the commercial or industrial site and affect persons who are not working onsite (Accomack County 2001). No specific noise thresholds have been established for sensitive receptors. The Accomack County Code states that noise would be deemed excessive if it "unreasonably interferes with the workings of such institution or building, provided that conspicuous signs are displayed on or near such building or institution indicating that such is a school, church, hospital, clinic, or other public building" (Accomack County 2001).

U.S. Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910.95) provide noise exposure limits for employees in noisy environments or workplaces. According to OSHA, an employee should not be subjected to continuous noise exceeding 90 dBA for durations lasting more than 8 hours per day, with a maximum limit of 115 dBA for durations of 15 minutes or less.

3.1.1 Affected Environment

All project areas (Boresight Antenna, Walker Marsh, and the UAS Airstrip) are relatively remote with infrequent vehicular or pedestrian activity. There are no sensitive human receptors or institutions near the project area. Chincoteague Island and Assateague Island National Park both lie northeast of the project site, approximately 3.2 to 4.8 kilometers (2 to 3 miles) away. The nearest residential home (i.e., sensitive receptor) is approximately 3.7 kilometers (2.3 miles) northeast of Walker Marsh, on Chincoteague Island.

In 2011, NASA monitored noise data at eight locations throughout WFF, which included noise measurements taken near the UAS Airstrip. The hourly sound levels showed a diurnal variation typical of background sound levels. The study determined that the background sound levels are strongly correlated with the wind conditions, with off-shore breezes playing a major role in the local soundscape. The average daily background levels for the sites on northern Wallops Island

ranged from approximately 30 to 50 dBA, with a constant level of low-frequency sound likely caused by the wind and surf. The noise environment at the Boresight Antenna area is similar to that described for the northern portion of Wallops Island near the UAS Airstrip, but with the surf less dominant in the soundscape.

Generally, the in-air and underwater noise environments on Walker Marsh are relatively quiet with the dominant noise sources being naturally occurring wind and wave action. In the waters surrounding Walker Marsh and west of Wallops Island, the primary human activities that generate noise include commercial fishing vessels, recreational boats, personal watercraft, and infrequent maintenance dredging of the barge route on the north end of Wallops Island.

Existing WFF activities that generate noise above ambient conditions within all proposed project areas include aircraft overflight, UAS flight operations, Navy rocket and target launches, and NASA and MARS rocket launch activities. Noise generated by rocket launches is short-term in duration, lasting less than 10 minutes with the peak noise levels occurring within the first one to two minutes. WFF has received no noise complaints in response to NASA launch operations or activities (Eggers 2017).

According to the WFF Public Affairs Office and Navy's Region Mid Atlantic, noise complaint calls have been received from callers in residential areas within 0.75 nautical miles west of the approach end of Runway 10 at the WFF Main Base.

3.1.2 Environmental Consequences

Noise-related impacts would be considered significant if the Proposed Action generated noise levels that were incompatible with surrounding land uses, resulted in long-term adverse impacts at noise-sensitive receptors, or created a situation that endangered human health and safety. The potential noise-induced effects on wildlife and people using Walker Marsh and the surrounding waters for recreation are discussed in Section 3.9 *Wildlife* and 3.15 *Recreation*.

3.1.2.1 *No Action Alternative*

The No Action Alternative would have no impacts on the noise environment because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect the noise environment would occur. The project sites would continue to be dominated primarily by natural sounds (wind and waves), with intermittent sounds from water vehicles and ongoing operations at WFF.

3.1.2.2 *Proposed Action*

Temporary operation of heavy equipment at the Maxi HDD entry pits and construction vehicles and equipment traveling to and from the Maxi HDD sites would be the principal noise sources during construction at the Boresight Antenna and UAS Airstrip. Construction and truck/transport noise would be generated throughout project activities, including mobilization and set up, drilling

operations, and demobilization/takedown. The Maxi HDD drill rig equipment, drill fluids management equipment (mud pumps, sand/silt separators/shakers) and other ancillary equipment (excavator, generators, lighting system) would be the principal noise sources at the Boresight Antenna and UAS Airstrip sites, with noise levels anticipated to be between 90 to 120 dBA range (eNoiseControl 2019). The Maxi HDD equipment would operate continuously (24 hours per day) for a duration of between 15 to 20 days for drilling of the HDD boreholes at both entry pits. In general, noise levels at the Maxi HDD entry sites would be typical of standard construction activities. Noise levels at the Boresight Antenna work area would primarily be attenuated by the surrounding forest, but also by background noise from wind and normal traffic noise along State Route 175. At the UAS Airstrip project site, background wind and surf noise would attenuate much of the construction noise.

Cable installation at Walker Marsh would require smaller and quieter pieces of equipment compared to the Maxi HDD operations. Noise at Walker Marsh would primarily be from the marsh buggy, the Mini HDD equipment mounted on the marsh buggy, barges, small portable generators and pumps, and excavation equipment for the handholes. While the noise level of marsh buggies and Mini HDD equipment has not been studied extensively, the Federal Highway Administration conservatively identifies miscellaneous equipment with engines greater than five horsepower as generating noise in the range of 85 dBA (FHWA 2017). Support barges would be anchored in place with their engines turned off during off-loading and while work was being conducted on the marsh. Boat and barge transit to/from Walker Marsh during mobilization, the 30-day construction period at Walker Marsh, and demobilization would result in intermittent noise from these vessels occurring for up to 90 days.

Minor, temporary impacts on the noise environment in the vicinity of the project sites would occur. At the Boresight Antenna project area, noise would primarily be attenuated by forest while at the UAS Airstrip and Walker Marsh project sites, background wind would attenuate much of the construction noise. 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). Construction-related noise levels would vary but are not expected to be heard at Chincoteague Island. There are no sensitive receptors near the proposed project areas that would be affected by the Proposed Action. There would be no long-term changes to the noise environment, and no long-term impacts on the soundscape from the Proposed Action.

3.2 Air Quality

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 Clean Air Act (CAA), and its subsequent amendments, established the National Ambient Air Quality Standards (NAAQS) for "criteria" pollutants: ozone, 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. Air quality at WFF is regulated by the United States Environmental Protection Agency (USEPA), VDEQ and the State Air Pollution Control Board (Code of Virginia § 10-1.1300).

In addition to the ambient air quality standards for criteria pollutants, national standards exist for hazardous air pollutants (HAPs). The National Emission Standards for Hazardous Air Pollutants regulates 187 HAPs based on available control technologies (VDEQ 2019a). Examples of HAPs regulated by VDEQ include benzene, methylene chloride, dioxin, toluene, and metals such as cadmium, mercury, chromium, and Pb compounds. The majority of HAPs are volatile and semi-volatile organic compounds. Unlike the criteria pollutants, toxics do not have NAAQS. HAP impacts are based on exposure concentration and duration.

Greenhouse gases (GHGs) include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone, and several hydro- and chlorofluorocarbons. For simplification, total GHG emissions are often expressed as a CO_2 equivalent (CO_2e). As GHGs are relatively stable in the atmosphere and are essentially uniformly mixed throughout the troposphere and stratosphere, the climatic impact of GHG emissions does not depend upon the source location. Therefore, regional GHG impacts are likely a function of global emissions.

On June 21, 2019, CEQ submitted draft guidance titled "Draft National Environmental Policy Act [NEPA] Guidance on Consideration of Greenhouse Gas [GHG] Emissions," to the *Federal Register* for publication and public comment. This draft guidance is intended to replace CEQ's August 2016 "Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews" (81 FR 51866, Aug. 5, 2016), which was withdrawn on April 5, 2017, pursuant to Executive Order (EO) 13783 *Promoting Energy Independence and Economic Growth*. It is NASA's policy to continue to follow the 2016 CEQ guidance on GHG emissions and climate change in NEPA review until directed otherwise by amendments to the guidance or regulation.

3.2.1 Affected Environment

The region of influence for air quality for this EA is defined as the Northeastern Virginia Intrastate Air Quality Control Region (AQCR) (defined in 40 CFR Part 81.144), which includes Accomack County. The Northeastern Virginia Intrastate AQCR is designated in attainment/unclassifiable for all criteria pollutants. Because the proposed project area is in an attainment area for all criteria pollutants, a General Conformity Review (under Section 176(c) of the CAA) does not apply to this project.

3.2.2 Environmental Consequences

Air quality impacts would be significant if emissions associated with the Proposed Action would: 1) increase ambient air pollution concentrations above the NAAQS, 2) contribute to an existing violation of the NAAQS, or 3) interfere with, or delay timely attainment of the NAAQS. As the Northeastern Virginia Intrastate AQCR is designated in attainment/unclassifiable for all criteria pollutants, the only applicable consequence is an increase of ambient air pollution concentrations above the NAAQS.

3.2.2.1 *No Action Alternative*

The No Action Alternative would have no impacts on air quality because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect air quality would occur.

3.2.2.2 *Proposed Action*

Air quality effects from construction would occur from combustion emissions due to the use of fossil fuel-powered equipment and fugitive dust emissions (PM_{10} and $PM_{2.5}$) during ground disturbance (such as excavation and the operation of equipment on bare soil). Fugitive dust emissions are expected to be negligible as the amount of upland land disturbance would be approximately 0.24 ha (0.6 ac) total at the Boresight Antenna and 0.16 ha (0.4 ac) at the UAS Airstrip (**Table 2-3**), and ground disturbing activities at Walker Marsh would be conducted in a wet marine tidal environment.

Construction equipment would be operated in compliance with applicable USEPA regulations for emissions from vehicles and engines. NASA's construction contractor would adhere to the following VDEQ air pollution regulations: 9 Virginia Administrative Code (VAC) 5-130, Open Burning restrictions (i.e., no open burning of waste would be permitted) and 9 VAC 5-50, Article 1, Fugitive Dust precautions (e.g., water may be sprayed to lessen impacts from activities that generate dust).

Project construction vehicles and equipment would emit minor amounts of criteria pollutants (principally NO_2, CO, CO_2, and PM) and HAPs during the short construction period. The main source of air pollutants would occur in the form of diesel exhaust organic gases and particulates from the combustion of diesel fuel. The operation of proposed diesel-powered construction equipment would be intermittent over the construction period and would produce minimal pollutant emissions in a localized area. Therefore, no quantitative assessment of emissions is warranted. Emissions would be minimized to the extent practicable by implementing Best Management Practices (BMPs) such as restrictions on excessive idling and adherence to equipment maintenance programs for the operation of the fuel burning equipment and vehicles. As a result, total emissions including GHG, from construction vehicles and equipment would result in negligible temporary effects to air quality. Once constructed, vehicles and boats would be used

to access the handholes for repair as needed. However, the amounts of air pollutants associated with emissions would be negligible, and repair of the fiber optic cable would have no impacts on air quality or contribute GHG to the atmosphere.

3.3 Hazardous and Regulated Materials and Waste

Hazardous materials are generally defined as any substance that, due to quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health, welfare, or the environment. Hazardous and toxic materials and wastes are regulated at the federal level by the USEPA in accordance with the CWA; Toxic Substance Control Act; Resource Conservation and Recovery Act; Comprehensive Environmental Response, Compensation, and Liability Act; CAA; and at the state level by VDEQ under applicable state authorization to the federal regulations. The federal government is required to comply with these acts and all applicable state regulations under EO 12088 *Federal Compliance with Pollution Control Standards*. Additionally, EO 12088, under the authority of the USEPA, ensures that necessary actions are taken for the prevention, management, and abatement of environmental pollution from hazardous materials.

The WFF *Integrated Contingency Plan* (ICP), developed by NASA to meet the requirements of 40 CFR 112 (Oil Pollution Prevention and Response), 40 CFR 265 Subparts C and D (Hazardous Waste Contingency Plan), and 9 VAC 25-91-10 (Oil Discharge Contingency Plan), serves as the facility's primary guidance document for the prevention and management of oil, hazardous material, and hazardous waste releases (NASA 2019b).

3.3.1 Affected Environment

The affected environment for hazardous materials consists of all project areas associated with installing the proposed new fiber optic cable between the Wallops NWR and the UAS Airstrip. The effects of hazardous materials on the environment could be produced by using a hazardous material during construction/drilling operations, or if the Proposed Action was conducted in an area with existing hazardous materials.

Based on the information provided in the *Final Site-wide PEIS* (Section 3.3.1.4 of the *Final Site-wide PEIS*, Environmental Compliance and Restoration Program), there are no existing hazardous materials Areas of Concern that may pose a risk to human health or the environment in or near the proposed project area.

Munitions and Explosives of Concern (MEC) are explosive munitions (i.e., bombs, shells, grenades, etc.) that did not function as designed and may pose a risk of detonation. MEC is composed of unexploded ordnance (UXO) and discarded military munitions. The north end of Wallops Island was used for military munitions testing and as an explosives ordnance disposal area by the Department of Defense from the mid-1940s towards the end of the 1950s. The UAS Airstrip is within and adjacent to areas of the Gunboat Point Formerly Used Defense Site (FUDS) used as

a Strafing Range and Explosive Ordnance Disposal Area where MEC is known to be present. Signs posted by NASA at Gunboat Point notify the public of the potential munitions hazards that may exist and access to the area is restricted.

3.3.2 Environmental Consequences

The magnitude of potential impacts associated with hazardous and regulated materials and waste depends on the toxicity, transportation, storage, and disposal of these substances. The threshold of significance would be met if the use or accidental release of hazardous materials and/or hazardous waste during the Proposed Action resulted in human exposure that exceeds applicable regulatory criteria for such substances.

3.3.2.1 *No Action Alternative*

The No Action Alternative would have no impacts associated with hazardous materials or hazardous waste because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect those resources would occur.

3.3.2.2 *Proposed Action*

Construction at the UAS Airstrip would involve Maxi HDD at approximately 18 to 26 m (60 to 85 ft) below ground surface, thereby lessening the chance of encountering MEC. MEC may be encountered during construction of the 0.16 ha (0.4 ac) entry pit. The contractor would be required to prepare an MEC avoidance plan that would be coordinated with the WFF Safety Office. WFF personnel would provide education and oversight on the proper procedures to follow should MEC be discovered during construction and use of the entry pit.

The primary potential source of hazardous materials for the Marsh Fiber project would be from management and use of petroleum products during construction. Mobile equipment (e.g., trucks, boats, barges, excavator) and stationary equipment (Maxi HDD drill rig, sand/silt separators, pumps, generators, lighting systems, etc.) construction equipment would be powered by diesel and gasoline engines, with on-board fuel tank capacities expected to range from 10 to 380 liters (2 to 100 gallons). Some of the equipment would have on-board hydraulic oil systems with capacities estimated to range between 60 to 120 liters (15 to 30 gallons).

Portable above ground storage tanks used for on-site fuel storage (if needed) would be double-walled and/or equipped with secondary containment structures, as applicable. Smaller containers of regulated construction fluids (e.g., gas cans, oils, lubricants, solvents) would be stored in an appropriate on-site storage container that would be accessible only to authorized personnel. General solid waste would be collected in appropriate refuse containers, consolidated to a centralized dumpster in the project area at the end of each workday, and periodically transported offsite for disposal at a permitted facility by a licensed contractor. Fuel storage on the barges would

primarily be for use in the marsh buggy. Fuels would be transported to the sites by truck and barge in Department of Transportation-certified and USCG-certified containers.

NASA would require the HDD contractor to prepare a project-specific Spill Prevention, Control, and Countermeasure (SPCC) plan in accordance with 40 CFR Part 112, regardless of whether or not the HDD contractor plans to store more than 5,000 liters (1,320 gallons) of petroleum products in containers greater than 208 liters (55 gallons). The SPCC plan would include an equipment maintenance and fueling plan. Protective control measures (oil-absorbent socks, temporary containment areas) would be set up around the fuel transfer equipment. The SPCC plan would include provisions for controls and countermeasures during land-based and marine-based activities. The USEPA/OSHA Safety Data Sheets for all regulated materials would be kept on-site at each project work area. In accordance with Virginia Stormwater Management Program (VSMP) requirements, the HDD contractor would also be required to prepare and submit for approval a Stormwater Pollution Prevention Plan (SWPPP).

As discussed in Chapter 2, the drilling mud recovery and reclamation process separates excess solids from the drilling mud and reconditions the drilling mud for reuse. The Maxi HDD operation would employ equipment and procedures to maximize the recirculation and reuse of drilling mud to minimize waste disposal. The drill cuttings generated from the Maxi HDD drilling operations would be temporarily stored on site in roll-off containers to prevent their release into any surface waters or wetlands. Bentonite slurry may be used for Mini HDD but would be contained within the drilling pits and borehole such that no recycling system or on-site storage tanks for solids would be needed. Excess drilling fluid and cuttings for both Maxi and Mini HDD would be recovered and transported to an approved off-site upland disposal site.

Bentonite, used in the bentonite slurry (drilling mud) is not characterized or regulated as a hazardous substance under federal regulations (such as the Emergency Planning and Community Right-to-Know Act under Title III of the Superfund Amendments and Reauthorization Act, or the Resource Conservation and Recovery Act) or the NASA ICP, or under state regulations. Potential impacts from bentonite slurry and applicable mitigation measures are addressed in Section 3.7 *Water Resources*.

Construction activities would include the use of regulated materials and could generate the following types of hazardous and non-hazardous waste:

- Solvents, hydraulic fluid, oil, and antifreeze used in construction equipment
- On-site storage of materials such as petroleum products (fuels), oils, lubricants and solvents
- General refuse generated during construction (i.e., non-hazardous solid waste)
- Solids (soil cuttings and rock fragments) recovered from the bentonite slurry used in the HDD operations

NASA would require its contractors to manage all hazardous and regulated materials and wastes in accordance with the WFF ICP (NASA 2019b), the Goddard Procedural Requirements (GPRs) and applicable federal, state, and local regulations. Construction contractors would be responsible for coordinating with WFF for the disposal of any hazardous or solid wastes generated. NASA anticipates that the amount of hazardous materials that could be used during installation of the fiber optic cable would remain relatively small and would have negligible potential to impact human health or the environment, nor would it exceed the capabilities of NASA and its contractors to manage in accordance with current procedures.

Implementation of the above minimum prevention and control measures, and adherence to the following permits and plans would minimize both the likelihood and the impacts on the environment of a spill or release of hazardous materials occurring from the Proposed Action. Therefore, impacts from hazardous and regulated materials and wastes would be negligible.

- U.S. Army Corps of Engineers (USACE) Nationwide 12 Permit [Utility Line Activities],
- Virginia Marine Resources Commission (VMRC) Tidal Wetland Permit,
- VMRC Subaqueous Bottom Permit, for impacts on waters of the U.S. (WOTUS),
- SWPPP,
- SPCC, and
- WFF ICP.

3.4 Health and Safety

The health and safety analyses for this EA considers occupational hazards, risks to the public, NASA personnel, contractors, and civilians from potentially hazardous activities during construction.

3.4.1 Affected Environment

The WFF Safety Office plans, develops, and provides functional management of policies and procedures for safety and establishes and approves safety procedures for the protection of property and the public. NASA requires that all activities conducted at WFF and for NASA be conducted in accordance with federal OSHA regulations and Virginia OSHA regulations. Federal contractors are required to follow regulations defined in Federal Acquisition Regulation 52.236-13, Accident Prevention. The WFF Safety Office requires contractors to submit health and safety plans for approval prior to work onsite.

NASA Range Safety is managed by the WFF Safety Office in coordination with the NASA Headquarters Office of Safety and Mission Assurance, who have the responsibility to ensure safe mission activities from preparation through operation and post-operations for missions launched from the WFF Range. NASA's Range Safety requirements include the need for redundancy in

command and destruct and system operability (i.e., the ability for NASA to communicate with and remotely operate mission activities at the WFF Range in real-time as well as being prepared if a communication system fails or is down when needed).

WFF coordinates launch operations with USCG and other organizations as required to clear potential hazard areas. If necessary, Notice-to-Mariners (NOTMARs) depicting the hazard areas are published at least 24 hours prior to an operation. Additionally, the WFF Office of Communications regularly distributes both electronic and faxed notices of operations-related hazard areas to a group of more than 100 recipients that includes local watermen, marinas, and marine transportation companies.

Institutional and construction activities conducted at WFF are performed in accordance with applicable NASA institutional safety and mission programs and controls. The WFF Safety Office plans, develops, and implements facility programs and controls for the safety of personnel, protection of property, and operations of facilities. This organization develops, plans, and promotes occupational health and safety and emergency (i.e., fire, crash, and rescue) planning and operations. It also reviews contractor prepared safety plans for construction, modification, or demolition of facilities and infrastructure. Safety controls are established to minimize the potential hazards associated with institutional and workplace activities.

All personnel involved with operational programs at WFF follow appropriate safety protocols, including OSHA regulations and training requirements. The handling, processing, storage, and disposal of hazardous materials or hazardous wastes from operations and repair activities would be accomplished in accordance with all applicable Federal and state requirements.

3.4.2 Environmental Consequences

The threshold of significance would be met if construction activities would substantially increase the potential for occupational hazards, risks to the public, NASA personnel, contractors, and civilians.

3.4.2.1 *No Action Alternative*

The No Action Alternative would result in the potential for long-term adverse impacts on health and safety because the proposed fiber optic cable would not be installed and operated, and there would be no redundancy in communication systems between the WFF Main Base and the Wallops Island launch range. WFF would not be in compliance with NASA OCIO or NASA Range Safety Requirements that mandate redundancy in communication systems to the launch range. In the event that a failure of the existing data/communications line was to occur during an operational emergency, self-destruct measures may not be available to prevent a launch from damaging private property or resulting in human injury or death. As noted in Section 3.4.2.2.1 of the *Final Site-wide PEIS*, operational missions and activities (such as maintaining hazard arcs, public notification of launch activities, etc.) would follow current procedures to ensure public safety.

3.4.2.2 *Proposed Action*

Proposed construction activities could present safety risks to construction personnel, WFF personnel/contractors, and the public near the project areas. Risks to construction-related personnel would result from transporting and operating construction equipment, particularly the specialized HDD and trenching equipment, the use of barges and boats for transportation of personnel, materials and equipment, and the handling, use, and transport of hazardous materials.

The staging and work areas could also present safety risks to WFF personnel/contractors working at the UAS Airstrip (who are not associated with the construction of the Marsh Fiber project), and to the public that are in the vicinity of Walker Marsh while work is ongoing. No WFF personnel/contractors or members of the public are anticipated to be near the Boresight Antenna work area since public access is restricted, and no NASA personnel are permanently staffed at the facility.

To minimize risks to safety and human health, all construction activities would be performed by qualified personnel who are trained to safely operate the appropriate equipment. Use of bentonite (a component of the bentonite slurry used in HDD operations), which is classified as crystalline silica by OSHA, is regulated by OSHA under 29 CFR 1926.1153. NASA and its contractors would conduct all project activities in accordance with federal OSHA regulations and Virginia OSHA regulations, with oversight by the WFF Safety Office. Federal contractors would follow regulations defined in Federal Acquisition Regulation 52.236-13, Accident Prevention, and NASA's contractor would be required to submit a project-specific health and safety plan for approval by the WFF Safety Office prior to starting work.

Public signage, as appropriate, would be placed on Walker Marsh to alert the public of project activities at Walker Marsh. NASA would coordinate with the USCG, and would issue public notices, as appropriate, regarding when the project activities at Walker Marsh would take place to alert local marinas, boaters, and recreational users of the potential closure and safety hazards of the Proposed Action activities. If appropriate, the USCG would issue NOTMARs, and the WFF Office of Communications would issue notices to warn boaters who may be in the vicinity of the activity at Walker Marsh to proceed with caution for the duration of construction activities.

Installing a new communication pathway to provide fiber optic communications from the Main Base to the WFF Range at Wallops Island, which would result in the existing fiber optic cable becoming a backup system for redundancy, would bring WFF into compliance with NASA-OCIO and NASA Range Safety requirements. The Proposed Action would have long-term substantial beneficial impacts on public health and safety during WFF launch range activities.

With implementation of the measures described above, there would be negligible adverse impacts on health and safety from the Proposed Action in the short-term, and beneficial impacts over the long-term.

3.5 Land Use

Land use generally refers to human modification of the land, often for residential or economic purposes. It can also refer to use of land for preservation or protection of natural resources such as wildlife habitat, vegetation, or other unique features. Human land uses include residential, commercial, industrial, agricultural, or recreational uses.

3.5.1 Affected Environment

Land use at the Boresight Antenna and UAS Airstrip are for federal purposes only as they are on federal property and restricted to the public. The UAS Airstrip is further restricted to only authorized personnel associated with UAS operations. The land at the Boresight Antenna project area is only used by NASA (through a lease agreement with the USFWS Wallops NWR) to operate and maintain the antenna and underground communications lines to the antenna. The land surrounding the Boresight Antenna is primarily undeveloped, part of the Wallops NWR, and managed by the USFWS. The refuge is not open to the public. The USFWS, through the Chincoteague National Wildlife Refuge, has an agreement with NASA to use Wallops Island on a non-interference basis for research and management of declining wildlife species in need of special protection.

Walker Marsh is owned and managed by the Commonwealth of Virginia, and consists entirely of natural, undeveloped saltmarsh. The general public is allowed access to Walker Marsh for recreational activities (boating, hunting, wildlife viewing, and public and commercial shellfish harvesting) year-round.

As an active launch range, Wallops Island is closed to the public. All access is controlled by NASA's Protective Services Division. A guard post is located at the common entrance to the Mainland and Wallops Island. Security cameras are mounted on towers and buildings throughout the island to monitor activity at the gate entrance and along the beachfront on Wallops Island. NASA has entered into a land use agreement with MARS that authorizes NASA and its contractor, Sentinel Robotics Solutions (SRS) Group, to manage the UAS Airstrip on northern Wallops Island.

All areas of the proposed project are zoned as agricultural by Accomack County (Accomack County Comprehensive Plan 2016), although county zoning does not apply to state or federal property (the Boresight Antenna and UAS Airstrip are on federal property, Walker Marsh is on state property).

3.5.2 Environmental Consequences

Impacts on land use would be considered significant if the Proposed Action resulted in a land use incompatibility that impairs or prevents the continued long-term operation of an existing land use on or outside WFF.

3.5.2.1 *No Action Alternative*

Under the No Action Alternative, existing land use classification would remain unchanged. However, as mentioned above in Section 3.5.2.1, without installation of a redundant, geographically diverse cable, the risk of failure of the existing data/communications line increases. If a failure was to occur during an operational emergency, self-destruct measures may not be available to prevent a launch from damaging private property or resulting in human injury or death. Therefore, there could be long-term adverse impacts from increased safety concerns for use of private and public land in the vicinity of WFF. As noted in Section 3.4.2.2.1 of the *Final Site-wide PEIS*, operational missions and activities (such as maintaining hazard arcs, public notification of launch activities, etc.) would follow current procedures to ensure public safety.

3.5.2.2 *Proposed Action*

The new fiber optic cable would be installed entirely underground (in uplands, the saltmarsh, and underneath waterways). The Proposed Action would not result in any change in existing land use or land use designations in or adjacent to the project area. The public would not be able to access the southern portion of Walker Marsh during the anticipated 30-day construction period in the saltmarsh, and access to Walker Marsh would be affected intermittently during mobilization and demobilization. Temporary closures and/or inability to access Walker Marsh would not result in long-term changes to land use or compatibility with designated land use. Land use within or outside of WFF would not be affected by the Proposed Action.

3.6 Land Resources

Land resources for this EA describe physical surface characteristics including topography, geology, and soils of the affected land areas.

3.6.1 Affected Environment

3.6.1.1 *Topography*

The topography at WFF is typical of the Mid-Atlantic coastal region, generally low-lying with elevations ranging from sea level to 15 m (50 ft) above mean sea level (MSL). Elevations in the proposed project areas were surveyed in July 2019 (Rauch 2019). Elevation at the Boresight Antenna project area is approximately 3.3 m (11 ft) above MSL. Elevation at the UAS Airstrip project area ranges from 1.2 m (4 ft) above MSL to 1.8 m (6 ft). This area has been built up with fill for construction of the runway. Elevations within the Walker Marsh project area range from sea level to less than 1 m (3 ft) above MSL, with portions of the project areas inundated by marine waters during high tide.

The maximum depth of water in Ballast Narrows is approximately 10 m (35 ft) below MSL, and in Watts Bay is approximately 3 m (10 ft) below MSL, with shallow waters (less than 1.2 m [4 ft]) extending across much of the alignment across Watts Bay.

3.6.1.2 *Geology*

Located within the Atlantic Coastal Plain Physiographic Province, WFF is underlain by approximately 2,100 m (7,000 ft) of sediment overlying crystalline basement rock. The sedimentary section, ranging in age from Cretaceous to Quaternary, consists of a thick sequence of terrestrial, continental deposits overlain by a much thinner sequence of marine sediments. The two uppermost stratigraphic deposits at WFF are the Yorktown Formation and the Columbia Group, which is not subdivided into formations. The Yorktown Formation is the uppermost unit in the Chesapeake Group and generally consists of fine to coarse, glauconite quartz sand. The overlying Columbia Group are generally unconsolidated deposits of clay, silt, sand, and gravel.

The Maxi HDD borehole would reach a maximum depth of approximately 18 m (60 ft) below MSL at its deepest point below the subaqueous bottom of Watts Bay, and approximately 27 m (90 ft) below the subaqueous bottom of Ballast Narrows. Geology at this depth is primarily unconsolidated sediments of the Columbia Group (Virginia Division of Minerals 1972).

Results of geotechnical borings taken in May 2019–one in the middle of Watts Bay and one in the middle of Ballast Narrows, both within the proposed Marsh Fiber alignment–showed a mix of sand, silt, and clay layers with varying textures to a depth of approximately 23 m (75 feet) below the subaqueous bottom. The materials in the Ballast Narrows boring was a mix of "very soft to soft" silt and clay to a depth of 5 m (17 ft), underlain by a mix of "dense and very dense" incohesive soils and "stiff and very stiff" cohesive soils. The materials in the Watts Bay boring was a mix of "very soft to soft" silt and "medium dense to loose" fine sand to a depth of 6.7 m (22 ft), underlain by a mix of "medium stiff to stiff and very stiff" cohesive soils, with the bottom 4 m (13 ft) classified as "medium dense and dense" fine to medium sand.

3.6.1.3 *Soils*

Soil textures at the Boresight Antenna project area range from fine sandy loam to loamy sand, and soils are very deep, well-drained to somewhat excessively drained, with a depth to water table and restrictive features of 80 or more inches (NRCS 2019). None of the soils are classified as hydric (meaning they are not permanently or seasonally saturated by water resulting in anaerobic conditions and are not indicative of wetlands). Most of the soils in the Boresight Antenna project area have been previously disturbed during construction of the antenna, fencing, and a small building.

Soils at Walker Marsh are classified as silt loam and fine sandy loam, very deep, very poorly drained, with a moderate to moderate slow permeability, a depth to water table of about 0 inches, and restrictive features of 80 or more inches. The soils are all classified as hydric (NRCS 2019).

Soils at the UAS Airstrip area vary across the site. Soils in the project area at the western end of airstrip are classified as fine sand, very deep, poorly to moderately well drained, rapidly permeable with a water table depth ranging from about 0 inches to 36 inches and restrictive features at 80 or more inches, and hydric. Moving eastward across the airstrip, soils are classified as non-hydric, moderately well drained, fine sand, and silt loam. However, the entire project area at the UAS Airstrip has been previously disturbed during construction of the runway, and the majority of the project area includes fill to varying depths.

3.6.2 Environmental Consequences

3.6.2.1 *No Action Alternative*

The No Action Alternative would have no impacts on land resources because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect land resources would occur.

3.6.2.2 *Proposed Action*

Under the Proposed Action, there would be no long-term changes to topography. Temporary excavations would be filled upon completion of the project and re-contoured to pre-disturbance elevations.

As a result of geotechnical analysis conducted under Watts Bay and Ballast Narrows in 2019 for the Marsh Fiber project, NASA determined that the geologic material in the path of the proposed Maxi HDD boreholes is suitable for the HDD method. Although the project would drill through geologic material, there would be no changes to the geologic material and thus no impacts to geology. However, there is potential for a frac-out in which drilling mud is inadvertently released from the borehole into the surrounding materials and typically moves upwards in fissures in the rock and soil.

A release could also occur in non-fissured cohesive soils when the pressure of the drilling fluid exceeds the strength of material above the borehole. NASA's HDD contractor would evaluate the geologic and soil conditions along the borehole path as the drilling progresses and would plan appropriate drill fluid pressures to avoid or minimize the potential for frac-out. The HDD contractor would prepare a Frac-Out Contingency Plan, which would establish operational procedures and responsibilities for the prevention, containment, and clean-up of frac-outs, as described in Section 3.7.1 *Surface Waters and Stormwater Management*.

The Proposed Action would result in minor, long-term impacts on soils at the Maxi and Mini HDD entry pits due to removal of soils to excavate the pits, and then replacement of soils with a high likelihood for mixing/restructuring of soil horizons and soil compaction. Impacts would be contained within the entry pits. Soils excavated from the HDD entry pits and handhole areas would be temporarily stored on-site adjacent to the pit and backfilled immediately after work is complete.

At the Boresight Antenna area and UAS Airstrip area, there would be short-term impacts on soils from disturbances of the surface from heavy equipment, storage of materials, and the Maxi HDD rig and accessory equipment. However, soils at both areas have been previously disturbed. Therefore, impacts would be minor.

NASA's primary goal for use of the vibratory trenching method across Walker Marsh is to minimize impacts on soils and vegetation. An advantage of vibratory trenching over standard trenching is that the vibratory trench results in a narrow (3.8-cm [1.5-inch]-wide) opening in the soil, resulting in relatively little damage to the ground surface and eliminating the need for backfilling. The vibratory trench would be mounted on a low ground pressure marsh buggy, which is designed to minimize the pressure of the machinery where it sits on the ground surface, and thus minimize the compaction of soils in the saltmarsh.

There would be minor, short-term impacts on soils at Walker Marsh within the limits of disturbance due to the presence and operation of heavy equipment to handle exit of the conduit/cable and connection of the cable with the conduit in the trench. To minimize impacts, NASA has confined the limits of disturbance to the smallest areas practicable, would use the barges as materials staging, and would place synthetic composite mats on the ground within the Maxi and Mini HDD works areas and along the path of the marsh buggy. The mats would further reduce impacts on marsh soils by minimizing rutting and root damage that can result from movements of the marsh buggy, equipment, and workers.

To minimize impacts on soils from erosion, NASA's construction contractor would develop site-specific erosion and sediment control (ESC) plans prior to ground-disturbing activities, in compliance with the Virginia Stormwater Management Program regulations (9 VAC 25-870). The contractor would implement ESC BMPs during and after construction and excavation activities to stabilize soils. These BMPs could include using silt fencing, soil stabilization blankets, and matting around areas of land disturbance during construction. Bare soils would be revegetated after construction to reduce erosion and stormwater runoff velocities.

Spill or leaks from construction vehicles and equipment could affect soils. NASA would implement site-specific BMPs addressing spill prevention and control measures and would conduct the HDD operations in a manner that avoids the discharge of water, drilling mud, and soil particles ("cuttings") outside the HDD entry and exit work areas during the construction process.

3.7 Water Resources

Water resources for this EA refer to surface and subsurface waters, wetlands, estuarine and tidal waters, floodplains, and the coastal zones that exist in and around WFF. The CWA of 1972, as amended, is the primary federal law that protects the nation's waters, including lakes, rivers, aquifers, and coastal areas.

3.7.1 Surface Waters and Stormwater Management

VSMP regulations (9 VAC 25-870), administered by the VDEQ, require that construction and land development activities incorporate measures to protect aquatic resources from the effects of increased volume, frequency, and peak rate of stormwater runoff and from increased non-point source pollution carried by stormwater runoff. The VSMP also requires that land-disturbing activities of 0.4 ha (1 ac) or greater develop a SWPPP and acquire a permit (9 VAC 25-880) from the VDEQ prior to construction.

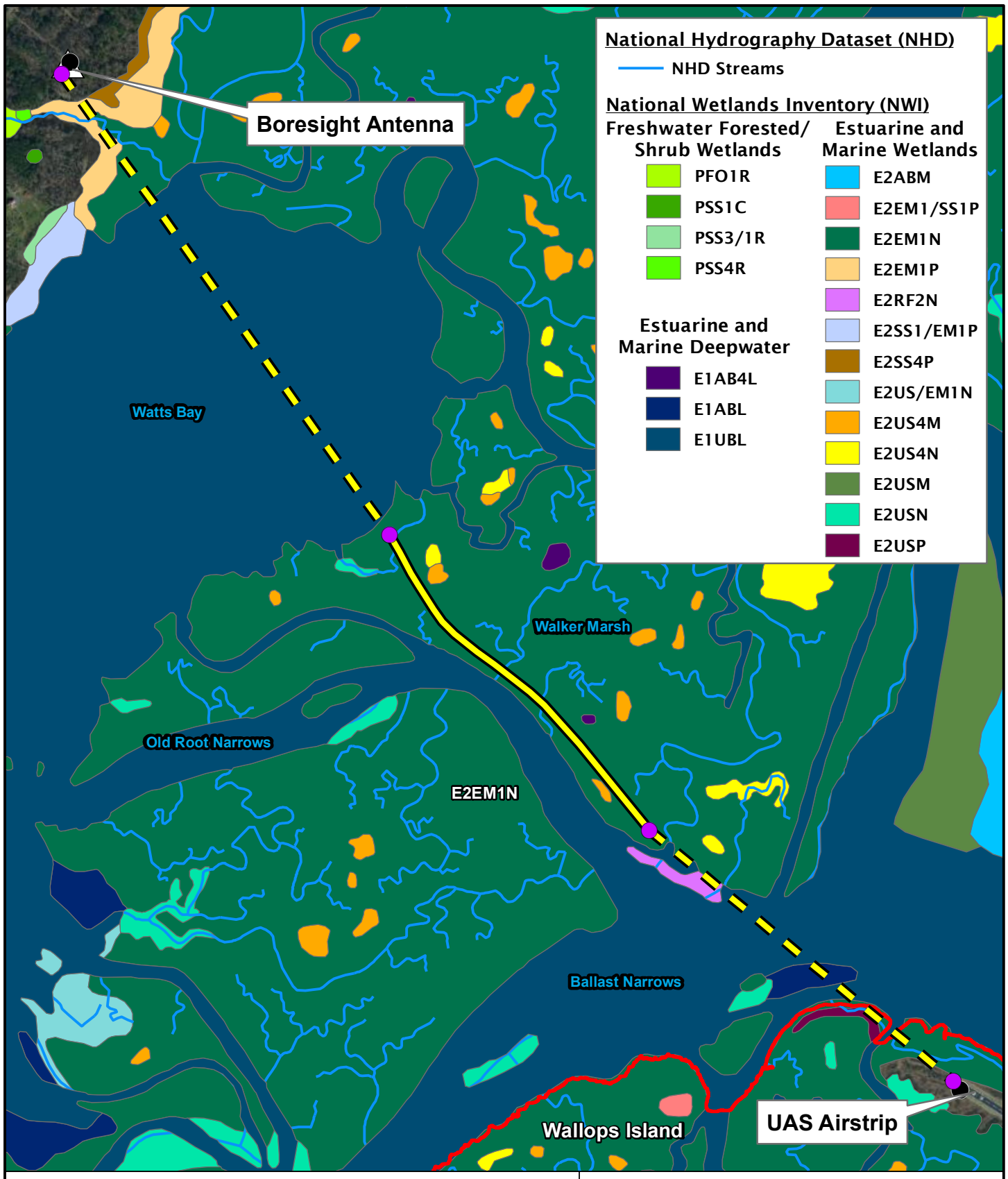
The VDEQ designated the surface waters in the vicinity of WFF as Class I–Open Ocean and Class II–Estuarine Waters. Surface waters in Virginia are subject to the water quality criteria specified in 9 VAC 25-260-50. This set of criteria establishes limits for minimum dissolved oxygen concentrations, pH, and maximum temperature for the different surface water classifications in Virginia. In addition, Virginia surface waters must meet the surface water criteria specified in 9 VAC 26-260-140. This set of criteria provides numerical limits for various potentially toxic parameters. For the Class I and II waters in the vicinity of WFF, the saltwater numerical criterion is applied. Both sets of standards are used by the Commonwealth of Virginia to protect and maintain surface water quality.

3.7.1.1 *Affected Environment*

The proposed project is in the Upper Chesapeake subregion watershed and Chincoteague subbasin. Surface waters in the vicinity of the proposed project are saline to brackish and are tidally influenced. These waters include Watts Bay, Old Root Narrows, Ballast Narrows, and multiple guts located in Walker Marsh (**Figure 3-1**). Surface waters at the Boresight Antenna drain to Watts Bay, surface waters at Walker Marsh flow to the surrounding tidal waters, and surface waters at the UAS Airstrip project area drain north to Ballast Narrows (**Figure 3-1**).

There is no stormwater drainage infrastructure or stormwater management system (ditches, swales, pipes, outfalls, etc.) at Walker Marsh, and stormwater at the Walker Marsh project sites flows naturally into surface waters. The UAS Airstrip is surrounded by a subsurface drainage system; this gravel-filled infiltration trench captures the surface water runoff from the runway and directs it off-site. There is an existing drainage system at the Boresight Antenna to collect and dissipate stormwater runoff.

There are several depressions and ponded areas that contain surface waters at Walker Marsh, as well as three unnamed guts within the project limits of disturbance (**Figure 3-1**). The proposed cable route at Walker Marsh was designed to avoid depressions and ponded areas that contain surface waters. There are no surface waters within the project limits of disturbance at the Boresight Antenna or the UAS Airstrip. The Maxi HDD borehole path would be drilled underneath Watts Bay and Ballast Narrows.



Legend

- New Handhole
- Existing Handhole
- Fiber HDD Path
- Fiber Vibratory Trench Path
- Wallops Flight Facility Boundary

Sources: NASA, USFWS NWI, USGS NHD, VGIN VBMP 2017 Orthoimagery
Prepared by: 3e 19-756 MM / Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 3-1
SURFACE WATERS INCLUDING NWI-MAPPED WETLANDS

0 1,350 2,700
Feet

N

NASA WFF Marsh Fiber EA

3.7.1.2 *Environmental Consequences*

Impacts on surface water resources and stormwater management would be significant if they would have large scale adverse impacts on hydrologic function of the proposed project area, or if runoff from the project areas would include concentrations of pollutants and/or sediments exceeding applicable regulatory criteria.

No Action Alternative

The No Action Alternative would have no impacts on surface waters or stormwater management because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect surface water resources would occur.

Proposed Action

The Proposed Action would potentially result in impacts on the water quality of surface waters in the following ways:

- Land disturbance and subsequent erosion and sedimentation from storm water runoff
- Sedimentation in marine waters from disturbances of the subaqueous bottom
- Contamination from leaks and spills of pollutants during construction
- Contamination from an inadvertent release of drilling mud into marine waters

Impacts from Stormwater Runoff

Land disturbing activities with the potential to cause soil erosion would occur at the Boresight Antenna and the UAS Airstrip work areas due to excavations for the Maxi HDD entry pits, the open trenching, and areas where handholes would be installed.

Project activities on Walker Marsh would result in the temporary disturbance of the ground surface, soils, and vegetation. Construction activities have the potential for short-term impacts on surface waters from stormwater runoff, as well as from wave action and tidal fluctuations along the shoreline of the HDD work areas and the guts crossed by the project path.

The stormwater drainage infrastructure at both the Boresight Antenna and the UAS Airstrip may be disturbed from trenching and/or heavy equipment. NASA's contractor would be required to restore all drainage infrastructure to pre-construction conditions immediately upon completion of the project activities at each site.

NASA would obtain a VSMP construction site stormwater permit prior to construction. To minimize potential short-term impacts, the construction contractor would develop a site-specific SWPPP and adhere to VSMP permit conditions. The construction contractor would be required to avoid damage to or allow flow from the proposed project work site to enter either stormwater drainage system. The SWPPP would identify all stormwater discharges at the site, potential sources

of stormwater contamination, and would require the implementation of BMPs to reduce the impact of stormwater runoff on nearby receiving waters.

NASA's construction contractor would be required to remove all equipment, materials, drilling fluid, muck, waste, and other debris from the site as part of the demobilization process. Final washing and cleaning of equipment and materials would be performed in a manner so as not to cause contamination of surface waters or soils.

With adherence to BMPs and permit conditions, adverse temporary impacts from stormwater are expected to be minor.

Impacts from Disturbances of the Subaqueous Bottom

In-water activities, which would include anchoring of barges and transport of the marsh buggy across the guts (the marsh buggy would float but could disturb the subaqueous bottom where it enters and exits the water) would result in minor, localized impacts from increased turbidity by disturbing sediments on the subaqueous bottom. To minimize impacts, NASA's contractor may install turbidity curtains to contain suspended sediment within the work area until it has time to settle out of the water column. Impacts would be temporary and minor.

Impacts from Leaks and Spills

Other potential impacts on surface waters may include contamination from spills or leaks of pollutants from the vehicles, barges, or equipment used during construction activities and transportation of construction materials and equipment to and from the project sites. NASA's contractor would implement a site-specific construction SWPPP that would include BMPs for fueling and maintenance of vehicles and equipment as well as spill prevention and control measures to reduce potential impacts on surface waters. BMPs would include measures such as ensuring equipment is in good working condition and maintaining spill kits and clean-up materials onsite.

With implementation of the site-specific SWPPP, BMPs, adherence to CWA permit requirements, the WFF ICP and a project-specific SPCC, the Proposed Action could have short-term impacts on water quality if a spill or release occurred. Impacts could range from negligible to adverse depending on the size of the spill/release and how quickly it could be controlled and cleaned up. With these measures in place, adverse impacts are anticipated to be localized and the effects would not be long-term.

Impacts from Inadvertent Release of Drilling Mud

An inadvertent release of drilling mud into marine waters during HDD operations would have short-term adverse impacts on water quality. The Maxi HDD operation would use equipment and procedures to maximize the recirculation and reuse of drilling mud to minimize waste disposal of the recovered solids.

While drilling fluid seepage associated with an inadvertent return is most likely to occur near the HDD bore entry and exit points where the drill head is shallow, inadvertent returns can occur in

any location along an HDD borehole path. Drilling fluids that are released during a frac-out typically contain a lower concentration of bentonite when they surface because the bentonite is filtered out as its passes through existing sediments of varying types. However, if released into water bodies, bentonite has the potential to impact water quality. Bentonite is a naturally occurring clay. The impact on water quality from bentonite is likened to the environmental effects of sedimentation or turbidity from suspended solids (ASCE 2005).

NASA's contractor would be required to prepare and implement a Frac-Out Contingency Plan to prepare for and address the potential for release (or "frac-out") of drilling fluids to water resources. Section 3.7.1 *Surface Waters and Stormwater Management* provides the general measures that would be in this plan.

At a minimum, the following measures would be included in a Frac-Out Contingency Plan to prepare for and address the unlikely event of a frac-out.

Planning & Monitoring Measures:

- Prior to drilling operations and throughout the process, the drilling contractor would ensure that appropriate containment equipment (such as earth moving equipment, portable pumps, hay bales, silt fencing, etc.) is readily available and stored at the drilling site.
- The contractor would complete visual surface monitoring along the HDD path during drilling operations and monitor the use and return of the drilling fluids during the drilling processes. The contractor would provide a mud engineer on-site during all phases of the drilling process.
- If a frac-out or release of drilling fluid to water resources occurs, the contractor would follow the project's established chain of command and permit requirements for reporting to the project team, regulatory agencies, and landowners.

Response Measures:

- If a frac-out or release of drilling fluid occurs, the contractor would implement the following measures to recover and properly dispose of drilling fluids:
    - Decrease the drilling fluid circulation pressures.
    - Size the drill hole to remove blockages (i.e. cleaning the drill hole to remove potential blockages, thereby allowing the fluid to flow within the drill hole and not into the geologic formation).
    - Thicken the drilling fluid properties by increasing bentonite content, and/or, if necessary, make adjustments to the drilling alignment.
    - If the release location is in an upland area, stage barriers (e.g., hay bales, sandbags, silt fences, etc.) or construct containment berms immediately around the release point to keep any material from migrating to surface waters or wetlands. If the

amount of an upland release does not allow practical collection, dilute the affected area with fresh water and allow it to dry.

- In the event that a frac-out does occur that impacts water resources, immediately halt the pumping of the drilling fluid and install a silt curtain downstream to minimize the surface water area potentially impacted.
- Remove collected or contained drilling fluid by pump or vacuum truck.

- If necessary, the contractor would require that the drilling operations be temporarily reduced or suspended so that the extent of the release can be assessed and corrective actions, if any are required, can be implemented.

With these measures in place, any adverse impacts are anticipated to be localized and the effects would not be long-term.

Long-Term

No long-term adverse effects on water resources would be expected during repair of the fiber optic cable. Minor, small equipment would be needed to pull the damaged cable out of the conduit and conduct repairs. Ground disturbance associated with uncovering and repairing the damaged cable could affect water quality temporarily because of the potential for erosion and sedimentation to nearby water resources. However, repairs would be infrequent and brief, and the effects would be limited to the immediate vicinity of the repair site. Long-term, impacts would be negligible.

Summary of Permits and Plans

The following permits and plans would be required for surface water resources:

- Joint Permit Application for required Accomack County Wetlands Board, VDEQ, VMRC, and USACE permits:
  - Accomack County Wetlands Board Permit (waived)
  - VMRC Tidal Wetlands and Subaqueous Bottom Permits
  - VDEQ Virginia Water Protection Permit (waived)
  - USACE Nationwide Permit 12 for impacts on WOTUS
- Project-specific SPCC plan
- VSMP construction site stormwater permit including site-specific SWPPP
- Frac-Out Contingency Plan

3.7.2 Groundwater

Groundwater is subsurface water that occupies the space between sand, clay, and rock formations. Groundwater, an essential resource in many areas, is used for water consumption, agricultural irrigation, and industrial applications. Groundwater properties are often described in terms of depth

to aquifer, aquifer or well capacity, water quality, and surrounding geologic composition. Aquifers are areas of mostly high porosity soil where water can be stored between soil particles and within soil pore spaces.

3.7.2.1 *Affected Environment*

Because the boreholes for the Maxi HDD would reach depths of up to approximately 27 m (90 ft) below the subaqueous bottom, groundwater in the project area to that depth is described. WFF receives its potable water from seven groundwater supply wells that are located at the Main Base and the Mainland. There are no groundwater supply wells within or near the proposed project areas.

The Columbia aquifer and the Yorktown-Eastover multi-aquifer system lie under the Eastern shore and are designated and protected by the USEPA as a sole-source aquifer (USEPA 2019). The Columbia aquifer is the uppermost aquifer, is unconfined, and primarily comprised of saturated, sandy, surficial sediments (Accomack-Northampton Planning District Commission and the Eastern Shore of Virginia Groundwater Committee 2013). The Yorktown-Eastover aquifer system consists of alternating sand and clay-silt units. The *Final Site-wide PEIS* notes that at WFF, the Columbia aquifer occurs between depths of approximately 2 to 18 m (6 to 60 ft) below ground surface, and the shallow water table is generally 0 to 9 m (0 to 30 ft) below ground surface. The top of the shallowest confined Yorktown-Eastover aquifer at WFF is found at depths of approximately 30 m (100 ft) below the ground surface. It is separated from the overlying Columbia aquifer by a 6 to 9 m (20 to 30 ft) confining layer (aquitard) of clay and silt. In the Wallops area, the lower Yorktown-Eastover aquifer contains the freshwater/saltwater interface, which occurs at a depth of approximately 90 m (300 ft) below MSL.

Geotechnical borings taken on land east of the Boresight Antenna project site and west of the UAS Airstrip project sites in May 2019 encountered groundwater at approximately 1.8 m (6 ft) below ground surface in both geotechnical borings. Depth to groundwater at the UAS Airstrip project site is expected to be within 0.9 to 1.5 m (3 to 5 ft) below ground surface. The water table in all project areas is tidally influenced and can vary daily and seasonally.

3.7.2.2 *Environmental Consequences*

Significant impacts on groundwater would occur if the Proposed Action caused a long-term change in underground hydrologic patterns or caused adverse effects to groundwater quality that could not be mitigated.

No Action Alternative

The No Action Alternative would have no impacts on groundwater because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect groundwater would occur.

Proposed Action

Excavation for the open trenching at the upland sites (at the Boresight Antenna and the UAS Airstrip) and the Maxi HDD entry pits may encounter groundwater. At Walker Marsh, excavations (HDD entry pits and handholes) would encounter shallow groundwater. The vibratory trenching may encounter shallow groundwater at points along the trench path.

De-watering may be required at any of the project areas, given the shallow depth to groundwater across the proposed project areas, and would likely be needed for the Maxi HDD entry pits. De-watering could result in highly localized and temporary lowering of surficial groundwater levels in the immediate vicinity of the excavated area. Groundwater levels would quickly (i.e., within several hours) return to pre-disturbance conditions as the excavated areas are backfilled. Impacts would be temporary, and de-watering activities would be performed in accordance with approved BMPs and VSMP and CWA permit conditions. Where de-watering would be necessary, water would be discharged through an energy-dissipation structure such as a filter bag into a vegetated upland area to minimize erosion associated with discharge. Short-term impacts would be negligible. There would be no long-term impacts.

Groundwater contamination could occur from an inadvertent spill of fuel or hazardous liquids from construction equipment and vehicles, or during drilling operations due to an inadvertent release of bentonite slurry at the HDD work sites. The construction contractor would implement a bentonite slurry containment and recovery system to recapture the slurry used by the drilling operation, which would be sent to an enclosed, contained system for filtration, reprocessing and returned to operational use as a recycled product.

Groundwater contamination could also occur from a frac-out in which the bentonite slurry used to lubricate the drilling operations could leak into fractures/fissures in the material surrounding the borehole, and thus enter groundwater overlying the borehole. NASA's contractor would prepare and implement a Frac-Out Contingency Plan (described in Section 3.7.1 *Surface Waters and Stormwater Management*) that would include preventative measures to avoid/minimize the chance of a frac-out as well as control measures to immediately contain and manage a frac-out should one occur.

Hazardous liquids and materials would be stored and handled according to NASA's ICP and the VSMP permit conditions. In accordance with these plans, NASA and its contractor would immediately implement control and clean-up measures in the event of an inadvertent release of hazardous materials to prevent groundwater contamination. With the implementation of spill prevention measures and a Frac-Out Contingency Plan, no adverse short-term or long-term effects to groundwater resources are anticipated.

3.7.3 Wetlands

Wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its

surface. Wetlands are transitional areas between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water (Cowardin 1979). Wetlands consist of three mandatory technical parameters: a prevalence of hydrophytic vegetation, hydric soils, and wetland hydrology field indicators.

The CWA of 1972 is the primary federal law that protects the nation's waters, including coastal areas and WOTUS. 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 WOTUS and to minimize adverse effects on the aquatic environment. The USACE is responsible for day-to-day administration and permit review while USEPA provides program oversight.

EO 11990 *Protection of Wetlands* directs federal agencies to minimize the destruction, loss, and degradation of wetlands and to preserve and enhance the natural and beneficial values of wetland communities. Projects that impact wetlands require a CWA permit. For tidal wetlands in Virginia, a Joint Permit Application is filed with VMRC, which serves as the clearinghouse for federal, state, and local levels of permit review. Joint Permit Applications submitted to VMRC receive independent yet concurrent reviews by USACE, VMRC, VDEQ, and the Accomack County Wetland Board, respectively. NASA wetland regulations outline the required procedures for evaluating actions of NASA that impact wetlands.

3.7.3.1 *Affected Environment*

Wetlands at WFF are part of an extensive network of estuarine and intertidal systems within Accomack County. The approximate locations of tidal and nontidal wetlands in the project area as identified by the USFWS National Wetlands Inventory (NWI) Wetland Mapper are shown on **Figure 3-1**. The NWI-mapped wetlands in the project area are classified as estuarine, defined as tidal wetlands with salinities exceeding 0.5 parts per thousand (ppt) and partially enclosed by land.

In September 2019, wetland scientists evaluated the proposed Marsh Fiber project areas for presence of jurisdictional wetlands. The scientists delineated several jurisdictional wetland areas pursuant to the USACE 2010 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region, Version 2.0*, the USACE 1987 *Wetland Delineation Manual*, and applicable regulatory guidance.

Common marsh vegetation of tidal wetlands at WFF includes smooth cordgrass (*Spartina alterniflora*), salt meadow hay (*Spartina patens*), salt grass (*Distichlis spicata*), common reed (*Phragmites australis*), tall cordgrass (*Spartina cordifolia*), narrow leaved cattail (*Typha angustifolia*), and certain rushes (*Juncus* spp.). High marsh habitat is located just above the mean high tide elevation and is predominantly salt meadow hay, salt grass, common reed, and groundsel tree (*Baccharis halimifolia*). Walker Marsh is a 197 ha (487 ac) saltmarsh characterized entirely as low marsh habitat. Wetland vegetation was characterized during the September 2019 delineation and was predominantly short form salt marsh cordgrass, with other non-dominant species

including salt bush (*Iva frutecens)*, salt meadow hay, saltwort (*Salicornia spp.*) and sea lavender (*Limonium carolinianum*) (details provided in **Appendix A**). **Photo 3-1** shows vegetation at Walker Marsh in September 2019 observed during the wetland delineation.

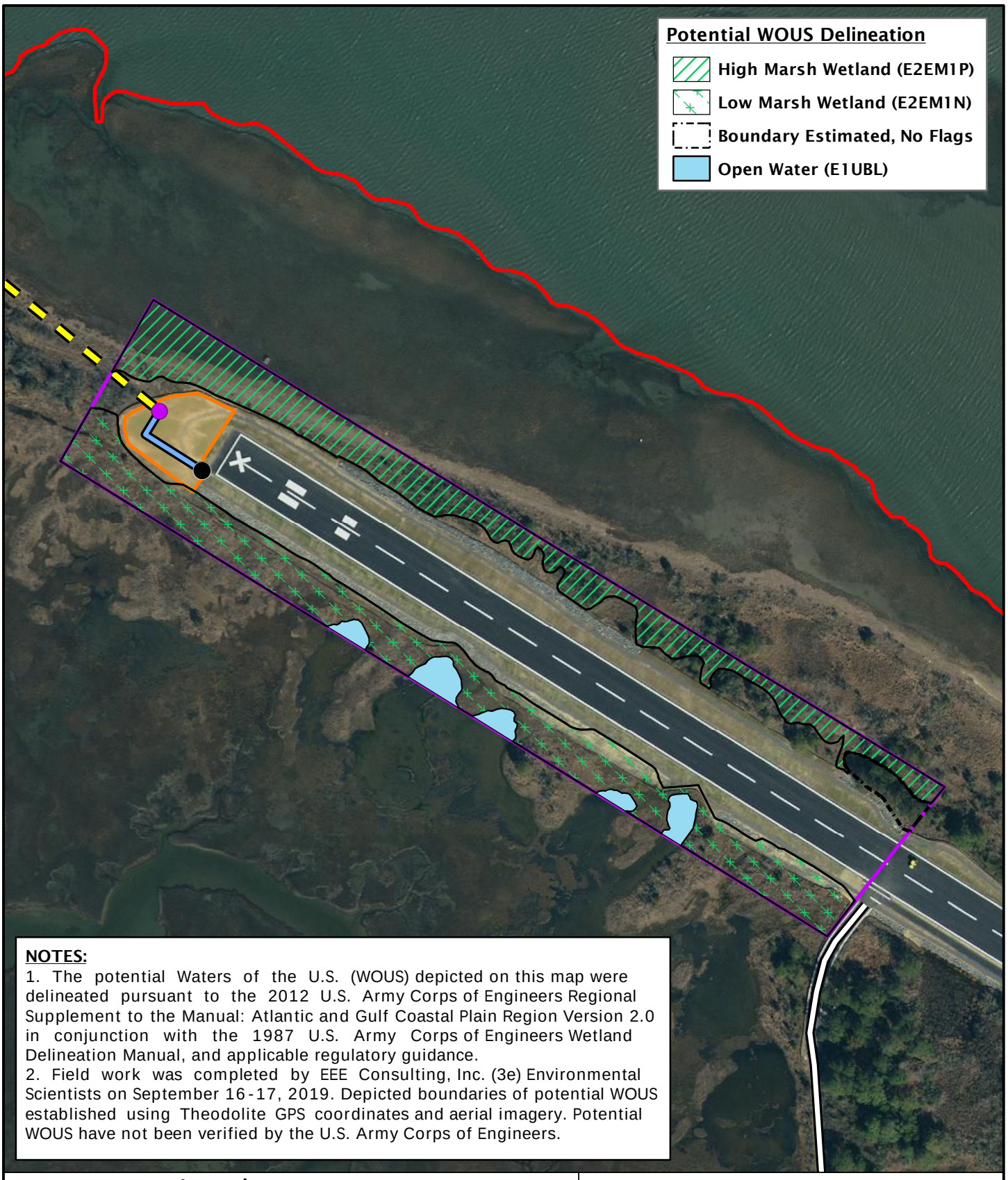
Photo 3-1. Vegetation at Walker Marsh. *Taken September 16, 2019.*

The limits of the September 2019 delineation at the UAS Airstrip included areas west, north, and south of the runway as well as the proposed project site (**Figure 3-2**). Open waters and two wetland types (E2EM1P–estuarine intertidal persistent emergent wetland, irregularly flooded and E2EM1N–estuarine intertidal persistent emergent wetland, regularly flooded) were identified in the UAS Airstrip delineation area **(Figure 3-2** and **Appendix A** for details). However, no wetlands were identified within the limits of disturbance for the proposed UAS Airstrip work area.

During the September 2019 delineation effort for the Marsh Fiber project, wetland scientists evaluated the Boresight Antenna project site and surrounding areas. No wetlands were identified within the Boresight Antenna work area.

The limits of the September 2019 wetland delineation at Walker Marsh were larger than the proposed project limits of disturbance at Walker Marsh. A buffer of 30 m (100 ft) on either side of the proposed cable path was delineated, resulting in a 61-m (200-ft) wide corridor of delineation. A single wetland type comprises the entire 7.8 ha (19.23 ac) Walker Marsh delineation area: estuarine, regularly flooded, intertidal persistent emergent (E2EM1N) (Cowardin 1979). Additionally, any open water within the delineated area was identified, including the three guts crossed by the proposed project path (identified as G1, G2 and G3 on **Figure 3-3**), a small portion of an unnamed inlet in the project path, and open water at the eastern edge of the saltmarsh, resulting in a total of 0.4 ha (1 ac) of Open Water. **Figure 3-3** shows the delineation area and locations of the wetlands and open water.

NASA provided the results of the wetland delineation to the USACE Norfolk District in the wetlands report included as **Appendix A**. In January 2020, the USACE provided a Preliminary Jurisdictional Determination (PJD) confirming the wetland types and boundaries described above and further detailed in the NASA wetlands report (**Appendix A**).



NOTES:

1. The potential Waters of the U.S. (WOUS) depicted on this map were delineated pursuant to the 2012 U.S. Army Corps of Engineers Regional Supplement to the Manual: Atlantic and Gulf Coastal Plain Region Version 2.0 in conjunction with the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual, and applicable regulatory guidance.
2. Field work was completed by EEE Consulting, Inc. (3e) Environmental Scientists on September 16-17, 2019. Depicted boundaries of potential WOUS established using Theodolite GPS coordinates and aerial imagery. Potential WOUS have not been verified by the U.S. Army Corps of Engineers.

Legend

- Existing Handhole
- New Handhole
- Open Trench
- Delineation Area
- Fiber HDD Path
- HDD Work Area
- Access Road
- WFF Boundary

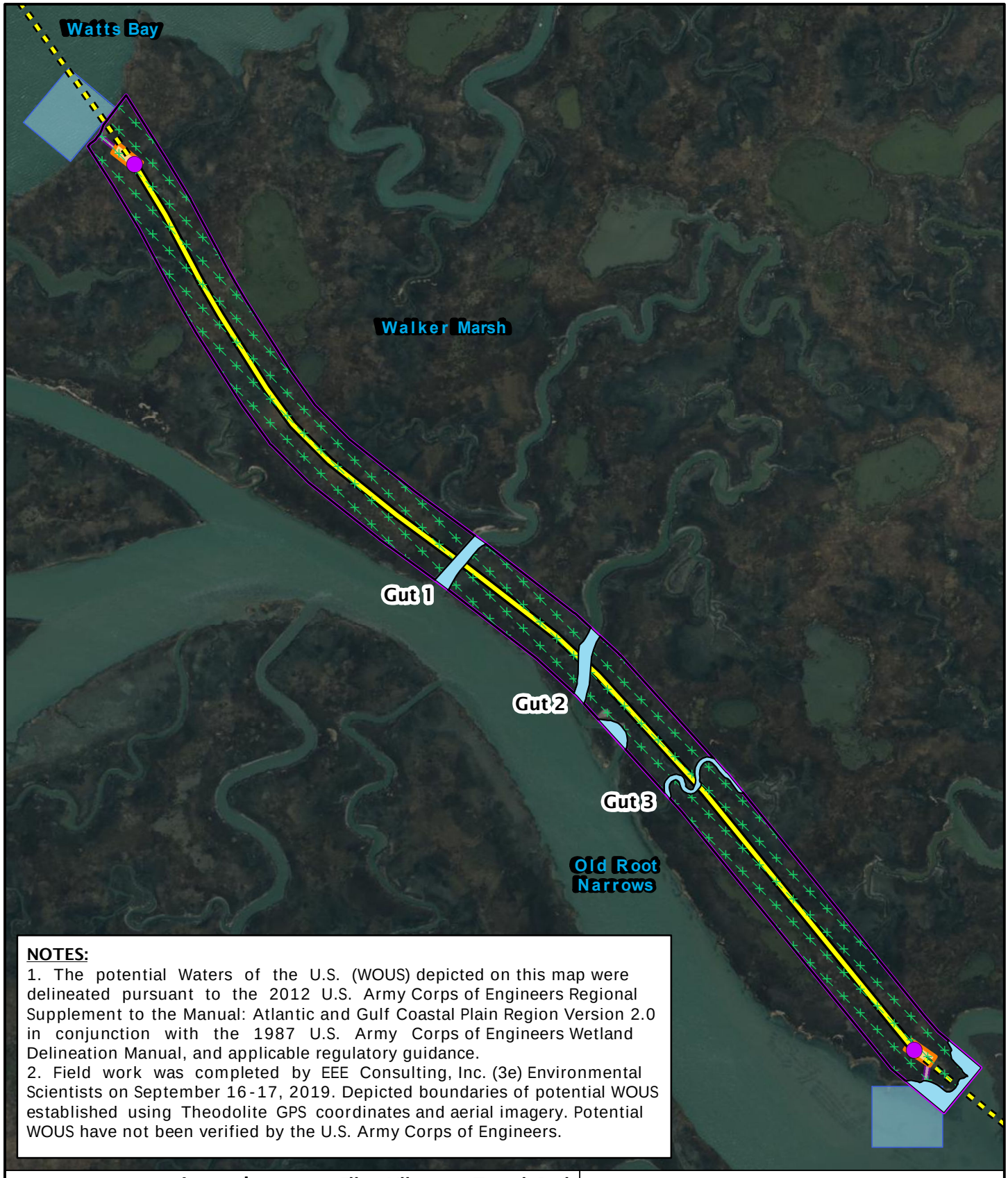
Sources: NASA, VGIN VBMP 2017 Orthoimagery / Prepared by: 3e 19-756 MM
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 3-2
POTENTIAL WATERS OF THE U.S.
UAS AIRSTRIP

0 200 400
Feet

N

NASA WFF Marsh Fiber EA



NOTES:

1. The potential Waters of the U.S. (WOUS) depicted on this map were delineated pursuant to the 2012 U.S. Army Corps of Engineers Regional Supplement to the Manual: Atlantic and Gulf Coastal Plain Region Version 2.0 in conjunction with the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual, and applicable regulatory guidance.
2. Field work was completed by EEE Consulting, Inc. (3e) Environmental Scientists on September 16-17, 2019. Depicted boundaries of potential WOUS established using Theodolite GPS coordinates and aerial imagery. Potential WOUS have not been verified by the U.S. Army Corps of Engineers.

Legend

- Fiber Vibratory Trench Path
- Fiber HDD Path
- New Handhole
- Work Area
- Delineation Area
- Barge Area
- Low Marsh
- Access Matting
- Open Water

Sources: NASA, VGIN VBMP 2017 Orthoimagery / Prepared by: 3e 19-756 MM
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 3-3
POTENTIAL WATERS OF THE U.S.
WALKER MARSH

0 450 900
Feet

N

NASA WFF Marsh Fiber EA

3.7.3.2 *Environmental Consequences*

Significant impacts on wetlands would occur if the Proposed Action caused a net loss of wetlands, or if direct impacts could not be mitigated. Less-than-significant impacts would occur if wetland impacts could be mitigated.

No Action Alternative

The No Action Alternative would have no impacts on wetlands because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect wetlands would occur.

Proposed Action

There would be no impacts on wetlands at the Boresight Antenna or UAS Airstrip project areas since no jurisdictional wetlands were identified at those sites, as confirmed by the USACE in the PJD. Construction activities on Walker Marsh would result in disturbances of and impacts on wetlands as described below.

Temporary Direct Impacts

Temporary direct impacts on wetlands are anticipated from placement and removal of matting; equipment movement and use near the HDD exit pit, excavation, and work areas; handhole enclosures; and for the 4.3-m (14-ft) wide marsh buggy LOD along the vibratory trench pathway. The Proposed Action would result in 0.63 ha (1.55 ac) of temporary direct impacts wetlands.

Although the marsh buggy would be equipped with low-pressure tracks that reduce the potential for rutting, soil compaction, and vegetation damage, there would be temporary minor impacts on wetlands due to ground disturbance from the marsh buggy. NASA would place synthetic composite mats in all Maxi HDD works areas on Walker Marsh, and in any other ground-disturbing areas to the extent practicable to minimize adverse impacts on wetlands. Excavation for the HDD entry pits would create side cast (soil temporarily placed to the side) that would be filled immediately after installation of the conduit.

Disturbed surfaces of the saltmarsh would be removed in layers and replaced in the order they are removed. Layers would be hand smoothed and once work was completed, any bare areas would be seeded with a native seed mix comprised of species observed at the site.

Public signage, as appropriate, would be placed on Walker Marsh to alert the public of project activities at Walker Marsh. NASA assumes that a total of up to five small signs will be hand-installed on small posts at each end of Walker Marsh and at the three open water gut crossings.

There is a potential for temporary direct wetland impacts from accidental leaks or spills from construction equipment or in the occurrence of a frac-out. Temporary, direct impacts could range from negligible to adverse depending on the size of the release of oil, hydraulic fluid (hydrocarbons), or bentonite slurry, and how quickly it could be controlled and remediated. Any spills would be minimized through compliance with all applicable spill prevention and control

requirements. With implementation of a site-specific SWPPP BMPs to avoid potential impacts on surface waters including wetlands, and adherence to CWA permit requirements, the WFF ICP, and a project-specific SPCC, if a release occurred during the Proposed Action, indirect impacts on wetlands are anticipated to be localized and the effects would not be long-term. NASA's contractor would be required to develop and implement a Frac-Out Contingency Plan to reduce the potential for an accidental release of bentonite slurry (Section 3.7.1 *Surface Waters and Stormwater Management* of this EA provides the general measures that would be in this plan).

No compensatory mitigation is required for temporary impacts. However, NASA would replant vegetation as noted in the *Permits and Mitigation* section below.

Temporary Indirect Impacts

Once installed, NASA would likely need to repair the fiber optic cable, which could include small equipment on Walker Marsh to pull cables out of the conduit. Ground disturbance associated with uncovering and repairing the damaged cable could temporarily affect water quality because of the potential for erosion and sedimentation to occur to nearby water resources. However, repairs would be infrequent and brief, and the effects would be limited to the immediate vicinity of the repair site. NASA would implement measures including use of low-pressure ground equipment (the marsh buggy), placement of synthetic composite matting in areas of disturbance, and implement SPCC and ESC BMPs to minimize potential impacts on wetlands.

Permanent Impacts

Permanent impacts on wetlands would occur in the footprint of the handhole enclosures where vegetation and soils would be removed. Permanent impacts would be in the footprint of the handhole, which would be an area of 2.4 m (8 ft) long by 1.2 m (4 t) wide, or a total of 5.9 m^2 (64 ft^2) for both handholes. Excavated soils would be spread out and disturbed areas revegetated according to CWA permit conditions. The Proposed Action would result in 6.0 m^2 (64 ft^2) or 0.0006 ha (0.0015 ac) of permanent impacts to wetlands.

Summary of Impacts

A summary of the temporary and permanent impacts on wetlands associated with the Proposed Action is shown in **Table 3-2**. All impacts would occur at Walker Marsh.

Table 3-2. Direct Wetland Impacts at Walker Marsh

Type of Impacts	Total
Temporary Impacts	0.63 ha (1.55 ac)
Permanent Impacts	0.0006 ha (0.0015 ac)

Note: Hectares not shown for permanent impacts since value would be so tiny as to not be useful

Permits and Mitigation

Impacts on wetlands require permitting under the CWA. Based on the nature of the Proposed Action, NASA anticipates that a USACE Nationwide Permit 12 (Utility Line Activities) along with VMRC Tidal Wetland and Subaqueous Bottom Permits are appropriate. To secure authorization for the unavoidable wetland impacts, NASA has submitted a Joint Permit Application to VMRC, which would be jointly reviewed by the USACE, VDEQ, and the Accomack County Wetlands Board.

A compensatory mitigation plan for permanent impacts is not required for the Nationwide Permit 12 because permanent project impacts are less than 0.04 ha (0.10 ac) and/or 91.4 linear meters (300 linear feet) of WOTUS. The Joint Permit Application includes a Mitigation Plan for the unavoidable impacts to state waters and resources from the Marsh Fiber project.

NASA would mitigate temporary impacts to tidal wetlands (vegetated and un-vegetated) by restoring marsh vegetation in areas where the degree of disturbance to plants would hinder natural revegetation from the existing root mat. NASA would restore soils, substrate, and contours to pre-construction conditions to the extent practicable, and would re-establish native vegetation in accordance with VMRC policy, regulations, and permit conditions.

Potential areas for revegetation include but are not limited to: vibratory plow indirect disturbance (up to 30 cm [12 inches] wide along the plow cut centerline where soils would be disturbed through vibration), underneath synthetic composite matting especially in equipment loading/unloading areas, the Maxi and Mini HDD exit points, and the Mini HDD entry pits. The extent of revegetation would be determined as the work progresses and would be documented and conducted in accordance with permit conditions.

NASA anticipates that the minimum amount of disturbance that may require restoration via replanting is as follows:

- 0.03 ha (0.09 ac) of disturbance associated with the vibratory trenching based on a vibratory trench length of 1,140 linear m (3,730 linear ft) multiplied by 30 cm (12 inches).
- 0.02 ha (0.04 ac) of disturbance associated with the three Mini HDD entrance pit excavation and backfill areas of approximately 56 m^2 (600 ft^2) each for a total replanting area of approximately 167 m^2 (1,800 ft^2).

Monitoring

As part of the permit conditions, NASA would biannually monitor the success of the mitigation site and restoration planting areas. NASA would prepare a monitoring plan for a 3-year period to include:

- data collection,
- monitoring of site conditions (plant mortality, standing cover of living stock, benchmark density in area of viable creation wetlands, wildlife use, soils, and overall health/condition) on a biannual basis, and

- biannual reporting required for VMRC and USACE delivery within 30 days of June 30th and December 31st.

NASA would adhere to all Nationwide Permit 12 and VMRC permit conditions including mitigation and monitoring.

3.7.4 Floodplains

Floodplains are lowland areas located adjacent to bodies of water in which the ordinary high water level fluctuates on an annual basis. EO 11988 *Floodplain Management* requires federal agencies to minimize occupancy and modification of the floodplain. Flood Insurance Rate Maps (FIRMs) are produced by the Federal Emergency Management Agency (FEMA) and delineate the scope of potentially affected floodplains in the project area.

3.7.4.1 *Affected Environment*

The entire Marsh Fiber project area is included on FIRM Community Panel 51001C0265G. All of Wallops Island and Walker Marsh are in the 100-year floodplain (Zone VE). Zone VE is defined as areas along coasts subject to inundation by the 1-percent-annual-chance flood event with additional hazards associated with storm-induced waves. The entire Boresight Antenna project area is in Zone X, outside of the 100- and 500-year floodplains (FEMA 2015).

3.7.4.2 *Environmental Consequences*

Significant impacts on floodplains would occur if the Proposed Action resulted in adverse changes on hydrologic function of the floodplain in the proposed project area.

No Action Alternative

The No Action Alternative would have no impacts on floodplains because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect floodplains would occur.

Proposed Action

NASA evaluated a range of action alternatives to install the proposed fiber optic cable. However, all alternatives but the Proposed Action were dismissed from evaluation in the EA, as described in Section 2.2 of this EA. Because Walker Marsh and Wallops Island are entirely in the 100-year floodplain, there are no practicable alternatives to avoid construction activities and the placement of handholes in the floodplain to install the fiber optic cable between the Main Base and Wallops Island.

The fiber optic cable would be installed and remain below ground, and the ground surface would be returned to its preexisting level following installation. The new handholes would remain in the floodplain. However, in the context of the floodplain in and adjacent to the project area, the area

affected by the handholes would be minuscule and would have no potential to change the functionality of the floodplain. During construction activities at Walker Marsh and the UAS Airstrip, equipment would be temporarily operated in a floodplain, and at the UAS Airstrip materials and equipment would be staged in a floodplain. If a weather event is predicted that could result in flooding of the project areas, NASA would remove any items from the floodplain that would have the potential for impacts or that could be moved by flood waters. With these contingency measures in place, the Proposed Action would have no impacts on the floodplain.

NASA would ensure that its actions comply with EO 11988 *Floodplain Management* and NASA Regulations on Floodplain and Wetland Management to the maximum extent possible. Since the Proposed Action would involve federally funded and authorized construction in the 100-year floodplain, this EA serves as NASA's means for facilitating public review as required by EO 11988.

3.7.5 Coastal Zone

Virginia's federally approved CZM Program is administered by VDEQ. Although federal lands are excluded from Virginia's CZM Program, activities on federal land that have reasonably foreseeable coastal effects must be consistent to the maximum extent practicable with the enforceable policies of the CZM Program (VDEQ 2019b).

3.7.5.1 *Affected Environment*

The Proposed Action has the potential to affect resources within Virginia's designated coastal zone. Therefore, NASA is required to determine the Proposed Action's consistency with the enforceable policies of the Virginia CZM Program.

3.7.5.2 *Environmental Consequences*

Significant impacts would occur if VDEQ determines that the proposed activities and/or its associated impacts are inconsistent with the enforceable policies of Virginia's CZM Program. VDEQ would withhold concurrence with NASA's FCD until the proposed activities and/or proposed mitigation measures have been modified to achieve consistency with the enforceable policies.

No Action Alternative

The No Action Alternative would have no impacts on the coastal zone because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect the coastal zone would occur.

Proposed Action

Construction activities for the Proposed Action would affect coastal resources within Virginia's Coastal Zone. Therefore, NASA has prepared an FCD and has determined that the Proposed Action is consistent with the enforceable policies of Virginia's CZM Program to the maximum extent

practicable (**Appendix B**). NASA is submitting the FCD with the Draft EA to VDEQ for review and concurrence. NASA will incorporate correspondence from VDEQ regarding the FCD in the Final EA and will address VDEQ comments on the FCD in a revised FCD and in the Final EA, as needed.

3.7.6 Sea-Level Rise

Several factors affect sea level, including changes in sea temperature, salinity, and total global water volume and mass. Coastal environments are highly dynamic and particularly vulnerable to climate change and rising sea levels. Sea-level rise is occurring along the Atlantic Ocean coastal zone. A June 2012, report from the U.S. Geological Survey (USGS) states that since about 1990, sea-level rise in the stretch of Coastal Zone from Cape Hatteras, North Carolina to north of Boston, Massachusetts, has increased 2 to 3 mm (0.08 to 0.12 in) per year (USGS 2012).

3.7.6.1 *Affected Environment*

Wallops Island has experienced shoreline changes throughout the six decades that NASA has occupied the area. Scientists from NASA's Goddard Institute for Space Studies (GISS) used local data to refine global climate model outputs, making the projections WFF-specific, as described in Section 3.5.1.9 of the *Final Site-wide PEIS*. Outputs of the GISS models project rising average sea levels for the Wallops area over the next 80 years (NASA GISS 2013). The USACE applied data from three coastal locations (Maryland, Delaware and Virginia) to project sea-level rise over a 50-year period at Wallops Island between 2010 and 2060. The results showed a range from 0.17 to 0.69 m (0.56 to 2.25 ft) for the analysis period (USACE 2010).

NASA incorporates sea-level rise into their planning and project designs, particularly for any facilities at Wallops Island. WFF's Facilities Management Division currently builds all facilities a minimum of 3.4 m (11 ft) amsl on Wallops Island to account for current sea-level rise projections. Any construction less than 3.4 m (11 ft) amsl must be hardened or raised to avoid flooding from storm surge (NASA 2010).

3.7.6.2 *Environmental Consequences*

Significant impacts would occur if either the proposed action caused an appreciable increase in the factors that affect sea-level rise or if sea-level rise affected the ability of the proposed action to function as designed.

No Action Alternative

There would be no effects from sea-level rise under the No Action Alternative because no human-built infrastructure or facilities contributing to sea-level rise, or activities that would add significant GHGs to the atmosphere would occur. Moreover, sea-level rise would not impact the No Action Alternative because nothing would be built in a coastal area that would be subject to sea-level rise.

Proposed Action

The installation and operation of the proposed fiber optic cable would not contribute to sea-level rise. However, the handhole enclosure infrastructure on Walker Marsh, and to a lesser extent at the UAS Airstrip, would be susceptible to sea-level rise. NASA would construct the enclosures such that the top of the handhole enclosures would be well above the base flood elevation.

Depending on the extent of future sea-level rise at the project site, the handholes may need to be elevated further or eventually replaced with structures that extend higher above the saltmarsh ground surface. As noted in the *Final Site-wide PEIS*, NASA would implement an adaptive management strategy regarding sea-level rise and its effects on project infrastructure and would modify existing structures and processes as needed. The scale of the Proposed Action is small relative to other human and naturally occurring activities that influence sea-level rise and therefore, would have no potential to contribute to sea-level rise. As such, impacts from sea-level rise on the Proposed Action would be negligible.

3.8 Vegetation

Vegetation consists of common native and non-native plant communities. Special-status vegetation species are discussed in Section 3.11 *Special Status Species*.

3.8.1 Affected Environment

Vegetation on the north end of Wallops Island consists of forested uplands, maritime grasslands, non-tidal wetlands (emergent and scrub-shrub) and tidal wetlands. The dominant habitat surrounding the proposed UAS Airstrip project area is tidal marsh that transitions into upland grass areas adjacent to the runway (**Photo 3-2**).

Photo 3-2. Vegetation in the vicinity of the UAS Airstrip. *Photo taken September 16, 2019.*

Additional information on wetland vegetation is provided in Section 3.7.3 *Wetlands*. Within the footprint of the proposed UAS Airstrip project area, native vegetation was removed for construction of the airstrip and the entire proposed project site has been maintained by mowing since the runway was built in 2016 as an obstruction-free zone to facilitate safe operation of aircraft using the runway (**Photo 3-3**).

Photo 3-3. Vegetation at the UAS Airstrip project site. *Photo taken September 16, 2019.*

Vegetation around the Boresight Antenna is primarily mature pine with mixed hardwoods, with dominant tree species including loblolly pine (*Pinus taeda),* black cherry (*Prunus serotina),* American holly (*Ilex opaca),* and eastern red cedar (*Juniperus virginiana*). The proposed project site at the Boresight Antenna is surrounded by mature trees, but the area within the proposed project footprint is maintained by mowing (**Photo 3-4**).

Photo 3-4. Vegetation at the Boresight Antenna project site. *Photo taken September 16, 2019.*

Common species that occur in areas maintained by mowing are crabgrass (*Digitaria sanguinalis*), Bermuda grass (*Cynodon dactylon*), meadow fescue (*Schedonorus pratensis*), bluegrasses (*Poa* spp.), sheep sorrel (*Rumex acetosella*), chickweeds (*Cerastium* spp.), and other non-native weedy species.

Vegetation at Walker Marsh consists entirely of a low tidal marsh community, with dominant species including short form saltmarsh cordgrass, saltbushes, saltmeadow hay, saltwort and sea lavender. A more detailed discussion of wetland vegetation at Walker Marsh is provided in Section 3.7.3 *Wetlands*.

3.8.2 Environmental Consequences

Impacts on vegetation would be considered significant if species or habitats of concern were substantially affected over relatively large areas or habitat disturbances resulted in reductions in the population size or distribution of a species, or the introduction of non-native invasive species (i.e., *Phragmites australis*) to sensitive habitats.

3.8.2.1 *No Action Alternative*

The No Action Alternative would have no impacts on vegetation because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect vegetation would occur.

3.8.2.2 *Proposed Action*

Impacts on vegetation at Walker Marsh are discussed in Section 3.7.3 *Wetlands* and are not discussed further in this section.

Construction activities would disturb vegetation at the Maxi HDD work/staging areas at both the Boresight Antenna and UAS Airstrip. Both HDD work/staging areas have been previously disturbed, are maintained by mowing, and consist of low-growing vegetation. No noteworthy vegetation species are present in these areas, and no mature trees would be removed by the proposed project activities. After the project is completed (approximately 90 days), vegetation in the Maxi HDD work/staging areas would be restored to pre-construction conditions. Contractors would adhere to applicable NASA and/or USFWS policies to prevent the introduction of invasive species by vehicles and equipment during construction activities. New vegetation would be planted as needed in accordance with applicable NASA WFF and USFWS vegetation management policies. Short-term adverse impacts on vegetation from the Proposed Action would be minor.

Installation of the four handholes (two at Walker Marsh and one each at the UAS Airstrip and Boresight Antenna; see Section 2.3.1.4) would result in the permanent loss of approximately 12 m^2 (128 ft^2) of vegetation in the project area (each handhole would have an area of 2.9 m^2 [32 ft^2];

see Section 2.2.3.2). Because existing vegetation in the footprints at the Boresight Antenna and the UAS Airstrip comprises grasses that are maintained by mowing, impacts would be negligible.

Minor short-term impacts on vegetation would occur in the area surrounding the handholes during repair from ground disturbances associated with equipment and workers accessing and working in the area adjacent to the handholes. At the Boresight Antenna and UAS Airstrip handholes, maintenance of vegetation (mowing and weed eating) around the handhole enclosures would occur along with regular vegetation management activities in those areas.

3.9 Wildlife

Wildlife addressed in this section consists of common terrestrial and aquatic mammals, reptiles, amphibians, birds, fish, and invertebrates that are not federally or state-listed as threatened, endangered, or otherwise protected. Special-status species, including birds protected by the Migratory Bird Treaty Act (MBTA), are discussed in Section 3.11 *Special Status Species*.

3.9.1 Affected Environment

Representative mammal, reptile, bird, and invertebrate species found at and in the vicinity of the proposed project are discussed below.

3.9.1.1 *Terrestrial*

Mammals

As noted in the *Final Site-wide PEIS*, the only large mammal that occurs at WFF is the white-tailed deer (*Odocoileus virginianus*). Other mammals commonly found in the upland project areas (the area of the Boresight Antenna and the UAS Airstrip) include the red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), eastern grey squirrel (*Sciurus carolinesis*), white-footed mouse (*Peromyscus leucopus*), meadow vole (*Microtus pennsylvanicus*), river otter (*Lontraauruses*), and eastern cottontail (*Sylvilagus floridanus*). These mammals may use the proposed project areas for nesting, breeding, and foraging.

Semi-aquatic mammals such as river otter and common muskrat (*Ondatra zibethicus*) may inhabit Walker Marsh, but due to the marsh island's geographic separation from the mainland and lack of suitable habitat conditions, solely terrestrial mammals (e.g. opossum, squirrel) are unlikely to inhabit Walker Marsh.

Reptiles and Amphibians

Reptiles and amphibians found in the terrestrial project areas typically include Fowler's toad (*Anaxyrus fowleri*), green treefrog (*Hyla cinerea*), eastern ratsnake (*Pantherophis alleghaniensis*), eastern hognose snake (*Heterodon platirhinos*), fence lizard (*Sceloporus undulates*), eastern box turtle (*Terrapeneaurue*), and northern diamond-backed terrapin (*Malaclemys terrapin*). Green

treefrogs are often found in freshwater depressions on Wallops Island and Fowler's toads are found under stands of bayberry. Eastern ratsnakes, hognose snakes, and box turtles are often found in scrub-shrub habitat and the diamondback terrapin utilizes saltmarsh, tidal flats, and lagoons (NASA 2017). Five species of sea turtle, all of which are federally threatened or endangered, are known or have potential to occur in marine waters surrounding WFF. Sea turtles are discussed in Section 3.11 *Special Status Species*.

Invertebrates

Invertebrates occur in all terrestrial habitat types in the proposed project areas. However, their diversity is highest in marsh and wetlands areas. Common insects occurring at WFF include the salt marsh grasshopper (*Orchelium fidicinium*), planthoppers (*Prokelisia* spp.), salt marsh mosquitoes (*Ochlerotatus* spp.), greenhead flies (*Tabanus nigrovittatus*), and various wasps and parasitic flies. Spiders and mites are also common (NASA 2019a).

3.9.1.2 *Aquatic*

Fish

Common fish species found in the waters near Wallops Island include Atlantic croaker (*Micropogonias undulates*), sand shark (*Carcharias aurus*), smooth dogfish (*Mustelus canis*), smooth butterfly ray (*Gymnura micrura*), bluefish (*Pomatomidae saltatrix*), spot (*Leiostomus xanthurus*), and summer flounder (*Paralichthys dentatus*). During the summer months, variations in salinity and water depth are influencing factors on the presence of coastal fish species in the bays and inlets around WFF (NASA 2019a).

The tidal marsh areas near Wallops Island and Walker Marsh provide nursery habitat for a variety of fish species due to the protection the marsh grasses provide and the abundance of food. Marsh grasses, for example, provide protection to spot, northern pipefish (*Syngnathus fuscus*), dusky pipefish (*Syngnathus floridae*), and bay anchovy (*Anchoa mitchilli*) (NASA 2017).

Invertebrates

Most major invertebrate groups are found in nearshore sandy environment around the proposed project areas including mollusks (e.g., clams and whelks), crustaceans (e.g., crabs, shrimp, and amphipods), and polychaetes (marine worms). Other species of decapod crustaceans, stomatopod crustaceans, and cephalopods also occur in the nearshore area (U.S. Navy 2014). The abundance of many of these species changes seasonally.

Waters adjacent to the proposed project sites contain public and private shellfish harvesting areas, which are discussed in Section 3.10 *Aquaculture*.

3.9.1.3 *Avian*

Consistent with its coastal setting, birds are abundant in and around the proposed project areas. Much of WFF is located within the Barrier Island Lagoon System Important Bird Area and along the Atlantic Flyway, a migratory corridor for land and water birds along the East Coast of the United States. The area has also been designated as a United Nations Educational, Scientific, and Cultural Organization (UNESCO) Biosphere Reserve and a Western Hemisphere Shorebird Reserve Site (NASA 2019a). Barrier islands such as Wallops Island provide particularly important habitat for migratory birds. Some migratory species use the island as a stopover point, while others overwinter there. The highest concentrations of migratory birds tend to occur on the bay side (west side) of Wallops Island (NASA 2019a) and in the marsh habitats surrounding WFF.

At least 56 bird species are known or have potential to occur in or near the project area. The more common species include a variety of songbirds, raptors, waterfowl, and shorebirds/wading birds. Raptors occur mainly in the marsh areas west of Wallops Island, but great horned owls (*Bubo virginianus*) have been observed in coastal forest habitat. Waterfowl species frequently overwinter in areas around the project study area (NASA 2019a).

Most bird species in the proposed project area are protected by the MBTA and/or are considered Birds of Conservation Concern (BCC). The MBTA, BCC, and federally and state listed bird species are discussed in Section 3.11 *Special Status Species*.

3.9.2 Environmental Consequences

Determination of the significance of potential impacts on terrestrial wildlife is based on the sensitivity of the wildlife to the proposed activities. Impacts on terrestrial wildlife would be considered significant if a species was substantially affected over relatively large areas or if disturbances resulted in reductions in the population size or distribution of one or more species.

3.9.2.1 *No Action Alternative*

The No Action Alternative would have no impacts on wildlife because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect wildlife resources would occur.

3.9.2.2 *Proposed Action*

The Proposed Action would primarily affect terrestrial habitat, and minor amounts of marine habitat from disturbances of the subaqueous bottom. Impacts on special status species are discussed in Section 3.11 *Special Status Species*.

Direct Impacts

There would be short-term direct impacts on wildlife (terrestrial, aquatic and avian) from temporary habitat loss within the project area while equipment, materials and workers were

present. There would be long-term direct impacts on terrestrial wildlife from the permanent loss of approximately 2.9 m^2 (32 ft^2) of habitat in the footprint of each of the new handholes, for a total of 12 m^2 (128 ft^2) for all four handholes.

In some cases, slower-moving or less-mobile terrestrial individuals may be inadvertently destroyed by construction vehicles and equipment, resulting in direct adverse impacts on individuals. For immobile invertebrates inhabiting the subaqueous bottom in the Walker Marsh guts and where barges may be anchored, individuals in the footprint of disturbance could potentially be destroyed. While the inadvertent destruction of individuals would represent an adverse effect, such effects would occur at the individual rather than community, population, or species level and would not prevent the continued propagation of those species. These species are expected to reestablish following the completion of project activities.

There would also be direct impacts on wildlife (terrestrial, aquatic and avian) from noise generated by construction equipment and vehicles, increased human presence and associated noise, and disturbance of subaqueous habitat and sediments from anchoring of barges adjacent to Walker Marsh and the marsh buggy crossing the guts in Walker Marsh. These disturbances may temporarily displace species inhabiting those areas. Highly mobile individuals would likely relocate to adjacent or nearby areas providing similar habitat. It is anticipated that increased human activity in the work areas would initially alert most animals in and near those areas and result in them relocating to nearby areas offering similar habitat.

For mobile aquatic species such a fish, construction activities and associated noise and vibrations generated from work on the saltmarsh, particularly near the shoreline (such as the Maxi HDD work areas, the Mini HDD bordering the guts) would result in temporary impacts. Additional impacts would be generated from in-water activities including use of boats and barges to transport materials, equipment and workers to/from Walker Marsh, anchoring of the barges, and the marsh buggy crossing the guts.

The degree of disturbance or avoidance behavior exhibited by such species would depend on their tolerance of human presence and human-generated noise. Construction activities in Walker Marsh would be of limited duration (approximately 30 days), with mobilization and demobilization and associated boat/barge traffic intermittently over 90 days. Installation activities would occur on one side of the marsh at a time because the same work crew and equipment would work sequentially from one side of the marsh to the other during the 30-day period of construction on Walker Marsh. Fish would return to the area quickly when the activities creating disturbances cease.

Disturbance of subaqueous bottom would suspend sediments in the water column. However, because the amount of disturbed sediment would be relatively minimal, and sediment would quickly resettle, the disturbance would be unlikely to adversely affect aquatic/marine organisms. If needed, turbidity curtains would be used to contain suspended sediments in a localized area immediately surrounding the disturbed sites.

Generally, activities associated with the Proposed Action would be of relatively short duration (approximately 90 days). Additionally, some mobile wildlife may be accustomed to human activities such as commercial boating in and around the project area. Such activities would not be particularly unusual or disruptive to wildlife.

Avoidance and/or temporary relocation behaviors exhibited by wildlife during construction activities would be a minor adverse effect. Wildlife would be expected to return to the project areas upon the completion of project activities and to resume common breeding, nesting, and foraging behaviors. Effects are expected to occur at the individual, rather than community, population, or species level, and would not limit or prevent the continued propagation of any wildlife.

Indirect Impacts

Although bentonite is a naturally occurring clay (IMA-NA 2020), an inadvertent release of drilling mud (bentonite slurry) into marine waters may result in indirect impacts on fish and invertebrates. Because bentonite would behave as a suspended sediment if discharged in water (ASCE 2005), when it settles out, benthic invertebrates, aquatic plants, and fish and their eggs can be smothered by the fine particles. Although the bentonite slurry is not toxic, the tiny micro-particles of bentonite could attach to fish gills and cause them to suffocate due to the lack of oxygen (Jefferis & Lam 2013).

Adherence to the Frac-Out Contingency Plan, which would include steps to contain and remediate an inadvertent release of drilling mud, would minimize the potential for indirect adverse impacts from HDD operations on marine wildlife and habitat in and around the project area. To minimize potential impacts to benthic invertebrates, aquatic plants, and fish and their eggs, NASA may require the construction contractor to use non-toxic polymer additives, which could be combined with the bentonite clay, as part of the Frac-Out Contingency Plan.

A site-specific SWPPP would be prepared and implemented in compliance with VPDES regulations, which would minimize impacts on water quality from ground disturbances in all project areas. NASA would restore the areas of vegetation disturbed by construction activities, in accordance with applicable NASA and USFWS vegetation management policies, which would provide wildlife habitat equal to what was available prior to the project.

Periodic maintenance of vegetation around the handhole enclosures and accessing the handholes for repair of the cable would have the potential to temporarily startle and/or displace individuals of terrestrial wildlife species near the Boresight Antenna, UAS Airstrip, and at Walker Marsh. Such activities would occur infrequently (i.e., a few times each year), be of short duration (i.e., a few hours), and affect small areas of vegetation/habitat. At the Boresight Antenna and UAS Airstrip handholes, maintenance of vegetation (mowing and weed eating) around handholes would occur along with regular vegetation management activities in those areas. These activities would have the potential to disturb only a small number of individuals and would not delay or prevent the continued propagation of any species.

Therefore, the Proposed Action would have no or negligible long-term impacts on common wildlife species in and near the project area. To minimize short-term and long-term impacts on wildlife, NASA would incorporate the following mitigation, monitoring, and adaptive management measures:

- Prepare and adhere to a Frac-Out Contingency Plan to provide procedures and steps to contain an inadvertent release of drilling mud.
- Prepare and adhere to a SWPPP in accordance with VPDES regulations to minimize impacts on water quality from ground disturbance at the HDD work sites.
- Consider the use of sediment curtains in areas of subaqueous disturbance in the Walker Marsh guts to prevent or minimize the downstream migration of disturbed sediments and ensure sediments resettle near their original location.
- Plant new vegetation in accordance with applicable WFF and USFWS vegetation management policies to restore habitat in areas where vegetation has been removed and/or damaged.

3.10 Aquaculture

VMRC promotes and regulates clam and oyster farming and gardening, also known as shellfish aquaculture, in the subaqueous lands of Virginia. VMRC provides oyster ground leases to individuals who wish to conduct aquaculture in approved areas, and also issues permits and licenses depending on location, aquaculture method, and whether the shellfish will be sold commercially (VMRC 2019a).

In addition to issuing private aquaculture leases, Virginia committed to maintain public access to the natural oyster beds identified in the 1890's by James Baylor of the U.S. Coast and Geodetic Survey. These public areas are designated by VMRC as Baylor grounds and are mandated to be "… held in trust for the benefit of the people of the Commonwealth."

3.10.1 Affected Environment

As shown on **Figure 3-4**, waters in the project area contain public and private shellfish harvesting areas (Virginia Coastal Zone Management Program 2019), which are summarized below:

- Private oyster grounds in Watts Bay, Ballast Narrows, Old Root Narrows, and an unnamed channel connecting Watts Bay and Old Root Narrows.
- Public oyster grounds (Baylor Grounds), which are present in one of the three guts that would be crossed by the marsh buggy, in Watts Bay, in a gut that lies above the Maxi HDD cable route on the east end of Walker Marsh, and other waters surrounding Walker Marsh.
- Public clamming grounds in the channels along the north and south sides of Walker Marsh.
- A commercial shellfish aquaculture north of Wallops Island west of the UAS Airstrip.

- Three state constructed oyster reefs west of Walker Marsh.

3.10.2 Environmental Consequences

Significant impacts on aquaculture would occur if areas of public and/or private shellfish grounds were permanently damaged and/or permanently removed from production due to changes in land use.

3.10.2.1 *No Action Alternative*

The No Action Alternative would have no impacts on aquaculture because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect aquaculture would occur.

3.10.2.2 *Proposed Action*

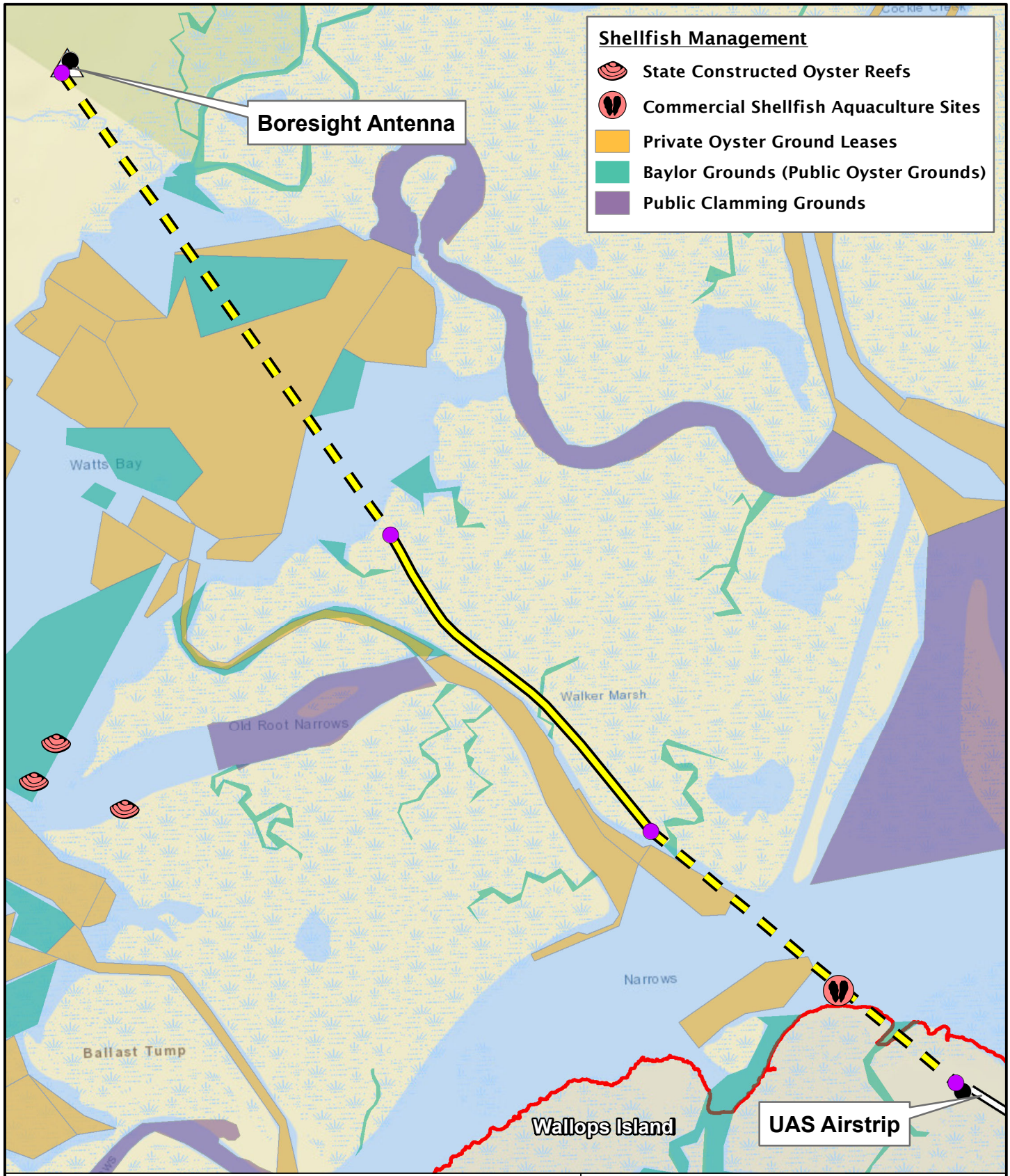
During consultation with VMRC regarding potential impacts to Baylor Grounds, VMRC's Chief of the Habitat Management Division stated that the HDD portion of the Proposed Action would be considered a federal action and would constitute a public use of Baylor Grounds. VMRC stated that the Proposed Action would not impact Baylor Grounds as the fiber optic cable would run under the subaqueous bottomlands (Personal Communication Watkinson 2019).

Temporary moorings including barge spuds and anchors would be required at two nearshore locations at the western and eastern ends of Walker Marsh. Temporary impacts to subaqueous bottom at each mooring location would be necessary to secure and stabilize the barge and other construction watercraft.

The exact locations and type of moorings have not been determined. Mooring locations would be selected based on avoiding impacts to oyster beds, the draft of the barges, water depth, and proximity to shoreline. Barges would be positioned and barge anchors and spuds deployed in a manner to avoid disturbance to oyster beds to the maximum extent practicable. NASA anticipates that disturbance to the subaqueous bottom would total a maximum of approximately 7.4 m^2 (80 ft^2).

Potential temporary disturbances to the subaqueous bottom and shellfish grounds could result from the marsh buggy crossing the Walker Marsh guts. NASA would implement mitigation measures as necessary during construction to avoid and/or minimize impacts. These measures may include use of the synthetic or timber matting and/or crossing the guts at high tide to avoid and minimize impacts to shellfish grounds and subaqueous bottoms.

Disturbance of the subaqueous bottom in the guts at Walker Marsh or from mooring the barge would not affect the long-term viability of public or private oyster grounds in those areas.



Legend

- New Handhole
- Existing Handhole
- Fiber HDD Path
- Fiber Vibratory Trench Path
- Wallops Flight Facility Boundary

Sources: NASA, VA Coastal Zone Management Program (coastalgems.org), VA Marine Resources Commission Chesapeake Bay Web Map, Marine Cadastre National Viewer (Aquaculture - Private Oyster Leases), ArcGIS Online (Baylor Grounds Layer), ESRI World Street Basemap
Prepared by: 3e 19-756 MM / Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 3-4
SHELLFISH GROUNDS
WALLOPS FLIGHT FACILITY

0 1,350 2,700
Feet

N

NASA WFF Marsh Fiber EA

Prior to construction, NASA would secure all necessary permits and permissions from VMRC to conduct work in waters overlying public and private oyster beds and in the subaqueous bottom of public and private oyster beds. NASA anticipates the need to obtain both a Subaqueous Bottom Permit and a Tidal Wetlands Permit from VMRC for the Marsh Fiber project, both of which would be part of the Joint Permit Application submittal to VMRC.

3.11 Special Status Species

This section addresses special-status species that are federally or state listed as threatened or endangered or otherwise protected by federal and/or state legislation. Section 7 of the Endangered Species Act (ESA) (16 U.S.C. 1531-1544, as amended) requires federal agencies to consider the effects of their actions on federally listed species and designated critical habitat and to take steps to conserve and protect these species and habitats. Birds of Conservation Concern (BCC) are species that are likely to become candidates for listing under the federal ESA without additional conservation measures. The Virginia ESA (29 VAC 1-563–29.1-570) prohibits the taking, transport, processing, sale, or offer for sale of any federally or state listed threatened or endangered species. NASA voluntarily complies with Virginia's ESA. NASA also recognizes species listed by the Commonwealth of Virginia at potential risk of extinction.

The MBTA establishes federal responsibilities for protecting nearly all migratory species of birds, their eggs, and their nests. More than 1,000 species, including most birds native to the U.S., are protected under the MBTA. The 2018 M-Opinion issued by USFWS concluded that "the take of birds resulting from an activity is not prohibited by the MBTA when the underlying purpose of that activity is not to take birds." Since taking of any migratory bird species is not the purpose of the Proposed Action, potential impacts to MBTA are not evaluated in this EA.

Although delisted from the federal Endangered Species List in 2007, the bald eagle (*Haliaeetus leucocephalus*) remains protected under the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668c). The BGEPA prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles. Taking also includes their parts, nests, or eggs, and molesting or disturbing the birds.

EFH is defined by the Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1976 as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity." The MSA requires federal agencies to consider the effects of their proposed actions on EFH when applicable. NOAA's National Marine Fisheries Service (NMFS) has regulatory jurisdiction over EFH. EFH may be designated for an individual species or an assemblage of species.

Since marine mammals primarily inhabit offshore waters, the Proposed Action would have no potential to affect these species, which are protected under the Marine Mammal Protection Act. Although marine mammals such as common bottlenose dolphin *(Tursiops truncatus truncatus)*, harbor seal *(Phoca vitulina)*, and harbor porpoise *(Phocoena phocoena)* occur in the Atlantic

Ocean nearshore waters of Wallops Island, they are not expected to be present in the marine waters surrounding Walker Marsh and between Walker Marsh and Assateague Island and would not be impacted by the Proposed Action. Therefore, marine mammals are not evaluated in this EA.

3.11.1 Affected Environment

3.11.1.1 *Federal and State-Listed Special Status Species*

In 2019, USFWS issued a combined Biological Opinion (BO) for Proposed and Ongoing Operations and Shoreline Restoration/Infrastructure Protection Program at WFF (USFWS 2019). As part of the terms and conditions of the BO to manage special-status species, WFF annually updates and administers a *Protected Species Monitoring Plan* (NASA 2019c). This plan outlines procedures for monitoring protected species that are likely to occur at Wallops Island including: seabeach amaranth, red knot, piping plover, northern long-eared bat, and sea turtles. Monitoring reports for these species are prepared annually by WFF and are submitted to the USFWS.

Federally and state-listed species with the potential to occur in or near the proposed project areas are listed in **Table 3-3**. Details about the species listed in the table are provided in the *Final Site-wide PEIS* (NASA 2019a).

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Table 3-3. Federally and State-Listed Species with Potential to Occur in the Proposed Project Areas and Determination of Effects					
Common Name	**Scientific Name**	**Status[1]**	**Habitat Type**	**Notes**	**Determination of Effect**
Plants					
Seabeach amaranth	*Amaranthus pumilus*	FT, ST	Areas seaward of primary dunes	Species has not been documented at WFF; nearest documented occurrence is on Assateague Island. No beach in the project limits; therefore, no suitable habitat present.	No effect
Mammals					
Northern long-eared bat	*Myotis septentrionalis*	FT, ST	Summer: Under bark, or in cavities or crevices of live and dead trees Winter: Caves and mines	Suitable habitat is present at WFF; however, no *Myotis* guild was detected during bat acoustic and netting surveys conducted in 2017 and 2018. No trees would be removed as part of the Proposed Action. No maternity roost trees or winter hibernacula suitable for the species have been documented at or near Wallops Island (VDGIF 2019).	No effect
Sea Turtles					
Loggerhead sea turtle	*Caretta caretta*	FT, ST	Coastal and offshore ocean waters; Wallops and Assateague Island beaches	Most prevalent sea turtle species around WFF; periodically nests on Wallops and Assateague Island beaches (NASA 2018; USFWS 2019). Loggerhead nests have been observed on Wallops Island beaches as recently as 2013. Greatest in-water concentrations over continental shelf (Shoop and Kenney 1992); however, species is also found in deeper waters (Mansfield et al. 2009). Proposed Action unlikely to affect species; bore pits and equipment access to handholes not located in nesting habitat. Potential occurrence in project area: adults and juveniles migrating and foraging from May–November (NOAA 2019). NMFS Protected Species Division responded via email on 9/26/19 to NASA's request for Section 7 ESA consultation for the Marsh Fiber Project with the following: "*Although four species of sea turtles and Atlantic sturgeon originating from five listed Distinct Population Segments (DPS) are known to occur along the coastal waters of Virginia, based on the activities associated with the project, the location of the project, and information you provided in your email and letter, we believe that these species will not be exposed to any direct or indirect effects of the action."*	No effect

Table 3-3. Federally and State-Listed Species with Potential to Occur in the Proposed Project Areas and Determination of Effects					
Common Name	**Scientific Name**	**Status[1]**	**Habitat Type**	**Notes**	**Determination of Effect**
Leatherback sea turtle	*Dermochelys coriacea*	FE, SE	Coastal and offshore ocean waters	Nesting in the project area is unlikely; only one individual demonstrating nesting behavior documented on Assateague Island in 1996 (Rabon et al. 2003). Generally considered oceanic; however, will forage in coastal areas if prey species are available in high densities (Eckert et al. 2006). Potential occurrence in project area: adults and juveniles migrating and foraging from May–November (NOAA 2019). As noted under notes for Loggerhead sea turtle above, in response to ESA consultation for the Marsh Fiber project, NMFS stated that "*these species will not be exposed to any direct or indirect effects of the action*."	No effect
Hawksbill sea turtle	*Eretmochelys imbricata*	FE, SE	Coastal ocean waters	Unlikely to occur in or near the project area; only two observations in Virginia since 1979 (Mansfield 2006). As noted under notes for Loggerhead sea turtle above, in response to ESA consultation for the Marsh Fiber project, NMFS stated that "*these species will not be exposed to any direct or indirect effects of the action*."	No effect
Kemp's ridley sea turtle	*Lepidochelys kempii*	FE, SE	Coastal ocean waters	Traditionally nests in Mexico; however, first Virginia nest discovered in 2012 at Virginia Beach (VANG 2019), with a second nest at False Cape in summer 2014 (VDGIF 2016). Generally occurs in more sheltered, shallower water habitats than other sea turtle species (Ogren 1989). Potential occurrence in project area: adults and juveniles migrating and foraging from May–November (NOAA 2019). As noted under notes for Loggerhead sea turtle above, in response to ESA consultation for the Marsh Fiber project, NMFS stated that "*these species will not be exposed to any direct or indirect effects of the action*."	No effect
Atlantic green sea turtle	*Chelonia mydas*	FT, ST	Coastal ocean waters	Nesting unlikely; only one documented nest in Virginia at Virginia Beach in 2005. Potential occurrence in project area: adults and juveniles migrating and foraging from May–November (NOAA 2019). As noted under notes for Loggerhead sea turtle above, in response to ESA consultation for the Marsh Fiber project, NMFS stated that "*these species will not be exposed to any direct or indirect effects of the action*."	No effect
Birds					

Table 3-3. Federally and State-Listed Species with Potential to Occur in the Proposed Project Areas and Determination of Effects

Common Name	Scientific Name	Status[1]	Habitat Type	Notes	Determination of Effect
Red knot	*Calidris canutus*	FT, ST	Wallops Island beaches	Present May through July during spring migration. Regularly forages on Wallops, Assateague, and Assawoman Island beaches during northerly spring migration (NASA 2018, USFWS 2020). The Proposed Action would not occur on beaches or near red knot habitat.	Not likely to adversely affect
Piping plover	*Charadrius melodus*	FT, ST	Sandy beaches and tidal flats along the Wallops Island shoreline	Transient and summer resident of the upper Virginia barrier islands. Regularly nests and forages on Wallops, Assateague, and Assawoman Island beaches (NASA 2018; USFWS 2016, USFWS 2020). The Proposed Action would not occur on beaches or near piping plover habitat.	Not likely to adversely affect
Roseate tern	*Sterna dougallii dougallii*	FE, SE	Offshore ocean waters	Rarely observed along the U.S. coast south of New Jersey; may transit over oceanic waters off WFF during seasonal migration (Nisbet 1984).	No effect
Eastern black rail	*Laterallus jamaicensis jamaicensis*	Proposed FT, SE	Salt and brackish marshes with dense cover and upland areas of such marshes	Species has recently been documented at WFF and suitable habitat is present at and near WFF, including Walker Marsh. Through informal conference with USFWS conducted on 8/16/2019, NASA would incorporate a time-of-year (TOYR) between April 1 and August 31 to avoid potential adverse effects on the species. Therefore, NASA anticipates that the species would not be present during project activities.	Not likely to adversely affect
Wilson's plover	*Charadrius wilsonia*	SE	Similar to piping plover	No active nests detected on Wallops Island (NASA 2019c); active nests on Assateague Island and two adjacent islands to the south (Boettcher 2013). Historically known to nest with the piping plover.	Not likely to adversely affect
Peregrine falcon	*Falco peregrinus*	ST	Elevated naturally occurring and human-made structures, almost always near water	One human-made peregrine falcon nesting tower is located on west side of north Wallops Island and has been historically used by a pair of falcons. May occur on WFF Wallops Island during migration.	Not likely to adversely affect
Loggerhead shrike	*Lanius ludovicianus*	ST	Open country with scattered shrubs and trees, but also more heavily wooded habitats with large openings and in very short habitats with few or no trees (Cornell Lab 2019)	Historic occurrence in Accomack County; however, recent Virginia occurrences have only been in the Shenandoah Valley (Fraser 1991).	No effect

Table 3-3. Federally and State-Listed Species with Potential to Occur in the Proposed Project Areas and Determination of Effects					
Common Name	**Scientific Name**	**Status[1]**	**Habitat Type**	**Notes**	**Determination of Effect**
Gull-billed tern	*Gelochelidon nilotica*	ST	Breeds on gravelly or sandy beaches. Winters in salt marshes, estuaries, lagoons and plowed fields, less frequently along rivers, around lakes and in fresh-water marshes	No active nests detected on Wallops Island; active nests on Assateague Island (NASA 2013; USFWS 2012).	No effect
Fish					
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	FE, SE	Spawn in flowing fresh waters between the salt front and fall line then migrate to estuarine and marine waters as adults	Species has been documented in deeper waters off WFF. Potential occurrence in project area: adults and subadults migrating and foraging from January 1 to December 31 (NOAA 2019). Potential for occurrence of any of these species in Ballast Narrows or Watts Bay is minimal and is expected to be limited to the occasional transient passage of individuals through the area during migration or while foraging.	Not likely to adversely affect
Shortnose sturgeon	*Acipenser brevirostrum*	FE, SE	Spawning in freshwater rivers and forage in mesohaline (i.e., salinities of 5 to 18 ppt) estuaries; may migrate along coastal areas	Species has not been previously documented at WFF. Potential occurrence in project area: adults migrating and foraging from January 1 to December 31 (NOAA 2019). Potential for occurrence of any of these species in Ballast Narrows or Watts Bay is minimal and is expected to be limited to the occasional transient passage of individuals through the area during migration or while foraging.	Not likely to adversely affect

[1]FE = federally endangered; FT = federally threatened; SE = state endangered; ST = state threatened
Source: NASA 2019a unless otherwise noted.

A description of the eastern black rail is provided below since this species was not described in the *Final Site-wide PEIS.*

Eastern Black Rail

The eastern black rail is a small, secretive, marsh-dwelling bird that is proposed for listing as federally threatened by USFWS. The species' habitat can be tidally or non-tidally influenced, and range in salinity from salt to brackish to fresh.

In the northeastern United States, the eastern black rail can typically be found in salt and brackish marshes with dense cover but can also be found in upland areas of these marshes. Farther south along the Atlantic coast, eastern black rail habitat includes impounded and unimpounded salt and brackish marshes.

Photo 3-5. Eastern black rail.
Photo from USFWS 2018

Adult eastern black rails vary from 10 to 15 cm (4 to 6 inches) in length and have a wingspan of 22 to 28 cm (9 to 11 inches). They weigh less than 35 grams (1.2 ounces) on average. Males and females are similar in size and adults are generally pale to blackish-gray with a small blackish bill and bright red eyes (USFWS 2020) (**Photo 3-5**).

The eastern black rail was documented on WFF Wallops Island in May 2019 and suitable habitat for the species is present within and adjacent to the project areas, especially Walker Marsh.

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3.11.1.2 *Bird of Conservation Concern*

BCC that may occur on or within the vicinity of WFF are listed in **Table 3-4**. Non-native bird species such as house sparrow, rock dove, and European starling are not protected under the MBTA.

Table 3-4. Birds of Conservation Concern with Potential to Occur in the Proposed Project Areas

Common Name	Habitat	Common Name	Habitat
American Bittern	Wading bird	Prairie Warbler	Woodland
American Oystercatcher	Shorebird	Red Knot (*rufa ssp.*)(a)(nb)	Shorebird
Bald Eagle (b)	Woodland	Red-headed Woodpecker	Woodland
Black Skimmer	Shorebird	Red-throated Loon (nb)	Marshland
Blue-winged Warbler	Woodland	Rusty Blackbird (nb)	Woodland
Brown-headed Nuthatch	Woodland	Saltmarsh Sharp-tailed Sparrow	Marshland
Buff-breasted Sandpiper (nb)	Shorebird	Seaside Sparrow	Marshland
Gull-billed Tern	Shorebird	Sedge Wren	Marshland
Horned Grebe (nb)	Wading bird	Semipalmated Sandpiper (nb)	Shorebird
Hudsonian Godwit (nb)	Shorebird	Short-billed Dowitcher (nb)	Marshland
Kentucky Warbler	Woodland	Short-eared Owl (nb)	Grassland
Least Bittern	Marshland	Snowy Egret	Marshland
Least Tern	Shorebird	Solitary Sandpiper (nb)	Marshland
Marbled Godwit (nb)	Marshland	Whimbrel (nb)	Shorebird
Nelson's Sharp-tailed Sparrow	Marshland	Wilson's Plover	Shorebird
Peregrine Falcon (b)	Woodland	Wood Thrush	Woodland
Pied-billed Grebe	Wading bird	Worm-eating Warbler	Woodland

Notes: (a) = Federal ESA threatened; (b) = Federal ESA de-listed; (c) = non-listed federal ESA subspecies or population; (nb) = non-breeding in this region

Source: USFWS 2008; Holcomb 2014 (taken from NASA 2019a)

3.11.1.3 *Essential Fish Habitat*

EFH for one or more life stages of 11 federally managed fish species has been designated in the waters in the vicinity of the project area. These species and life stages are listed in **Table 3-5**.

Table 3-5. Species and Life States with Designated EFH in Waters near the Proposed Project Areas				
Species Common Name (Scientific Name)	**Eggs**	**Larvae/ Neonates**	**Juveniles**	**Adults**
Atlantic butterfish (*Peprilus triacanthus*)			X	X
Atlantic herring (*Clupea harengus*)				X
Black sea bass (*Centropristis striata*)			X	X
Bluefish (*Pomatomus saltatrix*)			X	X
Clearnose skate (*Raja eglanteria*)			X	X
Sand tiger shark (*Carcharias taurus*)		X	X	X
Sandbar shark (*Charcharinus plumbeus*)		X	X	X
Smoothhound shark complex – Atlantic stock (*Mustelus canis*)		X	X	X
Summer flounder (*Paralicthys dentatus*)			X	X
Windowpane flounder (*Scophthalmus aquosus*)				X
Winter skate (*Leucoraja ocellata*)			X	X

Notes:

1. An "X" indicates that EFH has been designated within the project area for that species and life stage.
2. The three shark species bear live young (neonates) and do not have a free-swimming larval stage.

Source: NOAA 2019

NMFS Greater Atlantic Regional Fisheries Office provides an online EFH Assessment Worksheet for use in preparing EFH assessments. A copy of the worksheet that was completed to support EFH consultation for the Proposed Action in accordance with the MSA is included in **Appendix C**. The worksheet includes detailed information about the marine/estuarine habitats of the project area and the functions and values those habitats provide for the life stages of the EFH species potentially occurring in those habitats.

3.11.2 Environmental Consequences

An adverse effect on special-status species would be considered significant if the effect could not be resolved through mitigation measures implemented in consultation with USFWS, NOAA Fisheries, and/or other applicable regulatory agencies.

3.11.2.1 *No Action Alternative*

The No Action Alternative would have no impacts on special status species because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect special-status species would occur.

3.11.2.2 *Proposed Action*

Impacts from the Proposed Action are divided into the following topics areas: terrestrial, aquatic/marine, EFH, and avian. A summary of responses from NASA's coordination with USFWS and NMFS is provided at the end of Section 3.11.2.2.

Terrestrial Special Status Species

There is one terrestrial special status species in the vicinity of WFF: seabeach amaranth. Habitat for seabeach amaranth is solely beach areas seaward of primary dunes. Since no beach habitat is present in the proposed project areas, the Proposed Action would have no impacts on the seabeach amaranth.

Aquatic/Marine Special-Status Species

Seven federally and state-listed aquatic/marine species (five species of sea turtles and two species of sturgeon) could potentially occur in the marine waters of the project areas (**Table 3-3**). However, as indicated by their life history characteristics and records for the WFF area, the potential for occurrence of any of these species is minimal and is expected to be limited to the occasional passage of individuals through the area during migration or while foraging.

Because project activities are anticipated to occur over three months, which would be limited to September through March, the amount of time that impacts may occur to foraging or migrating individuals would be limited. Additionally, activities would not occur during sea turtle nesting season or near sea turtles nesting habitat on Wallops or Assateague Island beaches.

Small portions of the benthic community surrounding Walker Marsh could be disturbed from movement and anchoring of the barges. The benthic community in the three guts crossed by the marsh buggy in Walker Marsh would be disturbed. These benthic areas are a potential food source for all of the listed aquatic/marine species, except the green sea turtle, but the area affected would be small. Barges would be positioned and barge anchors deployed in a manner to avoid disturbance to oyster beds to the maximum extent practicable. Disturbance of the subaqueous bottom would not affect the long-term viability of the benthic community in those areas.

Accidental spills of fuel, oil, hydraulic fluid, or other potentially hazardous substances would be prevented or minimized through the contractor's adherence to spill prevention and control measures, as specified in WFF's Integrated Contingency Plan and the project-specific SPCC. An inadvertent release of drilling mud could occur during HDD. Drilling mud is nontoxic, and any release would be short-term and contained in accordance with the Frac-Out Contingency Plan. Potential effects could include increased turbidity from suspended clay particles in the immediate vicinity of the release, which may temporarily interfere with respiration by sturgeon and by invertebrates that are the main prey of sturgeon and sea turtles. Conditions would return to a pre-disturbance condition once particles disperse in the water column and/or settle to the bottom. Any effects on water quality from inadvertent releases of such substances or increases in turbidity

would be highly localized and temporary. A site-specific SWPPP, developed in compliance with the VSMP permit, would minimize impacts on water quality from ground disturbances.

Ambient noise levels would increase near trenching and HDD operations. Noise effects on fish, turtles, or their prey would be temporary and would occur during limited periods while the equipment is being operated near water bodies. Some invertebrates on which sturgeon and sea turtles feed may be directly affected through their avoidance of noise and vibration and/or increases in turbidity. However, impacts would be temporary and confined to aquatic habitat in the immediate vicinity of activities in Walker Marsh.

In the long term, there would be no effects on special status aquatic species from repair of the fiber optic cable.

In an electronic communication dated September 26, 2019, NFMS agreed with NASA's determination that the Proposed Action is not likely to adversely affect the Atlantic sturgeon and shortnose sturgeon and would have no effect on sea turtles.

Essential Fish Habitat

The potential for the Proposed Action to adversely affect EFH was evaluated in accordance with the MSA. A copy of the EFH Assessment Worksheet prepared for the Proposed Action to support consultation in accordance with the MSA is included in **Appendix C**.

Impacts on the marine environment, including direct impacts on the benthic community, which could affect the food available to fish in the affected project areas, are described in the Aquatic/Marine Special Status Species section above. Potential impacts (turbidity, accidental spills, and an inadvertent release of HDD drilling mud) and BMPs to avoid and minimize impacts that are stated above would be the same for EFH. The benthic community would re-establish in the affected areas through natural processes.

Ambient noise levels would increase in the vicinity of the construction activities and in the area of the boats and barges. Noise effects on fish or their prey would be direct and temporary, and would occur only during limited periods while equipment is being operated near water bodies. Prey of managed fish species may be directly affected through their avoidance of noise and vibration and/or increases in turbidity. However, impacts would be temporary and confined to aquatic habitat in the immediate vicinity of Walker Marsh.

As described above for aquatic/marine special status species, long-term operation and repair of the fiber optic cable would have no effect on EFH.

The project area does not provide spawning habitat for EFH species, and only neonates of sandbar, smoothhound, and sand tiger sharks may use the area as nursery habitat. Potential turbidity effects from disturbances of the subaqueous bottom (barge anchors and the marsh buggy) would be limited in duration and small in extent. There would be negligible impacts to nursery habitat for these species. The TOYR that NASA would implement from April 1 to August 31 would limit the portion of the year in which impacts may occur to approximately 3 consecutive months between

September through March. Sharks give birth during late spring or summer, so the TOYR would reduce the potential for neonates of these species to use the area as nursery habitat during project activities.

Adults and juveniles of Atlantic butterfish, black sea bass, bluefish, clearnose skate, sand tiger shark, sandbar shark, smoothhound shark complex–Atlantic stock, summer flounder, and winter skate and adults of Atlantic herring and windowpane flounder potentially forage and shelter in the shallow, brackish habitats of Ballast Narrows and Watts Bay. NASA's contractor would minimize turbidity in marine waters through the use of ESC BMPs, minimizing the disturbance to the subaqueous bottom from the marsh buggy in the guts, and may consider using turbidity curtains in the guts, if needed. Therefore, food sources available to these species would not be reduced, and there would be negligible impacts to foraging and sheltering habitat for these species.

In a letter dated October 10, 2019, NMFS agreed with NASA's determination that potential adverse effects of the Proposed Action on EFH would be minor and temporary.

Avian Special Status Species, Migratory Birds, and BCC

Eastern Black Rail

The Proposed Action would have no potential to affect the proposed federally threatened eastern black rail because NASA would adhere to a TOYR between April 1 and August 31 of any year during which no project work would occur. All project work would occur between the months of September and March when the species is not present in or near the project area.

Red Knot, Piping Plover, Roseate Tern, Wilson's Plover

The Proposed Action would have minimal direct impacts on the red knot, piping plover, roseate tern, or Wilson's plover because project activities would not occur in areas potentially providing suitable habitat for these species. Although increased noise and human presence associated with the Proposed Action could have an direct effect on these species and potentially result in startle or avoidance behaviors, such effects would be unlikely because project activities would occur a substantial distance from areas of WFF Wallops Island potentially providing suitable habitat for these species. Impacts on the loggerhead shrike and gull-billed tern are not anticipated because these species are unlikely to occur in or near the project area.

BCC

In the short term, construction of the Proposed Action would have the potential to disturb migratory birds present in and near the project area from noise, increased human presence, and removal of vegetation potentially providing habitat. To varying degrees, adherence to the TOYR for eastern black rail would also prevent or minimize adverse effects on some migratory bird species because project activities would occur between September and March outside of some species' breeding and nesting periods or when some species are not present in or near the project area.

Effects from the Proposed Action experienced by migratory birds would primarily consist of startle or avoidance behaviors resulting from project-related noise and increased human presence. It is likely that most individuals would be initially alerted by increased human presence in the project area and relocate to nearby areas providing similar habitat. Because birds are highly mobile, the inadvertent injury or destruction of individual birds from project activities would be unlikely.

Activities occurring in the HDD work/staging areas at the Boresight Antenna and UAS Airstrip would have no or minimal direct impacts on migratory birds because the quality of vegetation potentially providing suitable habitat for migratory bird species is poor. Birds inhabiting adjacent or nearby areas would likely avoid the area during project activities.

Avoidance or temporary relocation behaviors exhibited by migratory birds and BCC resulting from the Proposed Action would be an adverse effect. However, any such effects would occur at the individual, rather than community, population, or species level, and would not limit or prevent the continued propagation of any bird species. Activities associated with the Proposed Action would be of relatively short duration (approximately 90 days) and similar to other terrestrial human-centric construction and/or commercial boating activities occurring with relative frequency in and around the project area. Such activities would not be particularly unusual or disruptive to migratory birds and BCC. Birds present in the project area would be expected to return to the area upon the completion of project activities and resume common breeding, nesting, and foraging behaviors. Overall, the area of potential habitat that would be temporarily disturbed by the Proposed Action would be small relative to available habitat around the project area.

For these reasons, the Proposed Action would have minor short-term impacts on migratory birds and BCC and their habitat in and near the project area.

In the long term, restoration of disturbed vegetation in the project area, in accordance with applicable NASA and USFWS vegetation management policies, would provide migratory bird and BCC habitat similar to what was available prior to the project. Periodic maintenance of vegetation around the handhole enclosures would have the potential to temporarily startle and/or displace individual birds present near the Boresight Antenna, UAS Airstrip, and Walker Marsh. Such activities would occur infrequently (i.e., a few times each year), be of short duration (i.e., a few hours), affect exceedingly small areas of vegetation potentially providing habitat, be similar to other vegetation management activities occurring in those areas, and be conducted in accordance with applicable NASA and/or USFWS vegetation management policies. Such disturbance would have the potential to disturb only a small number of individuals at most and would not delay or prevent the continued propagation of any species.

Therefore, the Proposed Action would have negligible long-term impacts on BCC in and near the project area.

Bats

Adherence to the TOYR would also prevent adverse impacts on northern long-eared bats that may potentially be present in and near the project area, as project activities would occur outside the species' summer roosting and pup-rearing season.

BMPs

To minimize short-term and long-term impacts on special-status species from the Proposed Action, the project would incorporate the following mitigation, monitoring, and adaptive management measures:

- Prepare and adhere to a frac-out contingency plan to provide procedures and steps to contain an inadvertent release of drilling mud.
- Prepare and adhere to a Storm Water Pollution Prevention Plan in accordance with Virginia Pollutant Discharge Elimination System regulations to minimize impacts on water quality from ground disturbance at the HDD work sites.
- Use sediment curtains in areas of subaqueous disturbance in the Walker Marsh guts to prevent or minimize the downstream migration of disturbed sediments and ensure sediments resettle near their original location.
- Plant new vegetation during restoration of the HDD areas at the Boresight Antenna and UAS Airstrip in accordance with applicable NASA and/or USFWS vegetation management policies.
- Conduct periodic vegetation maintenance during the project's operational phase in accordance with applicable NASA and USFWS vegetation management policies. Adhere to a TOYR for proposed construction activities between April 1 and August 31 to prevent impacts on the federally proposed-threatened eastern black rail. This would further limit the portion of the year during which impacts on other special status species could occur to approximately 3 consecutive months within this 7-month period.

In a letter dated September 21, 2019, USFWS concurred with NASA's determination of effects to species as listed in **Table 3-3** above.

Summary of Agency Coordination for Special Status Species

A summary of agency coordination and responses for special status species is provided below. NASA's submittals and the agency responses are provided in **Appendix D**.

- **NMFS Habitat Conservation Division under the MSA for EFH**: On September 17, 2019, NASA submitted a letter to NMFS requesting concurrence with the evaluation of effects to EFH. In a letter dated October 10, 2019, NMFS responded that they have "no objections to the proposed installation of the fiber optic cable and have no conservation recommendations to provide" provided that BMPs (including those proposed by NASA

and recommended by NMFS in their October 10 letter) are incorporated into the project design.

- **NMFS Protected Resources Division under Section 7 of the ESA**: On September 17, 2019, NASA submitted a letter to NMFS requesting concurrence with the determination of effects to species under NOAA jurisdiction. On September 26, 2019, NMFS responded that they did not believe consultation in accordance with Section 7 of the ESA is necessary for the Marsh Fiber Project and as such, no further coordination with the NMFS Protected Resources Division is necessary.
- **USFWS under Section 7 of the ESA**: On September 17, 2019, NASA submitted its determination of effects to species to the USFWS Virginia Field Office as part of the Information, Planning, and Consultation System process. On September 27, 2019, USFWS responded stating they had no further comments or concerns regarding the project. Therefore, USFWS has concurred with NASA's determinations of effect (these determinations are also listed in **Table 3-3** of this EA).

3.12 Transportation

Transportation resources refer to the infrastructure and equipment required for the movement of people and goods in geographic space. For purposes of evaluation in this EA, transportation refers to the movement of vehicles on roads and of boats (commercial and recreational) on the waterways surrounding Walker Marsh. There are no ferries, shipping lanes, or other large commercial maritime transportation uses in the project area. There are no air transportation routes that would be affected by the proposed project.

3.12.1 Affected Environment

U.S. Route 13 is a four-lane divided north-south highway that bisects the Delmarva Peninsula. Local traffic travels by arteries branching off U.S. Route 13. Access to WFF is provided by Route 175 (Chincoteague Road), a two-lane minor arterial that connects to Atlantic Road and Mill Dam Road, both of which terminate at the Main Base gate. Wallops Island is accessed via Atlantic Road which intersects with Wallops Island Road. Wallops Island Road terminates at the Mainland gate.

Access to the UAS Airstrip work area is provided via an existing paved road that runs north from Wallops Island Road, and then by driving down the runway. NASA would access the HDD work area at the Boresight Antenna via an existing gated road that is entirely on Wallops NWR property that spurs off Chincoteague Road. NASA has an agreement with USFWS for the use of this road to access the Boresight Antenna. There is no public access to either HDD work area, and neither HDD work area is routinely accessed by USFWS or WFF personnel or government contractors.

The areas surrounding Walker Marsh and between Walker Marsh and Wallops Island are open year-round for motorized and non-motorized public boating. The area between Walker Marsh and Wallops Island includes the Virginia Seaside Trail, a transportation route for non-motorized

paddlers, and the Virginia Inside Passage, a federal navigation route. Parts of the Virginia Inside Passage have not been maintained in recent years, and in 2018 and 2019, the USCG removed 166 aids to navigation due to increasing areas of shallow waters and shoals along the route (USCG and USACE 2016).

3.12.2 Environmental Consequences

Significant impacts would occur if a proposed action created long-term traffic congestion on waterways or roadways that could not be alleviated or resulted in unsafe transportation conditions that could not be mitigated.

3.12.2.1 *No Action Alternative*

The No Action Alternative would have no impacts on transportation because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect transportation in the project area would occur. There would be no changes to the baseline transportation and traffic conditions throughout the project area.

3.12.2.2 *Proposed Action*

Under the Proposed Action, traffic movement at the turn-off from Chincoteague Road to access the Boresight Antenna, and along Wallops Island Road to access the UAS Airstrip would be slowed and could be temporarily stopped when large vehicles and heavy equipment are being brought to and from the project site. The associated traffic delays would occur primarily during the start of the project and again at the end of the project, and traffic disruptions would last for a few minutes at a time. Worker vehicles would enter/exit the sites on a more routine basis during the 90-day project duration.

There would be potential for slowing, stopping, or re-routing of boat traffic during the transportation of the barges, equipment, and workers to and from Walker Marsh. While the presence of an anchored barge at either end of Walker Marsh would result in boaters staying out of the area around the barge, the anchored barges would not impede transportation in surrounding waters. Impacts on boaters would be minor and short-term, expected to last for minutes to a couple of hours periodically for up to 90 days during mobilization, the 30-day construction period on Walker Marsh, and demobilization in the waters surrounding Walker Marsh. There would be no long-term impacts on transportation.

After the Marsh Fiber is installed, there would be the potential for minor and short-term adverse impacts on local traffic on Chincoteague Road, Wallops Island Road, and to boaters around Walker Marsh if equipment is brought in for repairs. Repairs are anticipated to be infrequent.

3.13 Infrastructure and Utilities

Infrastructure and utilities include potable water systems, wastewater treatment systems, electric utilities, communications, and solid waste management.

3.13.1 Affected Environment

The majority of utilities and infrastructure for WFF are located outside of the proposed project areas, and there are no utilities or infrastructure in place at Walker Marsh. At the Boresight Antenna site there is an existing handhole that provides electric and communication utilities to the antenna and to which the new fiber optic cable would connect. The Boresight Antenna structure is surrounded by security fencing so the antenna structure itself cannot be directly accessed.

At the UAS Airstrip, there are existing electric and communication utility lines adjacent to the south side of the runway to which the proposed marsh fiber would connect. The runway is used for UAS takeoff and landings.

The existing, non-operable fiber optic cable was abandoned in place, as shown on **Figure 1-2**. The cable lays along a separate and different pathway on the subaqueous bottom and underneath saltmarsh ground surface.

3.13.2 Environmental Consequences

3.13.2.1 *No Action Alternative*

Under the No Action Alternative, the proposed fiber optic cable would not be installed and operated. This alternative would not fulfill the purpose or need of the project and would leave NASA without a redundant fiber optic communications pathway, resulting in a long-term, major, adverse impact on emergency communications if needed during launch operations. Relying on a single means of fiber optic communications would leave NASA, its tenants, and the public at around WFF at risk for unacceptable disruptions to launch command and IT services if the existing Atlantic Road cable were to become damaged or fail as there would be no back-up system. Under the No Action Alternative, NASA could not meet OCIO and Range Safety requirements for diversity and redundancy of mission, facility, and corporate customer communication services.

Additionally, under the No Action Alternative, NASA would not be able to support current or future demands for rapid and reliable communications by providing the necessary bandwidth required by telemetry and meteorology, cameras and sensors, missions and facilities, for uploading and downloading acquired data.

3.13.2.2 *Proposed Action*

Under the Proposed Action, there would be a new fiber optic cable installed between the Boresight Antenna on the Wallops NWR and the UAS Airstrip on Wallops Island. NASA would encase the

fiber optic cable in conduit, and there would be space left within the conduit for additional cables to be installed in the future. The old abandoned fiber optic cable would remain in place.

Construction equipment, materials, and vehicles would be placed and maneuvered to not interfere with the existing handhole or the fence surrounding the antenna structure at the Boresight Antenna work area. Therefore, there would be no impacts on utilities or infrastructure in that project area.

There would be short-term adverse impacts on UAS operations during construction. Use of the UAS Airstrip runway as ingress/egress to the HDD work area would result in temporary closure of the runway while construction equipment and vehicles are on the runway pavement. Duration of the closures may be from a few minutes to a few hours, with the longest periods of closure occurring at the beginning and end of the 90-day project period when the majority of equipment and materials are mobilized and demobilized from the site. Worker vehicles would use the runway to access the site frequently during the 90-days, but closures would be on the order of minutes. The NASA WFF division overseeing construction (Code 780) would coordinate with the MARS staff overseeing operations at the UAS Airstrip to plan for and notify WFF personnel and relevant contractors and customers of closures.

The new cable would create a redundant, reliable fiber optic pathway to ensure NASA's current and future communications needs are met without any downtime required of the current network. Therefore, the Proposed Action would have long-term beneficial impacts on utilities and infrastructure by providing current technologies that are functional and reliable.

3.14 Employment and Income

Socioeconomics is defined as the study and analysis of the human environment, specifically the study of human population, employment, personal income, and housing. Only employment and income are evaluated in this EA, as housing and population would not be affected by the proposed project.

3.14.1 Affected Environment

The region of influence for employment and income is Accomack County which includes the town of Chincoteague, a popular tourist destination north of Wallops Island. This socioeconomic analysis includes data for Chincoteague and Accomack County. Data for the Commonwealth of Virginia is provided as a general comparison.

The median household income for Chincoteague in 2017 was $48,861, and for Accomack County was $42,260. By comparison, both are much lower than the Commonwealth of Virginia which reported a median household income of $68,766 (USCB 2017).

In 2017, the three largest industries in Chincoteague with respect to employment were educational services, health care, and social assistance (21.4 percent); art, entertainment, recreation, accommodation, and food services (20.8 percent); and retail trade (17.9 percent). In Accomack County, the largest industries were educational services, health care, and social assistance (21.1

percent), manufacturing (17.3 percent), and retail (10.6 percent). By comparison, the three largest industries in the Commonwealth of Virginia were educational, health, and social services (22 percent); professional, scientific, management, administrative, and waste management services (15.1 percent); and retail (10.7 percent) (USCB 2017).

3.14.2 Environmental Consequences

Significant impacts would occur if the Proposed Action were to substantially alter the demographics of a local population or if it were to adversely change the local population growth rate, housing market, housing vacancy rate, or availability of jobs, goods, and services.

3.14.2.1 *No Action Alternative*

The No Action Alternative would have no impacts on employment and income because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect employment and income would occur.

3.14.2.2 *Proposed Action*

Under the Proposed Action, installation activities would potentially benefit local stores and businesses due to workers associated with the installation activities purchasing food and goods, staying in hotels and motels, and fueling vehicles and equipment. However, such effects would be negligible in the context of the regional economy.

There is a potential for commercial fishing boats and charter boats for recreational fishing to be affected intermittently for up to 90 days during mobilization, the 30-day construction period on Walker Marsh, and demobilization. These boats would not be able to access all areas surrounding Walker Marsh primarily due to the presence of boats and barges at the west and east sides of the saltmarsh. The increased number of boats associated with bringing materials, equipment, and workers to and from Walker Marsh could cause commercial and charter boats to avoid the immediate Walker Marsh area while project-related water traffic was present. However, the boats could re-route to nearby tidal waters and impacts would be short-term (i.e., on the order of a few minutes to an hour) and minor.

In the long term, repair of the cable would result in increased boat traffic to Walker Marsh. Because it would be infrequent and of short duration (hours), impacts on commercial or recreational fishing would be negligible.

3.15 Recreation

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.

3.15.1 Affected Environment

There are no recreational areas open to the public or WFF employees and guests at or near the Boresight Antenna or the UAS Airstrip. The Wallops NWR is closed to the public and is not used for recreation. There is one main area designated for recreational use on Wallops Island, but it is a beach on the east side of the island facing the Atlantic Ocean and not near the proposed project sites.

There are recreational opportunities in the vicinity of Walker Marsh and the project area Walker Marsh, including boating, paddling, fishing, and shellfish harvesting. Walker Marsh is open to the public year-round. It is accessible only by boat, and people are allowed to land boats, walk on the saltmarsh, and hunt (which primarily entails setting up hunting blinds for waterfowl on the marsh). The waters surrounding Walker Marsh are part of the Virginia Seaside Water Trail, a water trail for day-use paddlers. Recreation primarily occurs in the warmer months of the year between spring and fall.

The VMRC regulates aquaculture (shellfish harvest) in tidal waters, including recreational harvests by the public in areas designated as Baylor Grounds. Shellfish harvest grounds, which occur in some of the subaqueous bottom areas of one of the guts that would be crossed, and in portions of the waters surrounding Walker Marsh, are described in Section 3.10 *Aquaculture*. Recreation at Walker Marsh and in the tidal waters surrounding Walker Marsh are overseen by either Virginia Department of Game and Inland Fisheries (VDGIF) or Virginia Department of Conservation and Recreation (VDCR) depending on the type of activity.

3.15.2 Environmental Consequences

Impacts on recreation would be considered significant if a large portion of a particular type of recreation was lost and could not be suitably substituted with a similar activity, or if demand could not be met by similar facilities or natural areas.

3.15.2.1 *No Action Alternative*

The No Action Alternative would have no impacts on recreation because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect recreation would occur.

3.15.2.2 *Proposed Action*

Under the Proposed Action, there would be short-term, minor impacts on boaters and fisherman intermittently for up to 90 days during mobilization, the 30-day construction period on Walker Marsh, and demobilization. Fishing and boating traffic surrounding Walker Marsh could be temporarily stopped or rerouted during ingress and egress of barges to and from Walker Marsh. If appropriate, the USCG would issue NOTMARs, and the WFF Office of Communications would

issue notices to warn boaters who may be in the vicinity of the activity at Walker Marsh to proceed with caution for the duration of construction activities.

The presence of humans and anthropogenic noise are likely to scare away wildlife that is the focus of recreational viewers and hunters. Additionally, human presence and noise would temporarily alter the characteristic of the natural setting that would be expected by recreational users. Therefore, the presence of barges and the use of construction and trenching equipment on Walker Marsh could result in short-term, minor impacts on recreation. The potential for impacts would last for the 90-day period of demobilization, work on Walker Marsh, and demobilization, with a few periods of inactivity within that 90-day window when work was not being conducted (i.e., nights and weekends). The public would be prohibited from accessing the work or staging areas while installation is ongoing. NASA would notify the VMRC and VDCR prior to installation activities so these agencies could give notice to the public regarding closure of Walker Marsh.

The potential exists for short-term, adverse impacts on recreation in the event of a frac-out resulting from the HDD process. Temporary closure of the marsh and/or parts of surrounding waters could result until the release is remediated. NASA's contractor would implement a Frac-Out Contingency Plan and would immediately implement containment and restoration measures to minimize impacts. Impacts on aquaculture, including public shellfish harvesting for recreation, are discussed in Section 3.10 *Aquaculture*.

3.16 Archaeological 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. Section 106 of the National Historic Preservation Action of 1966 (NHPA), as amended, requires federal agencies to consider the effects of their actions on historic properties that are listed or eligible for listing in the National Register of Historic Places. Archaeological resources are places where humans changed the ground surface or left artifacts or other physical remains (e.g., arrowheads or bottles).

The discussion of cultural resources in this EA is limited to archaeological resources because the Proposed Action would have no potential to affect architectural resources near the project area. Additionally, WFF does not possess or manage Native American collections or cultural items, Native American remains, or Native American sacred sites or traditional cultural properties. The facility is not located within the lands of any state or federally recognized Native American tribe (NASA 2019a). Therefore, traditional cultural resources are not addressed in this EA.

3.16.1 Affected Environment

The affected environment for archaeological resources consists of the areas where ground disturbance would occur, which are collectively referred to as the Area of Potential Effect (APE).

No previously recorded archaeological resources are located within the APE. A review of the Virginia Cultural Resource Information System (V-CRIS) identified two archaeological sites, Virginia 44AC0072 and 44AC0089, within a half-mile radius of the APE. Site 44AC0072 is a nineteenth-century scatter of artifacts and architectural debris located approximately 275 m (900 ft) northwest of the proposed project APE at the Boresight Antenna. Additionally, this proposed project area was previously disturbed during construction of the Boresight Antenna. Site 44AC0089 is an earthworks dating to the Revolutionary War and located approximately 60 m (200 ft) northeast of the proposed project APE at the UAS Airstrip. Neither of these sites are within the proposed project's APE.

Although the V-CRIS review did not identify potential archaeological resources at or near the Walker Marsh APE, this area has the potential for maritime resources and/or buried prehistoric resources, with no archaeological potential at or near the surface. Review of nineteenth and early twentieth-century nautical charts and historic maps, however, did not reveal the potential for significant shipwrecks or potentially submerged maritime industry resources. The marsh and shallow waterway are an area of sediment accretion, which may have buried early prehistoric resources, if present (Lowery 2003).

In 2003, NASA modeled all property within WFF's boundaries for the potential of archaeological resources (NASA 2003). According to NASA's predictive model for prehistoric and historic archaeological sites (which applies only to NASA's lands, including the UAS Airstrip), the APE at the UAS Airstrip site falls within the area of high archaeological potential (NASA 2003). During the NEPA analysis for the construction and operation of the UAS Airstrip, NASA performed a Phase I archaeological survey which did not result in identification of archaeological resources with potential to extend into the proposed project's APE (Espenshade and Lockerman 2009). Moreover, the entire APE near the UAS Airstrip has been previously disturbed during construction of the airstrip.

3.16.2 Environmental Consequences

Impacts on archaeological resources would be significant if a measurable effect could not be resolved through the Section 106 consultation process.

3.16.2.1 *No Action Alternative*

The No Action Alternative would have no impacts on archaeological resources because the proposed fiber optic cable would not be installed and operated, and none of the associated construction activities with potential to affect archaeological resources would occur.

3.16.2.2 *Proposed Action*

The area where NASA would install approximately 45 m (150 ft) of the fiber optic cable via shallow open trench at the Boresight Antenna has been previously disturbed during construction

of the Boresight Antenna. Additionally, results of a V-CRIS search did not indicate the presence of known archaeological resources within the proposed project APE; therefore, the Proposed Action would have no potential to effect historic resources at this site.

The area of disturbance associated with the proposed handhole west of the UAS Airstrip is within an area that was previously disturbed for construction of the airstrip. Additionally, the results of a nearby survey for archaeological resources conducted at the UAS Airstrip in 2009 were negative for artifacts, features, or cultural deposits. The airstrip separates Site 44AC0089 from the APE at the UAS Airstrip site. NASA would ensure that all proposed project activities would remain outside the protective fencing surrounding Site 44AC0089. Therefore, the Proposed Action would have no potential to effect historic resources at this site.

In accordance with Section 106 of the NHPA, on September 17, 2019, NASA submitted a letter to the Virginia Department of Historic Resources (VDHR), the State Historic Preservation Office for the Commonwealth of Virginia, stating its determination that there would be no historic properties affected by the Proposed Action. In an email to NASA dated October 16, 2019, VDHR concurred with NASA's determination (**Appendix D**).

In the event that undocumented archaeological resources or traditional cultural resources are inadvertently discovered during ground disturbing activities associated with the proposed project, the contractor would halt work immediately and contact the WFF Historic Preservation Officer.

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4 Permits, Mitigation and Monitoring

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. Section 4.1 provides NASA's proposed mitigation measures for implementing the Proposed Action to install a new fiber optic cable between the Boresight Antenna at the Wallops NWR and the UAS Airstrip on north Wallops Island.

Once implementation of a Proposed Action is underway, a federal agency has a responsibility to continually monitor that implementation to ensure that mitigation or other protective measures are being employed. Section 4.2 provides a summary of NASA's proposed monitoring of various resource areas during implementation of the Proposed Action.

4.1 Summary of Permits and Plans Required

NASA and NASA contractors would need to obtain the following permits and approve and implement the following plans, prior to starting work on the Marsh Fiber project.

- Joint Permit Application for the following:
    - Accomack County Wetlands Board Permit (waived)
    - VMRC Tidal Wetlands and Subaqueous Bottom Permits
    - VDEQ Virginia Water Protection Permit (waived)
    - USACE Nationwide Permit 12 for impacts on WOTUS
- VSMP construction site stormwater permit
    - Including a SWPPP and ESC BMPs
- SPCC Plan for controls and countermeasures in land-based and marine-based activities
- Health and Safety Plan to WFF Safety Office
- Frac-Out Contingency Plan

4.2 BMPs, Mitigation and Monitoring

Table 4-1 shows the BMPs, mitigation measures, and monitoring to be conducted by resource area to avoid and/or minimize impacts to the extent practicable.

Table 4-1. Summary of BMPs, Mitigation and Monitoring Measures

Resource Area	Measures
Air Quality	• BMPs for operation of diesel-powered equipment to prevent excessive emissions
Hazardous Materials and Hazardous Wastes	• BMPs for operation of diesel-powered equipment to prevent spills or releases • ICP BMPs to prevent and minimize impacts of potentially hazardous substances
Water Resources	• ESC BMPs during and after construction and excavation to stabilize soils and prevent or minimize erosion and increases in sedimentation and turbidity • SWPPP BMPs to reduce impact of stormwater runoff and from fueling and maintenance of vehicles and equipment • Mitigation plan within the Joint Permit Application addresses restoration of the ground and vegetation disturbance areas to pre-construction conditions • Frac-out contingency plan to reduce impacts from an inadvertent release of drilling mud • Monitoring of construction areas in accordance with VSMP permit
Vegetation	• Construction and post-construction monitoring as required in the Joint Permit Application (VMRC and USACE permits) to identify and document if and when disturbed areas achieve final stabilization as specified in the permits; NASA would implement corrective action measures such that permit requirements are met
Wildlife and Special Status Species	• Implement TOYR such that no work occurs between April 1 to August 31 • Comply with existing WFF Protected Species Monitoring Plan for tree clearing • Frac-out contingency plan to contain an inadvertent release of drilling mud • SWPPP • Sediment Curtains, if necessary • Plant new vegetation to restore habitat, if necessary • Conduct periodic vegetation maintenance, as necessary
Recreation	• Notify VMRC and VDCR prior to project start so they can notify the public, if needed, regarding closure of Walker Marsh • Frac-out contingency plan to contain measures and clean-up impacts; temporary closure could result until release is cleaned
Archaeological Resources	• Work would halt and WFF Historic Preservation Officer contacted immediately if cultural resources are discovered during ground disturbing activities

5 Cumulative Effects

The CEQ defines cumulative effects as the "impact on the environment which results from the incremental impact of the action(s) when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1500).

Section 5.4 of the *Final Site-wide PEIS* provides a detailed Cumulative Effects Analysis (CEA) for all potentially affected resource areas, with temporal range spanning from the mid-1940s when a federal presence started on the Main Base and Wallops Island through 2039, which accounts for the *Final Site-wide* PEIS 20-year planning horizon starting with the year 2019. The future timeline for this CEA spans from 2020 through 2040 to cover the anticipated 20-year lifespan of the fiber optic cable including periodic repair. The geographic scope of this CEA is the proposed project areas (the Boresight Antenna, Walker Marsh, and the UAS Airstrip) and the resources near WFF and the USFWS NWR.

The *Final Site-wide PEIS* CEA is incorporated by reference. The actions included in the past, present, and reasonably foreseeable future actions section of the *Final Site-wide PEIS* CEA are comprehensive and cover all actions that warrant consideration in the CEA for this tiered EA. Therefore, no additional actions are described in this EA. The relevant actions covered in the *Final Site-wide PEIS* that apply to this CEA include:

- NASA Activities including:
    - Wallops Island Shoreline Restoration and Infrastructure Protection Program (periodic beach renourishment, approximately every 5 years)
    - Expansion of the Wallops Island Launch Range
    - Phragmites Control and Monitoring Program
    - Replacement of Causeway Bridge
    - Development of North Wallops Island Deep-water Port and Operations Area
    - Construction of Launch Pier 0-D
- Other:
    - US Navy operations at Wallops Island and Atlantic Ocean (e.g., Field Carrier Landing Practice, Atlantic Fleet Training and Testing)
    - US Air Force Instrumentation Tower
    - USACE Federal Navigation Projects (dredging of Bogues Bay and Chincoteague Inlet)
    - Accomack County Subdivision Development within the Vicinity of WFF
    - Ongoing commercial and recreational vessel traffic in the area between Wallops Island and the mainland, including anchoring

5.1 Potential Cumulative Effects by Resource

As noted in the *Final Site-wide PEIS*, the scope of the CEA is related to the magnitude of the environmental impacts of the Proposed Action. The following section addresses those resources that have been identified as having the potential to be affected from the incremental effects of the Marsh Fiber project in combination with past, present, and reasonably foreseeable future activities. Only those resource areas upon which the Proposed Action would cause measurable effects are considered in detail in this CEA. Negligible, as used in this NEPA analysis, refers to impacts that would be so small that when studying the larger effect, the impacts would be imperceptible.

Table 5-1 provides a summary of those resources considered and whether they were included for detailed analysis in this CEA.

Table 5-1. Summary of Potential Environmental Impacts

Resource	EA Section	Type of Impact from Proposed Action	Analyzed in CEA?
Noise	3.1	Noise from construction activities would be minor, short-term, and localized. Cumulative impacts would be negligible.	No
Air Quality	3.2	Negligible impacts from Proposed Action; no cumulative effects anticipated.	No
Hazardous and Regulated Materials and Waste	3.3	Established procedures for managing hazardous and regulated materials and waste at WFF would be implemented along with a Frac-Out Contingency Plan. With implementation of site-specific plans and existing WFF plans and procedures, no cumulative effects anticipated.	No
Health and Safety	3.4	Beneficial impacts from Proposed Action; no cumulative effects anticipated.	Yes
Land Use	3.5	Land use compatibility would not be affected by the Proposed Action.	No
Land Resources	3.6	Minor, localized long-term impacts on soils from excavation of HDD entry pits and handholes; short-term impacts from ground disturbances. No impacts to topography or geology. Cumulative impacts would be negligible.	No
Surface Waters and Stormwater Management	3.7.1	With implementation of ESC BMPs and SWPPP, short-term minor impacts during construction.	Yes
Groundwater	3.7.2	Short-term minor impacts from dewatering; no cumulative effects anticipated.	No
Wetlands	3.7.3	Short-term indirect and direct impacts from Proposed Action; with wetland mitigation measures cumulative impacts would be minor in the short-term and negligible in the long-term.	Yes
Floodplains	3.7.4	No impacts from Proposed Action.	No

Table 5-1. Summary of Potential Environmental Impacts			
Resource	**EA Section**	**Type of Impact from Proposed Action**	**Analyzed in CEA?**
Coastal Zone	3.7.5	Project would be consistent to the maximum extent practicable with the enforceable policies of Virginia's CZM Program; no cumulative effects anticipated.	No
Sea Level Rise	3.7.6	No potential to contribute to sea-level rise; negligible impacts from sea-level rise on new infrastructure that would be constructed by the Proposed Action.	No
Vegetation	3.8	Short-term adverse impacts from removal of vegetation and disturbances; impacts would be minimized with use of synthetic matting at Walker Marsh and mitigated by replanting where vegetation would be disturbed. Permanent loss of vegetation in area of handholes.	Yes
Wildlife	3.9	Short-term minor impacts from disturbances during installation activities.	Yes
Aquaculture	3.10	Short-term impacts by not being able to harvest during 90-day period of work at Walker Marsh; minor impacts from disturbances to subaqueous bottom in the guts and edged of Walker Marsh where barge would anchor.	Yes
Special Status Species	3.11	With implementation of TOYR and BMPs, no impacts on federally threatened or endangered status species. Temporary minor impacts on EFH and BCC	No
Transportation	3.12	Minor short-term impacts from presence of boats and barges during installation; impacts would be negligible due to small number and 90-day duration of boat/barge activity.	No
Infrastructure and Utilities	3.13	Long-term beneficial impacts from new fiber optic cable.	Yes
Employment and Income	3.14	Negligible impacts from Proposed Action; no cumulative effects anticipated.	No
Recreation	3.15	Minor short-term impacts during 90-day installation at Walker Marsh from Proposed Action; due to short duration of project, cumulative impacts would be negligible.	No
Archaeological Resources	3.16	No effects to historic properties from the Proposed Action.	No

5.1.1 Health and Safety

Installing a new fiber optic communication cable under the Proposed Action would have long-term substantial beneficial impacts on public health and safety during WFF launch range activities. The Proposed Action, when combined with expansion of the launch range on Wallops Island and expansion of the permanent danger zone proposed by USACE as noted in the *Final Site-Wide PEIS*, would contribute to long-term cumulative beneficial impacts on launch range safety, and therefore on public health and safety.

5.1.2 Surface Waters

Past and projected construction activities in the areas surrounding the Proposed Action including grading, clearing, filling, and excavation would result in disturbance of the ground surface and would have the potential to cause soil erosion and the subsequent transport of sediment and/or nutrients into waterways via stormwater. NASA has and would continue to minimize impacts on surface waters by acquiring construction and industrial VPDES permits and by developing and implementing a site-specific SWPPPs and ESC plans prior to land-disturbing activities. NASA would follow VPDES and VSMP requirements for proper sizing and planning for stormwater conveyance from new infrastructure.

Other projects occurring in adjacent marine waters (i.e., dredging) would result in temporary elevated levels of turbidity, particularly for projects in the "back bays" west of Wallops Island. However, these projects would be temporally and spatially separated and would result in negligible cumulative water quality impacts. As such, there would be no significant cumulative impacts to surface water resources from implementing the Proposed Action.

5.1.3 Vegetation and Wetlands

The Proposed Action would result in temporary and permanent impacts to tidal vegetated wetlands. NASA would restore wetlands that would be temporarily impacted to pre-construction conditions and mitigate permanent impacts to wetlands through wetland creation or acquisition of wetland credits through the Virginia Aquatic Resources Trust Fund.

Impacts to wetlands would be permitted through the USACE, VMRC, VDEQ, and Accomack County to ensure no net loss of wetlands. As described in the *Final Site-wide PEIS*, unavoidable adverse impacts to wetlands have occurred cumulatively over time at WFF; however, no net loss of wetlands has occurred since 1988 due to the existence of state and federal regulations that require unavoidable impacts to be mitigated. Moreover, while the appropriate mitigation is determined at the time of permitting, it is often the case that the ratio of wetlands mitigation to wetlands loss is greater than 1:1. Therefore, the Proposed Action would not contribute a significant cumulative impact to wetlands.

5.1.4 Wildlife

During construction, elevated noise levels may startle wildlife in the vicinity of the project sites. Temporary increases in noise are anticipated as a result of current and planned projects in the CEA area, as noted in this CEA and the *Final Site-wide PEIS*. Avian foraging and nesting activities would be temporarily affected by the Proposed Action at Walker Marsh. Past, present and reasonably foreseeable activities at the UAS Airstrip, the WFF launch range, commercial and recreational fishing, navigation channel dredging west of Wallops Island, etc. can also temporarily affect avian foraging and/or nesting through noise and human presence. Noise generated from rocket launches is generally low frequency, of short duration, and occurs infrequently.

Noise associated with motorized watercraft and use has the potential to startle birds that may initiate a temporary flight response. Rodgers and Schwikert (2002) reported average flush distances for waterbirds ranging between approximately 20 and 60 m (65 to 200 ft) from the vessel, depending upon species. Vessel traffic in the CEA area is not heavy, the stimulus would be temporary, and it is expected that avian activity would return to normal shortly following vessel passage.

Naturally occurring background noises in the existing and potential nesting areas, such as wave action and thunderstorms, are more frequent and of longer duration than noise from a rocket launch and other human activities. In summary, no long-term changes to ambient noise levels are anticipated and the Proposed Action would not contribute significant cumulative impacts to wildlife.

5.1.5 Aquaculture

Portions of the public and private oyster beds at and surrounding Walker Marsh would be inaccessible for harvest, and anchoring of barges and the marsh buggy crossing the guts on Walker Marsh would disturb the subaqueous bottom during the 30-day installation period of the Proposed Action at Walker Marsh. However, the Proposed Action would not contribute significant cumulative impacts to aquaculture resources.

Future activities in marine waters such as dredging, commercial fishing using bottom-disturbing methods, anchoring of boats/barges/ships, construction of marinas/docks, etc. would result in temporary adverse changes to water quality (primarily from increased turbidity), and would have the potential to result in direct and indirect cumulative impacts to shellfish harvesting.

Activities that would occur in state waters surrounding Walker Marsh and in the “back bays” west of Wallops Island would require permitting from various agencies such as VMRC, USACE, Accomack County, and USCG. Activities not related to the Proposed Action that would have the potential to temporarily or permanently affect/prevent harvest of aquaculture species would require notification to VMRC and subsequent permitting, as applicable. Permits would include measures to avoid adverse impacts to aquaculture sites such that cumulative actions would not affect the long-term viability of public or private oyster grounds near these areas. As such,

5.1.6 Infrastructure and Utilities

The Proposed Action would have long-term beneficial impacts on infrastructure and utilities by providing current technologies that are functional and reliable at WFF. When combined with the actions described in the Final Site-Wide PEIS, there would be a long-term beneficial impact on infrastructure and utilities at Wallops Island that rely on NASA to provide reliable, secure, and rapid means of transmitting a diverse range of data to meet the current and future information IT demands. Cumulatively, the Proposed Action would have long-term beneficial impacts on the mission of NASA and its tenants at WFF.

6 Agencies and Persons Consulted

Copies of the Draft EA were sent to the following agencies, organizations, and individuals.

Table 6-1. List of Agencies and Persons Consulted for the EA

Name	Organization	Letter	Draft EA
Federal Agencies			
Ms. Sara Bahnson	USACE, Eastern Shore Field Office	✓	✓
Mr. Brian Hopper	NMFS, Protected Resources Division	✓	✓
Mr. David O'Brien	NMFS, Habitat Conservation Division	✓	✓
Ms. Kimberly Dahmon-Randall	NMFS, Protected Resource Division	✓	✓
Ms. Karen Greene	NMFS, Essential Fish Habitat Coordinator	✓	✓
Victor Grycenkov	NOAA, Wallops Command and Data Acquisition Station		✓
Ms. Deborah Darden	NPS, Assateague Island National Seashore		✓
LT Joshua Zirbes	USCG, Sector Field Office Eastern Shore		✓
Ms. Carrie Traver	EPA, Office of Environmental Programs	✓	✓
Ms. Cindy Schulz	USFWS, Virginia Field Office		✓
Ms. Emily Argo	USFWS, Virginia Field Office	✓	✓
Dr. Deborah Rocque	USFWS, Northeast Region		✓
Ms. Nancy Finley	USFWS, Chincoteague and Wallops Island NWRs	✓	✓
Mr. Bob Leffel	USFWS, Chincoteague and Wallops Island NWRs		✓
Mr. Kevin Holcombe	USFWS, Chincoteague and Wallops Island NWRs	✓	✓
State Agencies			
Mr. Sean Mulligan	Mid-Atlantic Regional Spaceport	✓	✓
Mr. Frank Piorko	Maryland Coastal Bays Program		✓
Ms. Rene Hypes	Virginia Department of Conservation and Recreation	✓	✓
Ms. Anne Chazal	Virginia Department of Conservation and Recreation	✓	✓
Ms. Sheri Kattan	VDEQ, Office of Wetlands and Water Protection	✓	✓
Ms. Amy Ewing	VDGIF, Fish and Wildlife Information Services	✓	✓
Ms. Ruth Boettcher	VDGIF, Fish and Wildlife Information Services	✓	✓
Ms. Laura Lavernia	VDHR, Review and Compliance	✓	✓
Ms. Karen Duhring	Virginia Institute of Marine Science		✓
Mr. Lyle Varnell	Virginia Institute of Marine Science	✓	✓
Mr. Hank Badger	VMRC, Habitat Management Division	✓	✓
Mr. Tony Watkinson	VMRC, Habitat Management Division	✓	✓

Table 6-1. List of Agencies and Persons Consulted for the EA			
Name	**Organization**	**Letter**	**Draft EA**
Local Government			
Mr. Michael Mason	Accomack County Administration		✓
Mr. Chris Guvernator	Accomack County Wetlands Board	✓	✓
Mr. Curtis Smith	Accomack-Northampton Planning District Commission		✓
Mr. Rich Morrison	Accomack County Dept. of Building and Zoning		✓
Mr. James West	Town of Chincoteague		✓
Ms. Julie Wheatley	Wallops Research Park		✓
Mr. C. Renata Major	Accomack County Board of Supervisors		✓
Mr. Donald Hart, Jr.	Accomack County Board of Supervisors		✓
Mr. Grayson Chesser	Accomack County Board of Supervisors		✓
Mr. Harrison Phillips, III	Accomack County Board of Supervisors		✓
Ms. Laura Belle Gordy	Accomack County Board of Supervisors		✓
Mr. Paul Muhly	Accomack County Board of Supervisors		✓
Mr. Robert Crockett	Accomack County Board of Supervisors		✓
Mr. Ronald Wolff	Accomack County Board of Supervisors		✓
Mr. William Tarr	Accomack County Board of Supervisors		✓
Mr. Randy Laird	Somerset County Board of Commissioners		✓
Mayor J. Arthur Leonard	Town of Chincoteague		✓
Other Organizations and Individuals			
Mr. Alverne Chesterfield	Chincoteague Bay Field Station	✓	✓
Dr. Bryan Watts	College of William and Mary, Center for Conservation Biology	✓	✓
Ms. Debra Ryon	Navy Surface Combat Systems Center		✓
Mr. Peter Bale	Sentinel Robotic Solutions, LLC		✓
Tribes			
Dr. Caitlin Totherow	Catawba Indian Nation	✓	✓
Chief Mr. Stephen Adkins	Chickahominy Indian Tribe	✓	✓
Chief Mr. Lee Lockamy	Nansemond Indian Tribal Association	✓	✓
Chief Dr. Robert Gray	Pamunkey Indian Nation	✓	✓
Paramount Chief Mr. Norris Howard, Sr.	Pocomoke Indian Nation	✓	✓
Chief Ms. Anne Richardson	Rappahannock Tribe	✓	✓

7 List of Preparers

Table 7-1. List of Preparers		
Name	**Title, Education and Years of Experience**	**Area of Responsibility in EA**
NASA		
Shari Miller	Environmental Engineer, BS Chemistry, BS Biology, 26 years	Center NEPA Manager, Document Development and Review
Douglas Bruner, PG	Environmental Engineer, MS Engineering Geology, 23 years	NEPA Project Co-Lead, Document Development and Review
Karalyn Springle	IT Project Manager, BS Business Administration, Graduate Certificate Project Management, 11 years	Project Manager and Team Lead, Development of Alternatives
Randall Stanley	Architect, BS in Architectural Engineering Technology, 10 years	Cultural Resources
EEE Consulting, Inc. (Contractor to NASA)		
Suzie Richert, AICP, CEP	NEPA Specialist, MS Soil Science, 19 years	Contractor Project Manager, Document Development
Doug Fraser	Senior Environmental Scientist, MS Geological Sciences, 41 years	Alternatives Development, Document Review
Robert Wright, PWS, PWD, CNRP	Senior Biologist and Wetlands Scientist, BS Environmental Science, 34 years	Water Resources, Permitting
Susan Liszeski, CEP	NEPA Specialist, MS Wildlife Management, 33 years	Document Review
Anna Salzberg	Environmental Scientist, PhD Public Policy & Administration, 7 years	Noise, Hazardous Materials and Hazardous Waste Management, Water Resources
Maunette Makowski	Environmental Scientist, BS Environmental Science, 12 years	GIS/Figures
Jeremy Bradley, GISP, CFM	Environmental Scientist, MS Natural Resources, 13 years	Land Use, Land Resources, Transportation, Stormwater, Infrastructure and Utilities, Employment and Income, Recreation
AECOM (Contractor to NASA)		
Craig Carver, AICP	NEPA Specialist, Master of Urban and Regional Planning, 10 years	AECOM Project Lead, NEPA QA/QC
Catey Lavagnino	Natural Resources Specialist, MS Environmental Science, 12 years	Special Status Species (USFWS), Vegetation, Wildlife
Steve Dillard	Senior Scientist, MS Environmental Systems Engineering, 30 years	Special Status Species (NOAA), EFH
Matthew Batdorf	Environmental Scientist, BS Biology, 6 years	Special Status Species (USFWS)

Table 7-1. List of Preparers		
Name	**Title, Education and Years of Experience**	**Area of Responsibility in EA**
Scott Seibel	Archaeology Program Manager, MSc Archaeomaterials, 22 years	Cultural Resources
Bobbie Hurley	NEPA Specialist, MA Chemistry, BS Biology/Chemistry, 39 years	AECOM Project Manager

The following USFWS staff reviewed the EA as a Cooperating Agency:

- Nancy Finley, USFWS, Chincoteague and Wallops Island NWRs
- Bob Leffel, USFWS, Chincoteague and Wallops Island NWRs

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

WFF Marsh Fiber Environmental Assessment

Appendix A
Waters of the U.S. Field Investigation Report

Wetland Delineation Report Site Information Summary
NASA Wallops Flight Facility (WFF) Marsh Fiber Project
Wallops Flight Facility, Wallops Island, VA 23337
(± 74.9 Acres)
Accomack County, Virginia

Date

October 4, 2019

Latitude/ Longitude in Decimal Degrees using coordinate plane (NAD 1983)

There are three delineation areas, listed below:

UAS Airstrip: 37.545939, -75.281851
Walker Marsh: 37.535580, -75.272175
Boresight Antenna: 37.531589, -75.263003

Has a previous delineation or JD been performed? If so, please provide USACE Project Number:

UAS Airstrip PJD NAO-2009-00939 (April 30, 2009)

Hydrologic Unit Code (HUC)

HUC 02040303

USGS Topographic Sheet

Chincoteague West, VA 7.5-minute quadrangle

Nearest Waterbody

Watts Bay, Old Root Narrows, and The Narrows are within the project review area. These features are estuarine waterbodies of Atlantic Ocean HUC.

Project Description

The WFF Marsh Fiber project would consist of installing a new fiber optic cable along a pathway between the Boresight Antenna area on the U.S. Fish and Wildlife's Wallops Island National Wildlife Refuge (Wallops NWR) and the Mid-Atlantic Regional Spaceport (MARS) Unmanned Aircraft Systems (UAS) Airstrip on Wallops Island (**Figures 1, 2 and 3, Appendix A**). NASA would install the new fiber optic cable via two primary methods: horizontal directional drilling (HDD) and vibratory trenching using low-pressure equipment. NASA would use the HDD method to install the cable beneath the bed of waterways (open water habitats and marsh) and portions of land east of the Boresight Antenna and west of the UAS Airstrip. NASA would use the vibratory

trenching method to install the cable through the saltmarsh (Walker Marsh) located between the shorelines on Wallops NWR and Wallops Island.

The proposed Marsh Fiber project aims to provide a secure, redundant and updated communication pathway for WFF to ensure that NASA and its tenants have a reliable means of communication for a diverse range of systems including command, voice, video, and data services for government, academic, and commercial missions on Wallops Island.

Delineation Methods

The 2012 U.S. Army Corps of Engineers (USACE) *Regional Supplement to the Manual: Atlantic and Gulf Coastal Plain Region* Version 2.0 in conjunction with the 1987 USACE *Wetland Delineation Manual*, and applicable regulatory guidance. The 2016 USACE Plant List was used to establish and calculate hydrophytic vegetation status. Munsell soil color charts were used to determine soil and redox feature color characteristics per Manuals.

On-Site Investigation Date

Wetland boundary delineation and site data collection were completed on September 16-17, 2019 by EEE Consulting, Inc. staff (Senior Environmental Scientist Robert Wright, PWS, PWD, CNRP and Wyatt Jamerson, Environmental Scientist).

Wetland Delineation Plan

The project review area consists of the potential areas of disturbance at the HDD entry points at the Boresight Antenna and the UAS Airstrip, a 200-foot wide corridor through Walker Marsh, and a 200-foot wide corridor along the HDD subsurface pathway. The project review area is shown on **Figure 3.**

Potential Waters of the U.S. (WOUS) in the Boresight Antenna, UAS Airstrip, and Walker Marsh project areas were field delineated in accordance with 2012 Regional Supplement Manual. The potential wetland and open water boundaries, data collection points, benchmarks and other features supporting the delineation were field determined, flagged using alpha numeric sequential vinyl surveyors flagging, and flag locations determined using an Apple iPAD with the Theodolite GPS coordinate software. All boundaries, landscape features, and annotations supporting the delineation are depicted on the "Potential Waters of the US Delineation Map" **Figure 7** (UAS Airstrip), **Figure 8** (Boresight Antenna), and **Figure 9** (Walker Marsh) dated October 3, 2019. Project graphics are presented in **Appendix A**. The potential WOUS boundaries shown on the figures are based on field observation, multiple GPS points, and interpretation of aerial photographs.

The potential WOUS along the HDD pathway beneath Watts Bay, Old Root Narrows, and The Narrows were mapped based on the USFWS National Wetlands Inventory (NWI) mapper website data. **Figure 10** presents the NWI mapper data and classifications for the project review area.

Wetland Investigation Results

Stream Channels: There are no streams present in the delineation areas.

Wetlands: A total of 34.0 acres of tidal vegetated wetlands were identified within the WFF Marsh Fiber project review area. **Table 1, Table, 2, and Table 3** summarize the delineated and mapped features at the UAS Airstrip, Walker Marsh, and HDD pathway, respectively. The Boresight Antenna delineation area supported no wetlands (3.96 acres of uplands, no table).

Of the total delineated and mapped potential project review area, approximately 29.61 acres are regularly inundated estuarine persistent intertidal emergent (E2EM1N, low salt marsh) tidal wetlands, approximately 3.65 acres are irregularly flooded, estuarine persistent intertidal emergent (E2EM1P, high salt marsh), approximately 0.69 acres of irregularly flooded, estuarine, intertidal unconsolidated shore (E2USP) wetlands, and approximately 0.05 acres of irregularly flooded, estuarine, intertidal, needle-leaved evergreen, scrub shrub (E2SS4P) wetlands. Data sampling points 1, 4, 5, 7, and 13-17 provided in **Appendix B**, characterize the vegetated tidal wetlands delineated within the project review area.

Additionally, approximately 27.01 acres of open water habitat (E1UBL), approximately 1.48 acres of subtidal estuarine aquatic bed habitat (E1ABL), approximately 1.02 acres of regularly flooded, estuarine, intertidal, mollusk reef (E2RF2N, oyster rock), were mapped within the project review area as summarized on **Table 1, Table 2,** and **Table 3** and as shown on **Figure 7, Figure 9,** and **Figure 10**.

Other Waters: None

Water bodies onsite identified as Section 10: Open water habitats (labelled/mapped as the E1UBL cover type) as shown on **Figure 7, Figure 8, Figure 9, and Figure 10** are considered Section 10 waters.

Uplands: Approximately 5.13 acres of the delineation area were classified as uplands at the UAS Airstrip. Approximately 3.96 acres of the Boresight Antenna site and access road were classified as uplands. These uplands are described by Data Sampling Points 2, 3, 6, 8, 9, and 10 provided in **Appendix B**. A small portion of a wetland/upland boundary (**Figure 7**) located in the extreme eastern end of the UAS Airstrip site could not be flagged due to multiple underground bee nests and thick upland scrub cover. The boundary is estimated by visual estimation methods. Walker Marsh supports no upland areas.

Representative site photos of the field delineation areas plus estuarine waters, and other features are provided in **Appendix C.**

100-Year Floodplains

As depicted on the Federal Emergency Management Agency's Flood Insurance Rate Map Number 51001C0275G, effective date 5/18/2015, most of the project review area is within the 100-year floodplain (Zone VE, Areas subject to inundation by the 1-percent-annual-chance flood event with

additional hazards due to storm-induced velocity wave action, Base Flood Elevation 9 Feet) **(Figure 4**, **Appendix A**). The area east of the Boresight Antenna is within the 100-year (Zone AE) and 500-year floodplain (Zone X) flood zones, and the project area at the Boresight Antenna is in the unshaded Zone X (Area of minimal flood hazard).

National Wetlands Inventory/National Hydrographic Dataset Mapping

The National Hydrography Dataset and NWI Map (**Figure 5, Appendix A**) combines tidal wetland cover types and depicts them as combined estuarine and marine wetlands. As shown on **Figure 10**, the National Wetland Mapper website identifies estuarine and marine wetlands including: E2EM1N (low marsh) and E2EM1P (high marsh), E2USP (oyster rock), E2USP unconsolidated shoreline wetlands, and scrub-shrub wetlands. Wetland 1 (**Figure 7**) is delineated as an E2EM1N tidal wetland. Wetland 2 (**Figure 7**) is delineated as E2EM1P tidal wetlands. All wetlands at Walker Marsh were identified as E2EM1N tidal wetlands **(Figure 9**). A total of approximately 28.0 acres of open water habitat (E1UBL), approximately 1.48 acres of subtidal estuarine aquatic bed habitat (E1ABL), approximately 1.02 acres of regularly flooded, estuarine, intertidal, mollusk reef (E2RF2N, oyster rock), were mapped within the project review area as summarized on **Table 1**, **Table 2**, and **Table 3** and as shown on **Figure 7**, **Figure 9**, and **Figure 10**.

USDA Soil Survey

The on-line USDA Natural Resource Conservation Service Soil Survey (**Figure 6, Appendix A**) identifies the following hydric soils within the project boundary: Camocca fine sand, 0 to 2 percent slopes, frequently flood (CaA), Chincoteague silt loam, 0 to 1 percent slopes, very frequently flooded (ChA), Fisherman-Assateague complex, 0 to 35 percent slopes, rarely flooded (FmD).

The on-line USDA Natural Resource Conservation Service Soil Survey identifies the following non-hydric soils within the project boundary: Molena loamy sand, 0 to 6 percent slopes (MoB), Molena loamy sand, 6 to 35 percent slopes (MoD), and Bojac fine sandy loam, 0 to 2 percent slopes (BoA).

Waters and Wetlands Tables:

Table 1: Summary of Delineated Features at UAS Airstrip (Figure 7)

Waters ID	Latitude	Longitude	Quantity/Units Acres/Linear Feet	Type	Authority
Wetlands					
Wetland 1	37.531415	-75.262930	1.50	E2EM1P High Marsh	Section 404/401
Wetland 2	37.537642	-75.262930	1.96	E2EM1N Low Marsh	Section 404/401
WETLAND TOTAL (Acres)			**3.46**		
No Streams					
Other Estuarine Waters					
Open Water 1	37.531252	-75.262830	0.03	E1UBL Unconsolidated Bottom Subtidal	Section 404/401 Section 10
Open Water 2	37.531171	-75.262552	0.08	E1UBL Unconsolidated Bottom Subtidal	Section 404/401 Section 10
Open Water 3	37.531104	-75.262427	0.04	E1UBL Unconsolidated Bottom Subtidal	Section 404/401
Open Water 4	37.530980	-75.262250	0.02	E1UBL Unconsolidated Bottom Subtidal	Section 404/401
Open Water 5	37.530952	-75.262096	0.06	E1UBL Unconsolidated Bottom Subtidal	Section 404/401
OTHER ESTUARINE WATERS TOTAL (Acres)			**0.23**	E1UBL Unconsolidated Bottom Subtidal	Section 404/401

Notes: Coordinates in centroid location in decimal degrees; depicted potential wetland boundaries have not been verified by regulatory agencies.

Table 2: Summary of Delineated Features at Walker Marsh (Figure 9)

Waters ID	Latitude	Longitude	Quantity/Units Acres/Linear Feet	Type	Authority
Wetlands					
Wetland 1	37.535812	-75.272293	19.23	E2EM1N Low Marsh	Section 404/401
WETLAND TOTAL (Acres)			**19.23**		
No Streams					
Other Estuarine Waters					
Open Water (Gut 1)	37.540020	-75.273538	0.20	E1UBL Unconsolidated Bottom Subtidal	Section 404/401 Section 10
Open Water (Gut 2)	37.535580	-75.272175	0.22	E1UBL Unconsolidated Bottom Subtidal	Section 404/401 Section 10
Open Water (Gut 3)	37.535181	-75.271601	0.15	E1UBL Unconsolidated Bottom Subtidal	Section 401/401 Section 10
Open Water	37.535313	-75.271976	0.09	E1UBL Unconsolidated Bottom Subtidal	Section 404/401 Section 10
Open Water (S Terminus)	37.534085	-75.270751	0.34	E1UBL Unconsolidated Bottom Subtidal	Section 404/401 Section 10
OPEN WATER E1UBL (Acres)			**1.00**		

Notes: Coordinates in centroid location in decimal degrees; depicted potential wetland boundaries have not been verified by regulatory agencies

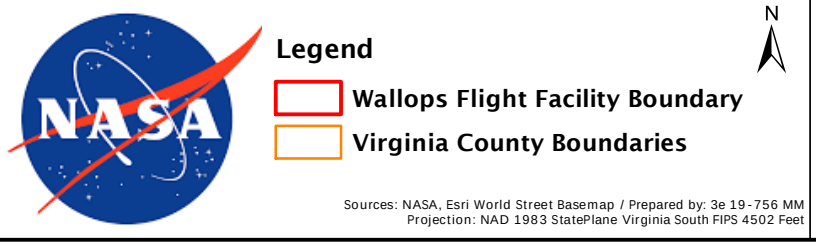
Table 3: Summary of Mapped Potential Wetland Features Within the Project Review Area (Figure 10)

Waters ID	Latitude	Longitude	Quantity/Units Acres/Linear Feet	Type	Authority
Wetlands					
Wetland 1	37.915940	-75.470919	0.05	E2SS4P	Section 404/401
Wetland 2	37.896695	-75.451978	8.42	E2EM1N	Section 404/401
Wetland 3	37.915135	-75.470677	2.15	E2EM1P	Section 404/401
Wetland 4	37.889667	-75.444718	0.69	E2USP	Section 404/401
WETLAND TOTAL (Acres)			**11.31**		
Other Estuarine Waters					
Open Water	37.90364	-75.459995	26.77	E1UBL	Section 404/401 Section 10
Open Water	37.890889	-75.446217	1.48	E1ABL	Section 404/401 Section 10
Open Water	37.893495	-75.450145	1.02	E2RF2N	Section 404/401
TOTAL Open Water (Acres)			**29.27**		

Notes: Coordinates in centroid location in decimal degrees; depicted potential wetland boundaries have not been verified by regulatory agencies

APPENDIX A

Graphics

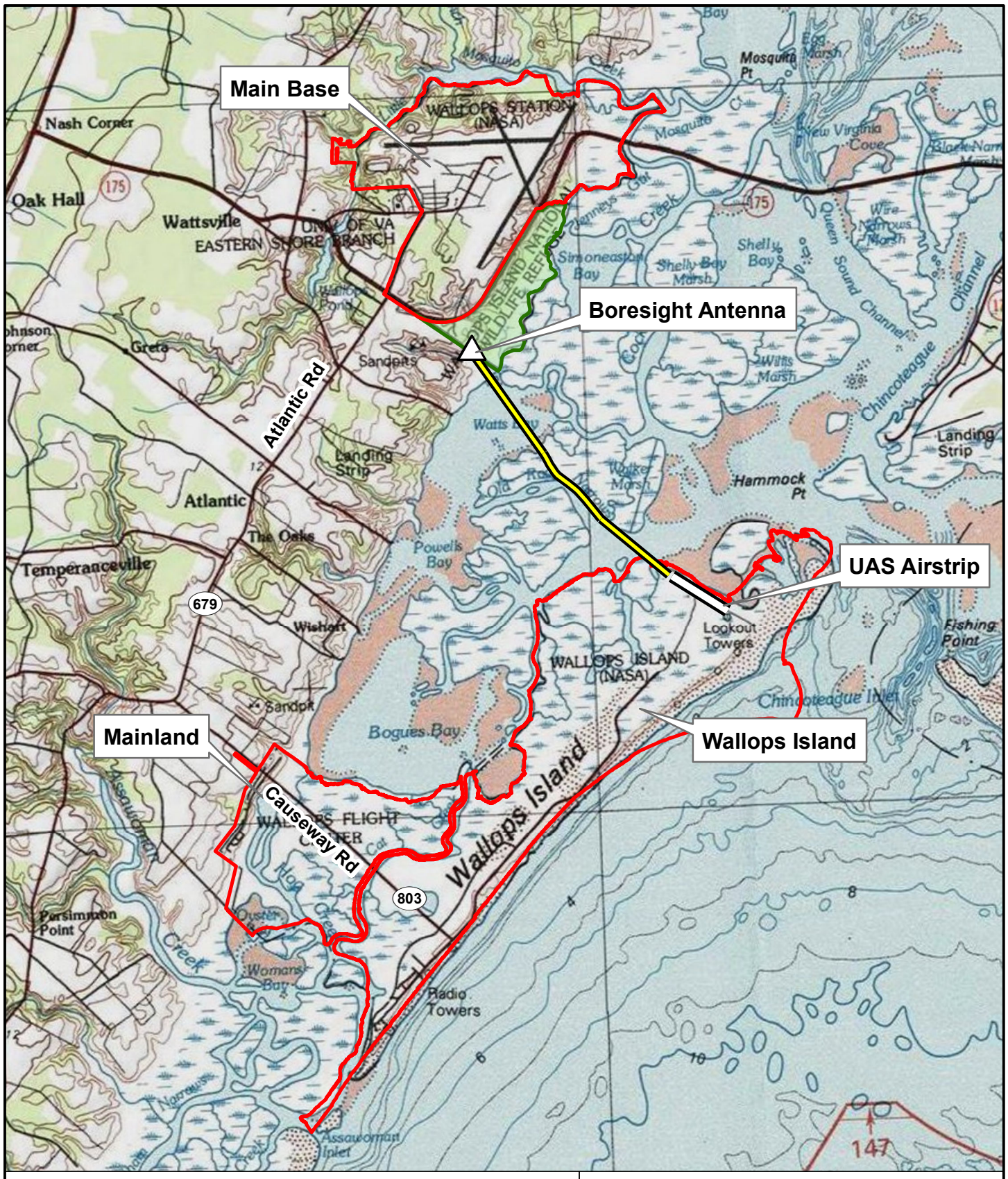


Sources: NASA, Esri World Street Basemap / Prepared by: 3e 19-756 MM
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 1
PROJECT LOCATION MAP
WALLOPS FLIGHT FACILITY

0 4.5 9
Miles

NASA WFF Marsh Fiber



Legend

- Proposed Marsh Fiber Path
- Wallops Flight Facility Boundary
- Wallops Island National Wildlife Refuge

N

Sources: NASA, USFWS, Esri USA Topo Basemap / Prepared by: 3e 19-756 MM
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 2
USGS TOPOGRAPHY
WALLOPS FLIGHT FACILITY

0 1.15 2.3
Miles

NASA WFF Marsh Fiber

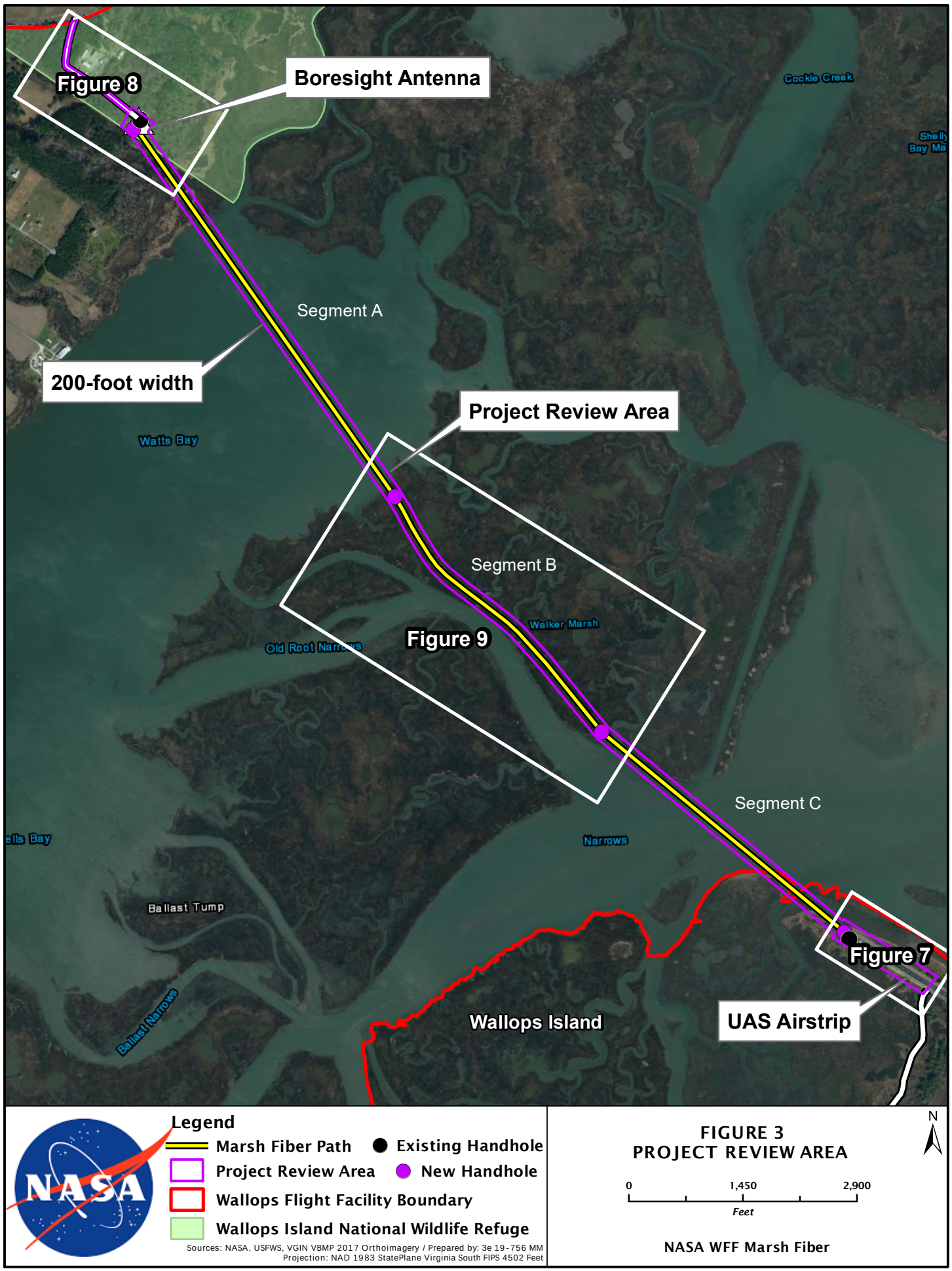
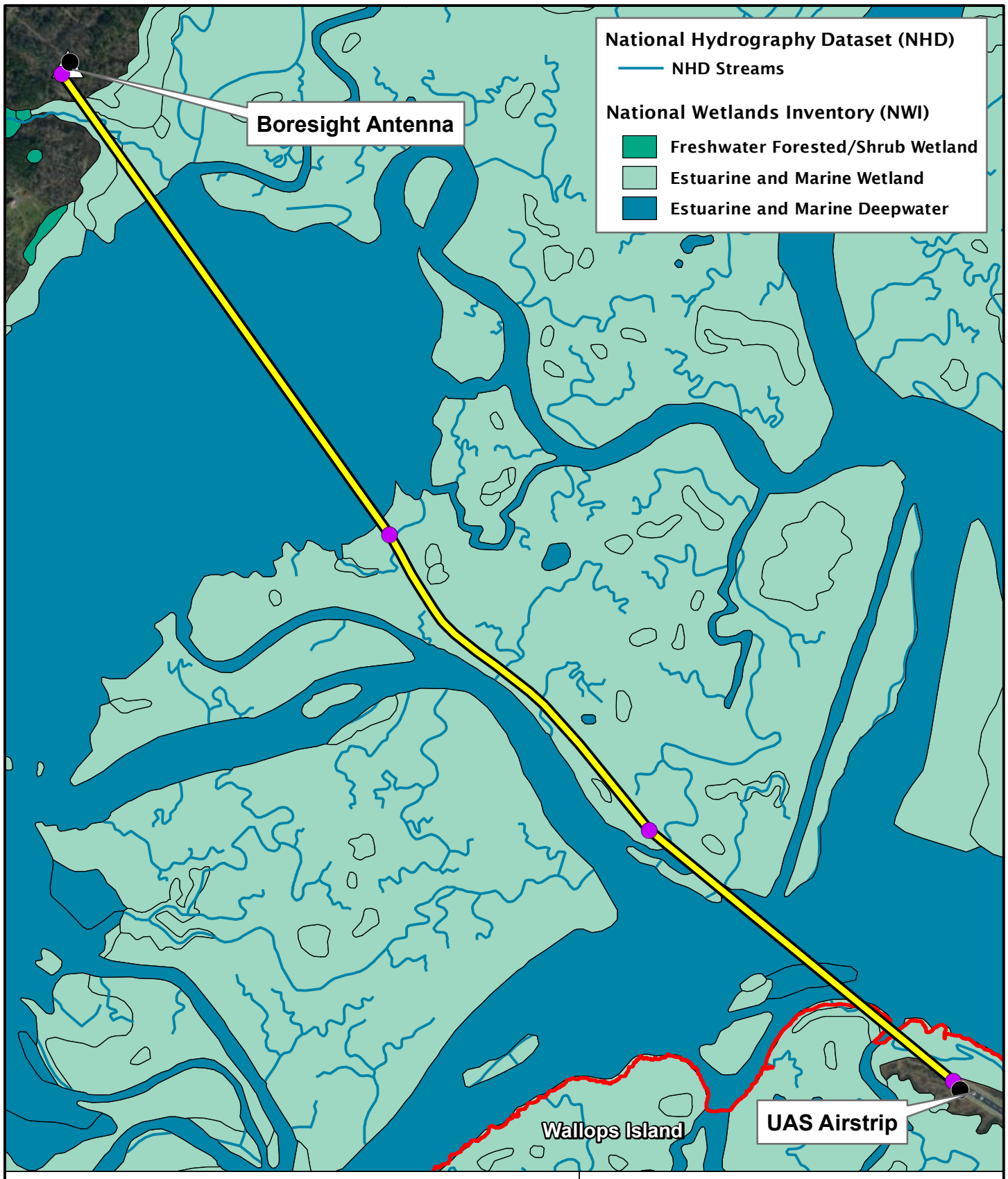


Figure 8
Boresight Antenna
Cockle Creek
Segment A
200-foot width
Project Review Area
Watts Bay
Segment B
Walker Marsh
Figure 9
Old Root Narrows
Segment C
Narrows
Ballast Tump
Figure 7
Wallops Island
UAS Airstrip
Ballast Narrows
Legend
Marsh Fiber Path
Existing Handhole
Project Review Area
New Handhole
Wallops Flight Facility Boundary
Wallops Island National Wildlife Refuge
Sources: NASA, USFWS, VGIN VBMP 2017 Orthoimagery / Prepared by: 3e 19-756 MM
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
FIGURE 3
PROJECT REVIEW AREA
N
0
1,450
2,900
Feet
NASA WFF Marsh Fiber


Flood Zone Designations
100-Year Floodplain (Zones AE, VE)
500-Year Floodplain (Zone X)
Area of Minimal Flood Hazard (Zone X)
Zone X
Zone AE
Zone X
Boresight Antenna
Segment A
Zone VE
Watts Bay
Zone VE
Segment B
Walker Marsh
Old Root Narrows
Segment C
Narrows
Ballast Tump
Wallops Island
UAS Airstrip
Legend
Existing Handhole
New Handhole
Proposed Marsh Fiber Path
Wallops Flight Facility Boundary
Sources: NASA, VGIN VBMP 2017 Orthoimagery, FEMA FIRM PANEL 51001C0265G
Prepared by: 3e 19-756 MM / Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
FIGURE 4
FEMA FLOOD MAP
N
0
1,350
2,700
Feet
NASA WFF Marsh Fiber



Legend

- Existing Handhole
- New Handhole
- Proposed Marsh Fiber Path
- Wallops Flight Facility Boundary

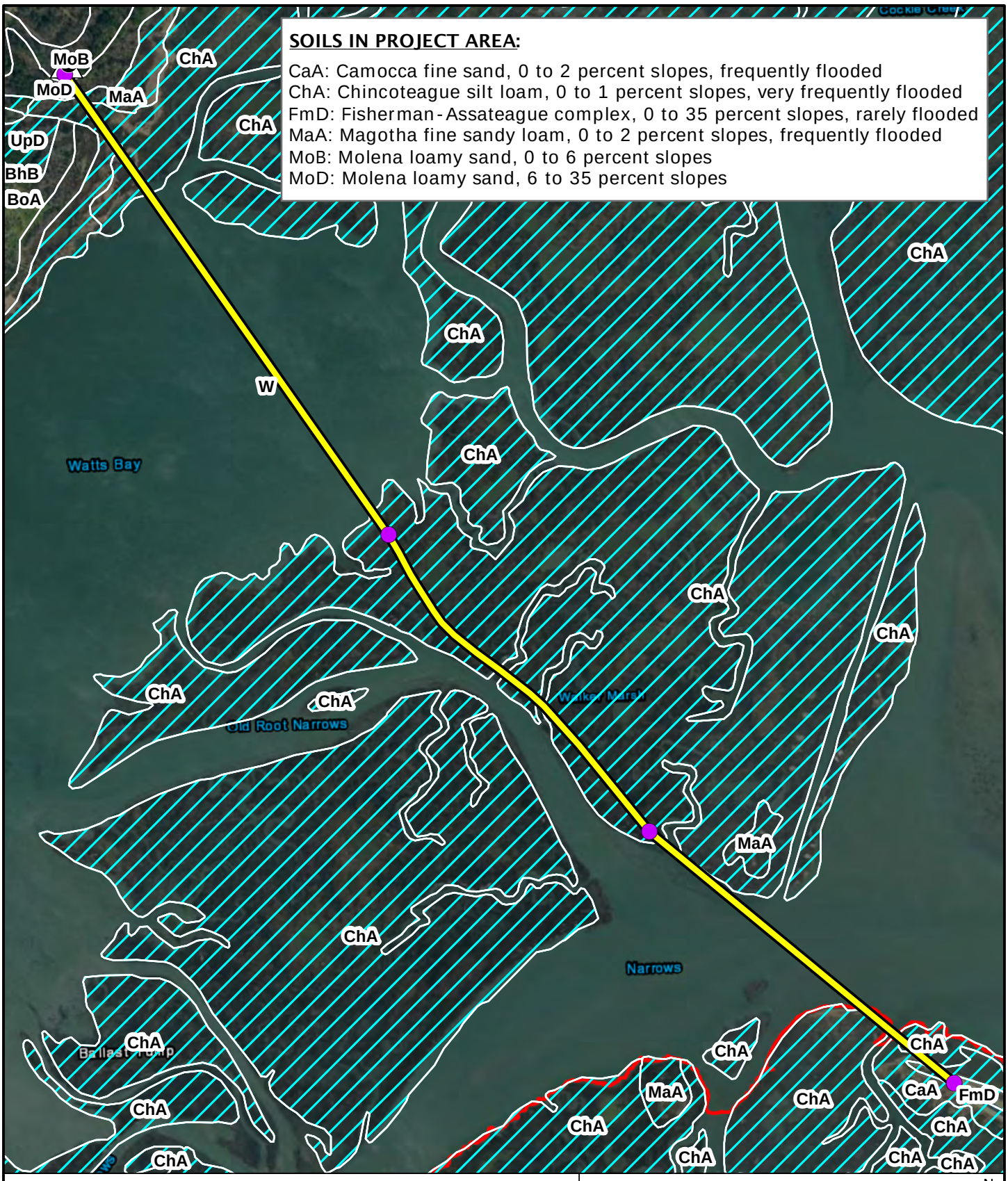
Sources: NASA, USFWS NWI, USGS NHD, VGIN VBMP 2017 Orthoimagery
Prepared by: 3e 19-756 MM / Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 5
NATIONAL HYDROGRAPHY DATASET AND NATIONAL WETLANDS INVENTORY

0 1,350 2,700
Feet

N

NASA WFF Marsh Fiber



Legend

- Existing Handhole
- New Handhole
- Proposed Marsh Fiber Path
- Hydric Soils
- Wallops Flight Facility Boundary

Sources: NASA, USDA NRCS Soil Survey Geographic (SSURGO) Database, VGIN VBMP 2017 Orthoimagery / Prepared by: 3e 19-756 MM
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 6
USDA NRCS SOILS

N

0 1,350 2,700
Feet

NASA WFF Marsh Fiber

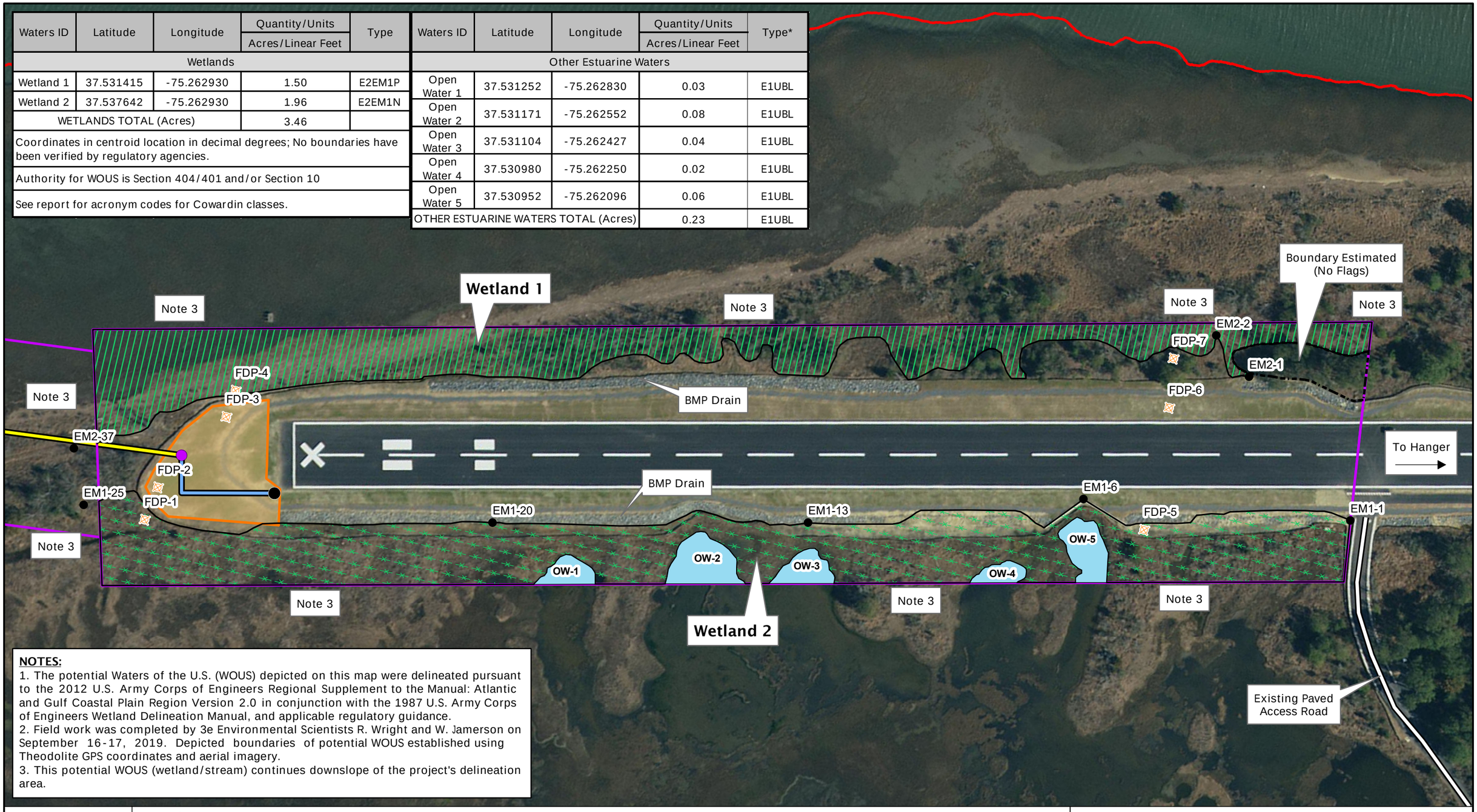
Waters ID	Latitude	Longitude	Quantity/Units Acres/Linear Feet	Type
Wetlands				
Wetland 1	37.531415	-75.262930	1.50	E2EM1P
Wetland 2	37.537642	-75.262930	1.96	E2EM1N
WETLANDS TOTAL (Acres)			3.46	

Coordinates in centroid location in decimal degrees; No boundaries have been verified by regulatory agencies.

Authority for WOUS is Section 404/401 and/or Section 10

See report for acronym codes for Cowardin classes.

Waters ID	Latitude	Longitude	Quantity/Units Acres/Linear Feet	Type*
Other Estuarine Waters				
Open Water 1	37.531252	-75.262830	0.03	E1UBL
Open Water 2	37.531171	-75.262552	0.08	E1UBL
Open Water 3	37.531104	-75.262427	0.04	E1UBL
Open Water 4	37.530980	-75.262250	0.02	E1UBL
Open Water 5	37.530952	-75.262096	0.06	E1UBL
OTHER ESTUARINE WATERS TOTAL (Acres)			0.23	E1UBL



NOTES:

1. The potential Waters of the U.S. (WOUS) depicted on this map were delineated pursuant to the 2012 U.S. Army Corps of Engineers Regional Supplement to the Manual: Atlantic and Gulf Coastal Plain Region Version 2.0 in conjunction with the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual, and applicable regulatory guidance.
2. Field work was completed by 3e Environmental Scientists R. Wright and W. Jamerson on September 16-17, 2019. Depicted boundaries of potential WOUS established using Theodolite GPS coordinates and aerial imagery.
3. This potential WOUS (wetland/stream) continues downslope of the project's delineation area.

Legend

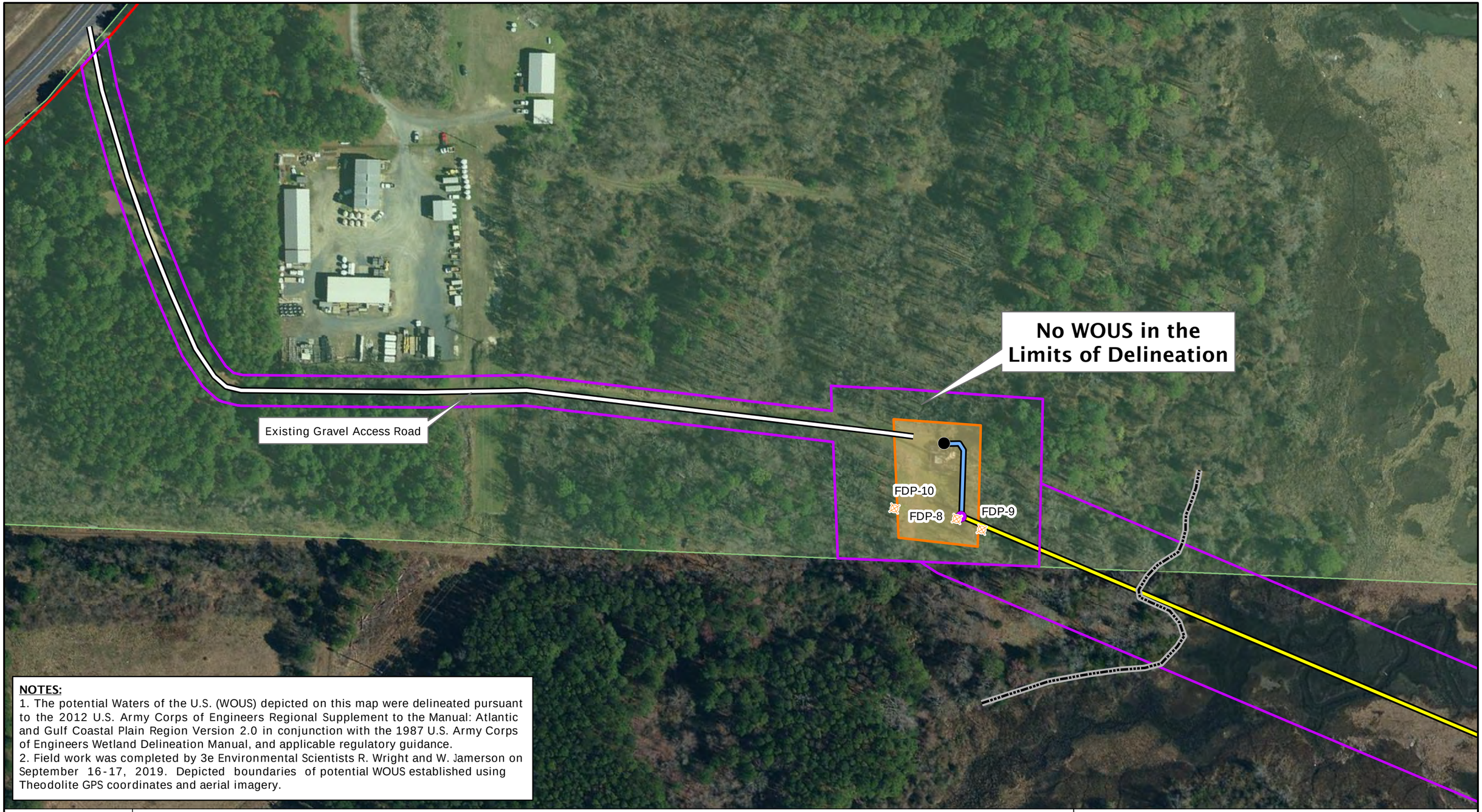
- New Handhole
- Existing Handhole
- Field Data Points (FDP)
- Flag Points
- Proposed Marsh Fiber Path
- Open Trench
- Access Road
- Project Review Area/ Delineation Area
- HDD Work Area
- Wallops Flight Facility Boundary
- Wetland 1 - EM2 (E2EM1P) High Marsh
- Wetland 2 - EM1 (E2EM1N) Low Marsh
- Boundary Estimated, No Flags
- Open Water/Unconsolidated Bottom (E1UBL)

Sources: NASA, VGIN VBMP 2017 Orthoimagery / Prepared by: 3e 19-756 MM 10/03/2019 / Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 7
POTENTIAL WATERS OF THE U.S. DELINEATION MAP
UAS AIRSTRIP

0 100 200
Feet

NASA WFF Marsh Fiber



NOTES:

1. The potential Waters of the U.S. (WOUS) depicted on this map were delineated pursuant to the 2012 U.S. Army Corps of Engineers Regional Supplement to the Manual: Atlantic and Gulf Coastal Plain Region Version 2.0 in conjunction with the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual, and applicable regulatory guidance.
2. Field work was completed by 3e Environmental Scientists R. Wright and W. Jamerson on September 16-17, 2019. Depicted boundaries of potential WOUS established using Theodolite GPS coordinates and aerial imagery.

Legend

- New Handhole
- Existing Handhole
- Field Data Points (FDP)
- Proposed Marsh Fiber Path
- Open Trench
- Access Road
- Estimated (No Flags) Landward Boundary of Tidal Wetland
- Project Reivew Area/Delineation Limits
- HDD Work Area
- Wallops National Wildlife Refuge
- Wallops Flight Facility Boundary

Sources: NASA, USFWS, VGIN VBMP 2017 Orthoimagery / Prepared by: 3e 19-756 MM 10/03/2019
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 8
POTENTIAL WATERS OF THE U.S. DELINEATION MAP
BORESIGHT ANTENNA

0 150 300
Feet

NASA WFF Marsh Fiber

Waters ID	Latitude	Longitude	Quantity/Units Acres/Linear Feet	Type
Wetlands				
Wetland 1	37.535812	-75.272293	19.23	E2EM1N
WETLAND TOTAL (Acres)			19.23	
Other Estuarine Waters				
Open Water (Gut 1)	37.54002	-75.273538	0.20	E1UBL
Open Water (Gut 2)	37.53558	-75.272175	0.22	E1UBL
Open Water (Gut 3)	37.535181	-75.271601	0.15	E1UBL
Open Water	37.535313	-75.271976	0.09	E1UBL
Open Water (S Terminus)	37.534085	-75.270751	0.34	E1UBL
OPEN WATER E1UBL TOTAL (Acres)			1.00	
Coordinates in centroid location in decimal degrees; No boundaries have been verified by regulatory agencies				
Authority for WOUS is Section 404/401 and/or Section 10				
See report for acronym codes for Cowardin classes.				

Watts Bay

N

FDP-13

Walker Marsh

FDP-14

FDP-15

FDP-16

FDP-17

G1

G2

G3

Old Root Narrows

S

NOTES:

1. The potential Waters of the U.S. (WOUS) depicted on this map were delineated pursuant to the 2012 U.S. Army Corps of Engineers Regional Supplement to the Manual: Atlantic and Gulf Coastal Plain Region Version 2.0 in conjunction with the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual, and applicable regulatory guidance.
2. Field work was completed by 3e Environmental Scientists R. Wright and W. Jamerson on September 16-17, 2019. Depicted boundaries of potential WOUS established using Theodolite GPS coordinates and aerial imagery.

Legend

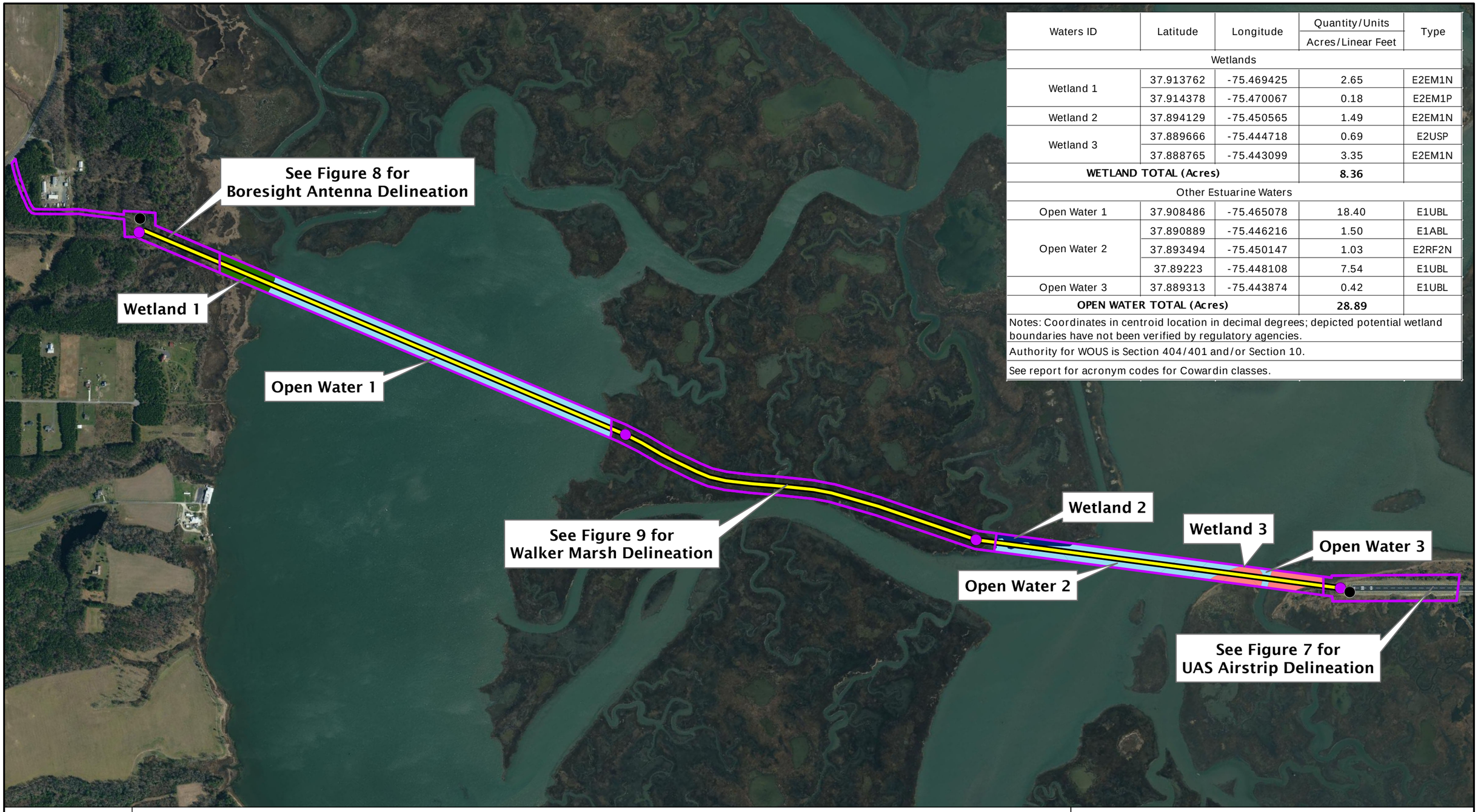
- New Handhole
- Field Data Points (FDP)
- Proposed Marsh Fiber Path
- Project Review Area/Delineation Limits
- Wetland 1 - EM1 (E2EM1N) Low Marsh
- Open Water/Unconsolidated Bottom (E1UBL)

Sources: NASA, VGIN VBMP 2017 Orthoimagery / Prepared by: 3e 19-756 MM 10/03/2019
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

FIGURE 9
POTENTIAL WATERS OF THE U.S. DELINEATION MAP
WALKER MARSH

0 300 600
Feet

NASA WFF Marsh Fiber



Waters ID	Latitude	Longitude	Quantity/Units Acres/Linear Feet	Type
Wetlands				
Wetland 1	37.913762	-75.469425	2.65	E2EM1N
	37.914378	-75.470067	0.18	E2EM1P
Wetland 2	37.894129	-75.450565	1.49	E2EM1N
Wetland 3	37.889666	-75.444718	0.69	E2USP
	37.888765	-75.443099	3.35	E2EM1N
WETLAND TOTAL (Acres)			**8.36**	
Other Estuarine Waters				
Open Water 1	37.908486	-75.465078	18.40	E1UBL
Open Water 2	37.890889	-75.446216	1.50	E1ABL
	37.893494	-75.450147	1.03	E2RF2N
	37.89223	-75.448108	7.54	E1UBL
Open Water 3	37.889313	-75.443874	0.42	E1UBL
OPEN WATER TOTAL (Acres)			**28.89**	

Notes: Coordinates in centroid location in decimal degrees; depicted potential wetland boundaries have not been verified by regulatory agencies.

Authority for WOUS is Section 404/401 and/or Section 10.

See report for acronym codes for Cowardin classes.

Legend

- New Handhole
- Existing Handhole
- Proposed Marsh Fiber Path
- Project Work Area/Delineation Limits (200-foot width)

Sources: NASA, USFWS NWI, VGIN VBMP 2017 Orthoimagery / Prepared by: 3e 19-756 MM 1/23/2020
Projection: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

National Wetlands Inventory (NWI)

- Wetland 1 - E2EM1N and E2EM1P
- Wetland 2 - E2EM1N
- Wetland 3 - E2USP and E2EM1N
- Open Water - E1UBL, E1ABL, and E2RF2N

N

FIGURE 10
MAPPED POTENTIAL WOUS IN WATTS BAY, OLD ROOT NARROWS, AND PROXIMAL AREAS

0 1,000 2,000
Feet

NASA WFF Marsh Fiber

APPENDIX B

Wetland Data Sheets

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: UAS Airstrip- WFF Marsh Fiber City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA / Wallops Island NWR State: VA Sampling Point: FDP1

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Marsh Local relief (concave, convex, none): slightly convex Slope (%): 01

Subregion (LRR or MLRA): T153C Lat: 37.8881084 Long: -75.441604 Datum: NAD 83

Soil Map Unit Name: Camocca fine sand 0-2% slope frequent flooding NWI classification: E2USN

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [✓]	No [ ]	**Is the Sampled Area within a Wetland?** Yes [✓] No [ ]
Hydric Soil Present?	Yes [✓]	No [ ]	
Wetland Hydrology Present?	Yes [✓]	No [ ]	

Remarks:

Low marsh/ high marsh interface.

All mandatory technical parameters for wetland are met; site is a low/high marsh area.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [ ] Surface Water (A1)
- [✓] High Water Table (A2)
- [✓] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [✓] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [✓] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [✓] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [✓] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [✓] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes [✓]	No [ ]	Depth (inches): 0 (tidal)	
Water Table Present?	Yes [✓]	No [ ]	Depth (inches): 0	
Saturation Present? (includes capillary fringe)	Yes [✓]	No [ ]	Depth (inches): 0	**Wetland Hydrology Present?** Yes [✓] No [ ]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Tidal salt marsh.

Multiple field indicators of supporting hydrology present; meets parameter.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP1

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Sapling Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Shrub Stratum (Plot size: 30 feet)			
1. Iva frutescens	35	Y	FACW
2.			
3.			
4.			
5.			
6.			
	35 = Total Cover		
50% of total cover: 18	20% of total cover: 7		
Herb Stratum (Plot size: 30 feet)			
1. Spartina alterniflora	60	Y	OBL
2. Spartina patens	40	Y	FACW
3. Juncus gerardii	5	N	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	105 = Total Cover		
50% of total cover: 53	20% of total cover: 21		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	65	x 1 =	65
FACW species	75	x 2 =	150
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	140 (A)		215 (B)

Prevalence Index = B/A = 1.53

Hydrophytic Vegetation Indicators:

- [x] 1 - Rapid Test for Hydrophytic Vegetation
- [x] 2 - Dominance Test is >50%
- [x] 3 - Prevalence Index is ≤3.0[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes [x] No [ ]

Remarks: (If observed, list morphological adaptations below).

Sample area meets the dominance and prevalence index tests; meets parameter.

SOIL

Sampling Point: FDP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3							Muck	
3-9	10 YR 4/2	100					LoSa	Saturated
9-14	10 YR 3/2	100					FSa	Saturated
14+	5Y 5/1	100					FSa	Saturated

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [x] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Organic Bodies (A6) **(LRR P, T, U)**
- [ ] 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- [ ] Muck Presence (A8) **(LRR U)**
- [x] 1 cm Muck (A9) **(LRR P, T)**
- [x] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Coast Prairie Redox (A16) **(MLRA 150A)**
- [ ] Sandy Mucky Mineral (S1) **(LRR O, S)**
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Dark Surface (S7) **(LRR P, S, T, U)**
- [ ] Polyvalue Below Surface (S8) **(LRR S, T, U)**
- [ ] Thin Dark Surface (S9) **(LRR S, T, U)**
- [ ] Loamy Mucky Mineral (F1) **(LRR O)**
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Marl (F10) **(LRR U)**
- [ ] Depleted Ochric (F11) **(MLRA 151)**
- [ ] Iron-Manganese Masses (F12) **(LRR O, P, T)**
- [ ] Umbric Surface (F13) **(LRR P, T, U)**
- [ ] Delta Ochric (F17) **(MLRA 151)**
- [ ] Reduced Vertic (F18) **(MLRA 150A, 150B)**
- [ ] Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- [ ] Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- [ ] 1 cm Muck (A9) **(LRR O)**
- [ ] 2 cm Muck (A10) **(LRR S)**
- [ ] Reduced Vertic (F18) **(outside MLRA 150A,B)**
- [ ] Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- [ ] Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- [ ] Red Parent Material (TF2)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: none

Depth (inches): _____

Hydric Soil Present? Yes [x] No [ ]

Remarks:

Multiple field indicators of hydric soil present; meets parameter.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: UAS Airstrip -WFF Marsh Fiber City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA / Wallops Island NWR State: VA Sampling Point: FDP2

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Point Local relief (concave, convex, none): slightly convex Slope (%): 0-3

Subregion (LRR or MLRA): T153C Lat: 37.887737 Long: -75.441772 Datum: NAD 83

Soil Map Unit Name: Fisherman-Assateague complex NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [ ]	No [✓]	**Is the Sampled Area within a Wetland?** Yes [ ] No [✓]
Hydric Soil Present?	Yes [ ]	No [✓]	
Wetland Hydrology Present?	Yes [ ]	No [✓]	

Remarks:

All three mandatory technical parameters are not met; area is not a wetland.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [ ] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes [ ]	No [✓]	Depth (inches): none
Water Table Present?	Yes [ ]	No [✓]	Depth (inches): none
Saturation Present? (includes capillary fringe)	Yes [ ]	No [✓]	Depth (inches): >18

Wetland Hydrology Present? Yes [ ] No [✓]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology. Well drained sand.

Field indicators of supporting wetland hydrology not present; fails parameters.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP2

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 feet)			
1. Digitaria ciliaris	80	Y	FACU
2. Eupatorium capillifolium	30	Y	FACU
3. Kummerowia stipulacea	20	Y	FACU
4. Eragrostis spectabilis	15	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	145 = Total Cover		

50% of total cover: 73 20% of total cover: 29

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species	145	x 4 =	580
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (If observed, list morphological adaptations below).

Sample area does not meet the dominance or prevalence tests; fails parameter.

SOIL

Sampling Point: FDP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10 YR 4/4	100	none				Lo sand	moist, slightly compacted
2-14	2.5 Y 6/4	100	none				Lo sand	moist
14+	10 YR 5/4	40	none				VF sand	very moist
	2.5 Y 6/4	60						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks:

Loamy sand, slightly compacted. Field indicators of hydric soil not present; fails parameter.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: UAS Airstrip - WFF Marsh Fiber City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA / Wallops Island NWR State: VA Sampling Point: FDP3

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Point Local relief (concave, convex, none): Slightly convex Slope (%): 0-2

Subregion (LRR or MLRA): T153C Lat: 37.887860 Long: -75.441754 Datum: NAD 83

Soil Map Unit Name: Fisherman-Assateague complex NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [✓]	No [ ]	**Is the Sampled Area within a Wetland?** Yes [ ] No [✓]
Hydric Soil Present?	Yes [ ]	No [✓]	
Wetland Hydrology Present?	Yes [ ]	No [✓]	

Remarks:

Two of the mandatory technical parameters are not met; area is not a wetland.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [ ] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes [ ]	No [✓]	Depth (inches): none
Water Table Present?	Yes [ ]	No [✓]	Depth (inches): none
Saturation Present? (includes capillary fringe)	Yes [ ]	No [✓]	Depth (inches): >18

Wetland Hydrology Present? Yes [ ] No [✓]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology.

Field indicators of supporting wetland hydrology not present; fails parameter.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP3

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: 20% of total cover:

Sapling Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: 20% of total cover:

Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: 20% of total cover:

Herb Stratum (Plot size: 30 feet)			
1. Spartina patens	50	Y	FACW
2. Panicum amarulum	15	N	FAC
3. Teucrium canadense	10	N	FACW
4. Gamochaeta purpurea	5	N	UPL
5. Erigeron (Conzya) canadensis	5	N	FACU
6.			
7.			
8.			
9.			
10.			
11.			
	85 = Total Cover		

50% of total cover: 43 20% of total cover: 17

Woody Vine Stratum (Plot size: 30 feet)			
1. Smilax bona-nox	50	Y	FAC
2. Toxicodendron radicans	25	Y	FAC
3.			
4.			
5.			
	75 = Total Cover		

50% of total cover: 38 20% of total cover: 15

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	90	x 3 =	270
FACU species	5	x 4 =	20
UPL species	5	x 5 =	25
Column Totals:	160 (A)		435 (B)

Prevalence Index = B/A = 2.72

Hydrophytic Vegetation Indicators:

- [x] 1 - Rapid Test for Hydrophytic Vegetation
- [x] 2 - Dominance Test is >50%
- [x] 3 - Prevalence Index is ≤3.0[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes [x] No [ ]

Remarks: (If observed, list morphological adaptations below).

Sample area meets the dominance and prevalence index tests; meets parameter.

SOIL

Sampling Point: FDP3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10 YR 4/4	100	none				Lo sand	moist, slightly compacted
2-13	2.5 Y 6/4	100	none				Lo sand	moist
13+	10 YR 5/4	40	none				VF sand	very moist
	2.5 Y 6/4	60						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks:

Loamy sand slightly compacted. Field indicators of hydric soil not present; fails parameter.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: UAS Airstrip -WFF Marsh Fiber City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA / Wallops Island NWR State: VA Sampling Point: FDP4

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): none Slope (%): 0-1

Subregion (LRR or MLRA): T153C Lat: 37.887541 Long: -75.441927 Datum: NAD 83

Soil Map Unit Name: Camocca fine sand 0-2% slope frequent flooding NWI classification: E2EM1N

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [✓]	No [ ]	**Is the Sampled Area within a Wetland?** Yes [✓] No [ ]
Hydric Soil Present?	Yes [✓]	No [ ]	
Wetland Hydrology Present?	Yes [✓]	No [ ]	

Remarks:

High marsh.

All mandatory technical parameters for wetland are met; site is high marsh area.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [ ] Surface Water (A1)
- [✓] High Water Table (A2)
- [✓] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [✓] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [✓] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [✓] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [✓] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [✓] Saturation Visible on Aerial Imagery (C9)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [✓] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes [✓] No [ ]	Depth (inches): 0	
Water Table Present?	Yes [✓] No [ ]	Depth (inches): 0	
Saturation Present? (includes capillary fringe)	Yes [✓] No [ ]	Depth (inches): 0	**Wetland Hydrology Present?** Yes [✓] No [ ]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Tidal high marsh.

Multiple field indicators of supporting hydrology present; meets parameter.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP4

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Sapling Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Shrub Stratum (Plot size: 30 feet)			
1. Iva imbricata	65	Y	FACW
2. Juniperus virginiana	5	N	FACU
3.			
4.			
5.			
6.			
	70 = Total Cover		
50% of total cover: 35	20% of total cover: 14		
Herb Stratum (Plot size: 30 feet)			
1. Distichlis spicata	60	Y	OBL
2. Juncus gerardii	35	Y	OBL
3. Spartina patens	20	N	FACW
4. Salicornia virginica	5	N	OBL
5. Phragmites australis	5	N	FACW
6.			
7.			
8.			
9.			
10.			
11.			
	125 = Total Cover		
50% of total cover: 63	20% of total cover: 25		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x 1 =	100
FACW species	90	x 2 =	180
FAC species		x 3 =	
FACU species	5	x 4 =	20
UPL species		x 5 =	
Column Totals:	195 (A)		300 (B)

Prevalence Index = B/A = 1.53

Hydrophytic Vegetation Indicators:

- [x] 1 - Rapid Test for Hydrophytic Vegetation
- [x] 2 - Dominance Test is >50%
- [x] 3 - Prevalence Index is ≤3.0[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes [x] No [ ]

Remarks: (If observed, list morphological adaptations below).

Sample area meets the dominance and prevalence index tests; meets parameter.

SOIL

Sampling Point: FDP4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10 YR 3/2	100					Muck	saturated
4-10	10 YR 4/2	100					FSa	saturated
10+	7.5 Y 5/1	100					LoSa	saturated

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☑ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☑ 1 cm Muck (A9) **(LRR P, T)**
- ☑ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: none

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:

Multiple field indicators of hydric soil present; meets parameter.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: UAS Airstrip - WFF Marsh Fiber City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA / Wallops Island NWR State: VA Sampling Point: FDP5

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR or MLRA): T153C Lat: 37.887541 Long: -75.441927 Datum: NAD 83

Soil Map Unit Name: Camocca fine sand 0-2% slope frequent flooding NWI classification: E2EM1N

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [✓]	No [ ]	**Is the Sampled Area within a Wetland?** Yes [✓] No [ ]
Hydric Soil Present?	Yes [✓]	No [ ]	
Wetland Hydrology Present?	Yes [✓]	No [ ]	

Remarks:

All mandatory technical parameters for wetland are met; site is low salt marsh area.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [ ] Surface Water (A1)
- [✓] High Water Table (A2)
- [✓] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [✓] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [✓] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [✓] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [✓] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [✓] Saturation Visible on Aerial Imagery (C9)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [✓] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes [✓] No [ ]	Depth (inches): 0	
Water Table Present?	Yes [✓] No [ ]	Depth (inches): 0	
Saturation Present? (includes capillary fringe)	Yes [✓] No [ ]	Depth (inches): 0	**Wetland Hydrology Present?** Yes [✓] No [ ]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Tidal low marsh.

Multiple field indicators of supporting hydrology present; meets parameter.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP4

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Shrub Stratum (Plot size: 30 feet)			
1. Iva frutescens	35	Y	FACW
2.			
3.			
4.			
5.			
6.			
	35 = Total Cover		

50% of total cover: 18 20% of total cover: 7

Herb Stratum (Plot size: 30 feet)			
1. Distichlis spicata	65	Y	OBL
2. Schoenoplectus americanus	40	Y	OBL
3. Salicornia virginica	15	N	OBL
4. Panicum amarulum	10	N	FAC
5. Setaria pumila	10	N	FAC
6.			
7.			
8.			
9.			
10.			
11.			
	140 = Total Cover		

50% of total cover: 70 20% of total cover: 28

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	120	x 1 =	120
FACW species	35	x 2 =	70
FAC species	20	x 3 =	60
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	175 (A)		250 (B)

Prevalence Index = B/A = 1.43

Hydrophytic Vegetation Indicators:

- [x] 1 - Rapid Test for Hydrophytic Vegetation
- [x] 2 - Dominance Test is >50%
- [x] 3 - Prevalence Index is ≤3.0[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes [x] No [ ]

Remarks: (If observed, list morphological adaptations below).

Sample area meets the dominance and prevalence index tests; meets parameter.

SOIL

Sampling Point: FDP4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10 YR 3/2	100					Muck	
4-12	10 YR 4/2	100					Fn Sand	
12+	5 Y 5/1	100					Lo sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [✓] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Organic Bodies (A6) **(LRR P, T, U)**
- [ ] 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- [ ] Muck Presence (A8) **(LRR U)**
- [✓] 1 cm Muck (A9) **(LRR P, T)**
- [✓] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Coast Prairie Redox (A16) **(MLRA 150A)**
- [ ] Sandy Mucky Mineral (S1) **(LRR O, S)**
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Dark Surface (S7) **(LRR P, S, T, U)**
- [ ] Polyvalue Below Surface (S8) **(LRR S, T, U)**
- [ ] Thin Dark Surface (S9) **(LRR S, T, U)**
- [ ] Loamy Mucky Mineral (F1) **(LRR O)**
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Marl (F10) **(LRR U)**
- [ ] Depleted Ochric (F11) **(MLRA 151)**
- [ ] Iron-Manganese Masses (F12) **(LRR O, P, T)**
- [ ] Umbric Surface (F13) **(LRR P, T, U)**
- [ ] Delta Ochric (F17) **(MLRA 151)**
- [ ] Reduced Vertic (F18) **(MLRA 150A, 150B)**
- [ ] Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- [ ] Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- [ ] 1 cm Muck (A9) **(LRR O)**
- [ ] 2 cm Muck (A10) **(LRR S)**
- [ ] Reduced Vertic (F18) **(outside MLRA 150A,B)**
- [ ] Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- [ ] Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- [ ] Red Parent Material (TF2)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: none

Depth (inches): _____

Hydric Soil Present? Yes [✓] No [ ]

Remarks:

Multiple field indicators of hydric soil present; meets parameter.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: UAS Airstrip -WFF Marsh Fiber City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA / Wallops Island NWR State: VA Sampling Point: FDP6

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Back dune Local relief (concave, convex, none): Slightly convex Slope (%): 0-3

Subregion (LRR or MLRA): T153C Lat: 37.886720 Long: -75.438390 Datum: NAD 83

Soil Map Unit Name: Fisherman-Assateague complex NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [✓]	No [ ]	**Is the Sampled Area within a Wetland?** Yes [ ] No [✓]
Hydric Soil Present?	Yes [ ]	No [✓]	
Wetland Hydrology Present?	Yes [ ]	No [✓]	

Remarks:

Two of mandatory technical parameters are not met; area is not a wetland.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [ ] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes [ ]	No [✓]	Depth (inches): none
Water Table Present?	Yes [ ]	No [✓]	Depth (inches): none
Saturation Present? (includes capillary fringe)	Yes [ ]	No [✓]	Depth (inches): none

Wetland Hydrology Present? Yes [ ] No [✓]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology.

Field indicators of supporting wetland hydrology not present; fails parameter.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP6

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. Prunus serotina	60	Y	FACU
2.			
3.			
4.			
5.			
6.			
	60 = Total Cover		
50% of total cover: 30	20% of total cover: 12		
Sapling Stratum (Plot size: 30 feet)			
1. Morella cerifera	20	Y	FAC
2.			
3.			
4.			
5.			
6.			
	20 = Total Cover		
50% of total cover: 10	20% of total cover: 4		
Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 30 feet)			
1. Spartina patens	75	Y	FACW
2. Schedonorus arundinaceus	20	N	FAC
3. Pinus taeda (seedlings)	15	N	FAC
4. Juncus debilis	15	N	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	125 = Total Cover		
50% of total cover: 63	20% of total cover: 25		
Woody Vine Stratum (Plot size: 30 feet)			
1. Smilax bona-nox	50	Y	FAC
2.			
3.			
4.			
5.			
	50 = Total Cover		
50% of total cover: 25	20% of total cover: 10		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1 =	15
FACW species	75	x 2 =	150
FAC species	105	x 3 =	315
FACU species	60	x 4 =	240
UPL species		x 5 =	
Column Totals:	255 (A)		720 (B)

Prevalence Index = B/A = 2.82

Hydrophytic Vegetation Indicators:

- [x] 1 - Rapid Test for Hydrophytic Vegetation
- [x] 2 - Dominance Test is >50%
- [x] 3 - Prevalence Index is ≤3.0[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes [x] No [ ]

Remarks: (If observed, list morphological adaptations below).

Sample area meets the dominance and prevalence index tests; meets parameter.

SOIL

Sampling Point: FDP6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	0							Sandy leaf duff
3-7	10 YR 4/2	100	none				Lo sand	friable
7-15	10 YR 6/4	98	10 YR 5/6	2	C	PL	Lo sand	slightly moist
15+	2.5 Y 5/2	98	10 YR 5/4	2	C	PL	LoFsand	moist

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks:

Field indicators of hydric soil not present; fails parameter.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: UAS Airstrip - WFF Marsh Fiber City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA / Wallops Island NWR State: VA Sampling Point: FDP7

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Marsh Local relief (concave, convex, none): Slightly Concave Slope (%): 0-1

Subregion (LRR or MLRA): T153C Lat: 37.886588 Long: -75.438218 Datum: NAD 83

Soil Map Unit Name: Camocca fine sand 0-2% slope frequent flooding NWI classification: E2EM1P

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [✓]	No [ ]	**Is the Sampled Area within a Wetland?** Yes [✓] No [ ]
Hydric Soil Present?	Yes [✓]	No [ ]	
Wetland Hydrology Present?	Yes [✓]	No [ ]	

Remarks:

All mandatory technical parameters for wetland are met; site is high marsh area.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [ ] Surface Water (A1)
- [✓] High Water Table (A2)
- [✓] Saturation (A3)
- [ ] Water Marks (B1)
- [✓] Sediment Deposits (B2)
- [✓] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [✓] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [✓] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [✓] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [ ] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes [✓] No [ ]	Depth (inches):	0
Water Table Present?	Yes [✓] No [ ]	Depth (inches):	6
Saturation Present? (includes capillary fringe)	Yes [✓] No [ ]	Depth (inches):	0

Wetland Hydrology Present? Yes [✓] No [ ]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Tidal high marsh.

Multiple field indicators of supporting hydrology present; meets parameter.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP7

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Shrub Stratum (Plot size: 30 feet)			
1. Iva frutescens	25	Y	FACW
2.			
3.			
4.			
5.			
6.			
	25 = Total Cover		

50% of total cover: 13 20% of total cover: 5

Herb Stratum (Plot size: 30 feet)			
1. Distichlis spicata	65	Y	OBL
2. Toxicodendron radicans	20	Y	FAC
3. Schoenoplectus americanus	20	Y	OBL
4. Phragmites australis	5	N	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	110 = Total Cover		

50% of total cover: 55 20% of total cover: 22

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	85	x 1 =	85
FACW species	30	x 2 =	60
FAC species	20	x 3 =	60
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	135 (A)		205 (B)

Prevalence Index = B/A = 1.52

Hydrophytic Vegetation Indicators:

- [x] 1 - Rapid Test for Hydrophytic Vegetation
- [x] 2 - Dominance Test is >50%
- [x] 3 - Prevalence Index is ≤3.0[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes [x] No [ ]

Remarks: (If observed, list morphological adaptations below).

Sample area meets the dominance and prevalence index tests; meets parameter.

SOIL

Sampling Point: FDP7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-2	10 YR 2/2	100					Lo Muck	loamy muck
2-7	10 YR 4/2	100					Lo FSa	Saturated
7-18+	5 Y 5/1	100					FSa	Saturated

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☑ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☑ 1 cm Muck (A9) **(LRR P, T)**
- ☑ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:

Multiple field indicators of hydric soil present; meets parameter.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Boresight Antenna-WFF Marsh Fiber City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA/Wallops Island NWR State: VA Sampling Point: FDP 8

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Flat Slope (%): 0-2

Subregion (LRR or MLRA): T153C Lat: 37.916669 Long: -75.472008 Datum: NAD 83

Soil Map Unit Name: Molena Loamy Sand - 0-6% Slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ☐

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ✓	**Is the Sampled Area within a Wetland?** Yes ☐ No ✓
Hydric Soil Present?	Yes ☐	No ✓	
Wetland Hydrology Present?	Yes ☐	No ✓	

Remarks:

All three mandatory technical parameters for wetlands are not met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ☐	No ✓	Depth (inches):
Water Table Present?	Yes ☐	No ✓	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☐	No ✓	Depth (inches):

Wetland Hydrology Present? Yes ☐ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No field indicators of supporting wetland hydrology are present; fails parameter.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP 8

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 feet)			
1. Digitaria ciliaris	50	Y	FACU
2. Eulalia vimineum	50	Y	FAC
3. Festuca arundinacea	10	N	FAC
4. Polygonum longisetum	5	N	FAC
5. Potentilla canadensis	5	N	UPL
6.			
7.			
8.			
9.			
10.			
11.			
	120 = Total Cover		

50% of total cover: 60 20% of total cover: 24

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	55	x 3 =	165
FACU species	50	x 4 =	200
UPL species	5	x 5 =	25
Column Totals:	110 (A)		390 (B)

Prevalence Index = B/A = 3.5

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (If observed, list morphological adaptations below).

Sample area does not meet the dominance test for hydrophytic vegetation; fails parameter.

SOIL

Sampling Point: FDP8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/2	100	None				Loam	Dry
2-15	10YR 4/4	100	None				FLoSa	Dry Sandy
15+	10YR 5/6	100	None				FLoSa	Dry; Friable-Loose

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks:

Field indicator of hydric soils were not present; fails parameter.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Boresight Antenna -WFF Marsh Fiber City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA/Wallops Island NWR State: VA Sampling Point: FDP 9

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Flat Slope (%): 0-2

Subregion (LRR or MLRA): T153C Lat: 37.916409 Long: -75.471505 Datum: NAD 83

Soil Map Unit Name: Molena Loamy Sand - 0-6% Slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [ ]	No [✓]	**Is the Sampled Area within a Wetland?** Yes [ ] No [✓]
Hydric Soil Present?	Yes [ ]	No [✓]	
Wetland Hydrology Present?	Yes [ ]	No [✓]	

Remarks:

All three mandatory technical parameters for wetlands are not met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [ ] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes [ ]	No [✓]	Depth (inches):
Water Table Present?	Yes [ ]	No [✓]	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes [ ]	No [✓]	Depth (inches):

Wetland Hydrology Present? Yes [ ] No [✓]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No field indicators of supporting wetland hydrology are present; fails parameter.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP 8

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. Prunus serotina	20	Y	FACU
2. Liquidambar styraciflua	20	Y	FAC
3. Celtis occidentalis	20	Y	FACU
4. Sassafras albidum	5	N	FACU
5.			
6.			
	65 = Total Cover		
50% of total cover: 33	20% of total cover: 17		
Sapling Stratum (Plot size: 30 feet)			
1. Lindera benzoin	50	Y	FACW
2. Elaeagnus umbellata	40	Y	NA
3.			
4.			
5.			
6.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 23		
Shrub Stratum (Plot size: 30 feet)			
1. Rubus phoenicolasius	55	Y	FACU
2. Microstegium vimineum	20	Y	FAC
3. Ligustrum sinense	10	N	FAC
4.			
5.			
6.			
	85 = Total Cover		
50% of total cover: 43	20% of total cover: 17		
Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Woody Vine Stratum (Plot size: 30 feet)			
1. Vitis Vulpina	20	FAC	
2.			
3.			
4.			
5.			
	20 = Total Cover		
50% of total cover: 10	20% of total cover: 4		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	0 (A)		0 (B)

Prevalence Index = B/A = 0

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (If observed, list morphological adaptations below).

Sample area does not meet the dominance test for hydrophytic vegetation; fails parameter.

SOIL

Sampling Point: FDP8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 4/2	100	None					loose
3-11	10YR 3/3	100	None				Lo	Friable, dry
11-18	10YR 5/6	100	None				SaCLLo	Moist, Friable

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks:

Field indicator of hydric soils were not present; fails parameter.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Boresight Antenna - WFF Marsh Fiber City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA/Wallops Island NWR State: VA Sampling Point: FDP 10

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Flat Slope (%): 0-2

Subregion (LRR or MLRA): T153C Lat: 37.916974 Long: -75.472220 Datum: NAD 83

Soil Map Unit Name: Molena Loamy Sand - 0-6% Slopes NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [ ]	No [✓]	**Is the Sampled Area within a Wetland?** Yes [ ] No [✓]
Hydric Soil Present?	Yes [ ]	No [✓]	
Wetland Hydrology Present?	Yes [ ]	No [✓]	

Remarks:

All three mandatory technical parameters for wetlands are not met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [ ] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes [ ]	No [✓]	Depth (inches):
Water Table Present?	Yes [ ]	No [✓]	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes [ ]	No [✓]	Depth (inches):

Wetland Hydrology Present? Yes [ ] No [✓]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No field indicators of supporting wetland hydrology are present; fails parameter.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP 10

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. Liquidambar styraciflua	60	Y	FAC
2. Sassafras albidum	20	Y	FACU
3.			
4.			
5.			
6.			
	80 = Total Cover		
50% of total cover: 40	20% of total cover: 16		
Sapling Stratum (Plot size: 30 feet)			
1. Elaeagnus umbellata	60	Y	NA
2. Ilex opaca	20	Y	FAC
3. Juniperus virginiana	10	N	FACU
4.			
5.			
6.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 23		
Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 30 feet)			
1. Ligustrum sinsense	20	Y	FACU
2. Elaeagnus umbellata	20	Y	NA
3. Eulalia vimineium	10	N	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	50 = Total Cover		
50% of total cover: 25	20% of total cover: 10		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 30 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	0 (A)		0 (B)

Prevalence Index = B/A = 0

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: (If observed, list morphological adaptations below).

Sample area does not meet the dominance test for hydrophytic vegetation; fails parameter.

SOIL

Sampling Point: FDP10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-3	10YR 4/2	100	None				Lo	Dry
3-6	10YR 4/3	100	None				LoSa	Dry
6-13	10YR 4/4	100	None				LoSa	Dry
13-18	2.5Y5/4	100	None				LoFSa	Dry

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☑

Remarks:

Field indicator of hydric soils were not present; fails parameter.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Walker Marsh- WFF Marsh Fiber City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA / Wallops Island NWR State: VA Sampling Point: FDP13

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Marsh Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR or MLRA): T153C Lat: 37.541345 Long: -75.273954 Datum: NAD 83

Soil Map Unit Name: Chincoteague fine silt loam 0-2% slope regularly flooded NWI classification: E2EM1N

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [✓]	No [ ]	**Is the Sampled Area within a Wetland?** Yes [✓] No [ ]
Hydric Soil Present?	Yes [✓]	No [ ]	
Wetland Hydrology Present?	Yes [✓]	No [ ]	

Remarks:

All mandatory technical parameters for wetland are met; site is low salt marsh area.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [✓] Surface Water (A1)
- [ ] High Water Table (A2)
- [✓] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [✓] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [✓] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [✓] Saturation Visible on Aerial Imagery (C9)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [✓] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes [✓] No [ ]	Depth (inches):	1 (tidal)
Water Table Present?	Yes [✓] No [ ]	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes [✓] No [ ]	Depth (inches):	0

Wetland Hydrology Present? Yes [✓] No [ ]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Tidal low salt marsh.

Multiple field indicators of supporting hydrology present; meets parameter.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP13

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Sapling Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Herb Stratum (Plot size: 30 feet)			
1. Spartina alterniflora	80	Y	OBL
2. Limonium carolinianum	10	N	OBL
3. Salicornia virginica	10	N	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x 1 =	100
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = 1.0

Hydrophytic Vegetation Indicators:

- [x] 1 - Rapid Test for Hydrophytic Vegetation
- [x] 2 - Dominance Test is >50%
- [x] 3 - Prevalence Index is ≤3.0[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes [x] No [ ]

Remarks: (If observed, list morphological adaptations below).

Sample area meets the dominance and prevalence index tests; meets parameter.

SOIL

Sampling Point: FDP13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2							Muck	flooded
3-7	5Y 5/1	100					SiLo	tidal flooded
7-18+	5Y 4/1	100					FSiLo	tidal flooded

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☑ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☑ 1 cm Muck (A9) **(LRR P, T)**
- ☑ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:

Multiple field indicators of hydric soil present; meets parameter.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Walker Marsh - WFF Marsh Fiber City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA / Wallops Island NWR State: VA Sampling Point: FDP14

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Marsh Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR or MLRA): T153C Lat: 37.540170 Long: -75.272536 Datum: NAD 83

Soil Map Unit Name: Chincoteague fine silt loam 0-2% slope regularly flooded NWI classification: E2EM1N

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [✓]	No [ ]	**Is the Sampled Area within a Wetland?** Yes [✓] No [ ]
Hydric Soil Present?	Yes [✓]	No [ ]	
Wetland Hydrology Present?	Yes [✓]	No [ ]	

Remarks:

All mandatory technical parameters for wetland are met; site is low salt marsh area.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [✓] Surface Water (A1)
- [ ] High Water Table (A2)
- [✓] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [✓] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [✓] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [✓] Saturation Visible on Aerial Imagery (C9)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [✓] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes [✓] No [ ]	Depth (inches):	1 (tidal)
Water Table Present?	Yes [✓] No [ ]	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes [✓] No [ ]	Depth (inches):	0

Wetland Hydrology Present? Yes [✓] No [ ]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Tidal low marsh.

Multiple field indicators of supporting hydrology present; meets parameter.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP14

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Sapling Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Herb Stratum (Plot size: 30 feet)			
1. Spartina alterniflora	90	Y	OBL
2. Salicornia virginica	10	N	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x 1 =	100
FACW species	_____	x 2 =	_____
FAC species	_____	x 3 =	_____
FACU species	_____	x 4 =	_____
UPL species	_____	x 5 =	_____
Column Totals:	_____ (A)		_____ (B)

Prevalence Index = B/A = 1.0

Hydrophytic Vegetation Indicators:

- [x] 1 - Rapid Test for Hydrophytic Vegetation
- [x] 2 - Dominance Test is >50%
- [x] 3 - Prevalence Index is ≤3.0[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes [x] No [ ]

Remarks: (If observed, list morphological adaptations below).

Sample area meets the dominance and prevalence index tests; meets parameter.

SOIL

Sampling Point: FDP14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3							Muck	
3-9	5Y 5/1	100					SiLo	tidal flooded
9-18+	5Y 4/1	100					SiLo	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☑ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☑ 1 cm Muck (A9) **(LRR P, T)**
- ☑ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:

Multiple field indicators of hydric soil present; meets parameter.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Walker Marsh- WFF Marsh Fiber City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA / Wallops Island NWR State: VA Sampling Point: FDP15

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Marsh Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR or MLRA): T153C Lat: 37.535601 Long: -75.272142 Datum: NAD 83

Soil Map Unit Name: Chincoteague fine silt loam 0-2% slope regularly flooded NWI classification: E2EM1N

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [✓]	No [ ]	**Is the Sampled Area within a Wetland?** Yes [✓] No [ ]
Hydric Soil Present?	Yes [✓]	No [ ]	
Wetland Hydrology Present?	Yes [✓]	No [ ]	

Remarks:

All mandatory technical parameters for wetland are met; site is low salt marsh area.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [✓] Surface Water (A1)
- [ ] High Water Table (A2)
- [✓] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [✓] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [✓] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [✓] Saturation Visible on Aerial Imagery (C9)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [✓] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes [✓] No [ ]	Depth (inches):	1 (tidal)
Water Table Present?	Yes [✓] No [ ]	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes [✓] No [ ]	Depth (inches):	0

Wetland Hydrology Present? Yes [✓] No [ ]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Tidal low salt marsh.

Multiple field indicators of supporting hydrology present; meets parameter.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP15

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Sapling Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Herb Stratum (Plot size: 30 feet)			
1. Spartina alterniflora	100	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x 1 =	100
FACW species	_____	x 2 =	_____
FAC species	_____	x 3 =	_____
FACU species	_____	x 4 =	_____
UPL species	_____	x 5 =	_____
Column Totals:	_____ (A)		_____ (B)

Prevalence Index = B/A = 1.0

Hydrophytic Vegetation Indicators:

- [x] 1 - Rapid Test for Hydrophytic Vegetation
- [x] 2 - Dominance Test is >50%
- [x] 3 - Prevalence Index is ≤3.0[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes [x] No [ ]

Remarks: (If observed, list morphological adaptations below).

Sample area meets the dominance and prevalence index tests; meets parameter.

SOIL

Sampling Point: FDP15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2							Muck	
2-9	10YR 5/1	100					FSiLo	tidal flooded
9-18+	10YR 4/1	100					SiLo	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☑ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☑ 1 cm Muck (A9) **(LRR P, T)**
- ☑ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:

Multiple field indicators of hydric soil present; meets parameter.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Walker Marsh - WFF Marsh Fiber City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA / Wallops Island NWR State: VA Sampling Point: FDP16

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Marsh Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR or MLRA): T153C Lat: 37.535181 Long: -75.271601 Datum: NAD 83

Soil Map Unit Name: Chincoteague fine silt loam 0-2% slope regularly flooded NWI classification: E2EM1N

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [✓]	No [ ]	**Is the Sampled Area within a Wetland?** Yes [✓] No [ ]
Hydric Soil Present?	Yes [✓]	No [ ]	
Wetland Hydrology Present?	Yes [✓]	No [ ]	

Remarks:

All mandatory technical parameters for wetland are met; site is low salt marsh area.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [✓] Surface Water (A1)
- [ ] High Water Table (A2)
- [✓] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [✓] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [✓] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [✓] Saturation Visible on Aerial Imagery (C9)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [✓] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes [✓] No [ ]	Depth (inches):	1 (tidal)
Water Table Present?	Yes [✓] No [ ]	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes [✓] No [ ]	Depth (inches):	0

Wetland Hydrology Present? Yes [✓] No [ ]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Tidal low salt marsh.

Multiple field indicators of supporting hydrology present; meets parameter.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP16

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 feet)			
1. Spartina alterniflora	90	Y	OBL
2. Salicornia virginica	10	N	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		

50% of total cover: 50 20% of total cover: 20

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x 1 =	100
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = 1.0

Hydrophytic Vegetation Indicators:

- [x] 1 - Rapid Test for Hydrophytic Vegetation
- [x] 2 - Dominance Test is >50%
- [x] 3 - Prevalence Index is ≤3.0[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes [x] No [ ]

Remarks: (If observed, list morphological adaptations below).

Sample area meets the dominance and prevalence index tests; meets parameter.

SOIL

Sampling Point: FDP16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3							Muck	
3-9	10YR 5/1	100					SiLo	tidal flooded
9-18+	10YR 4/1	100					VFSiLo	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☑ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☑ 1 cm Muck (A9) **(LRR P, T)**
- ☑ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:

Multiple field indicators of hydric soil present; meets parameter.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Walker Marsh City/County: ACCOMACK Sampling Date: 9/16/2019

Applicant/Owner: NASA / Wallops Island NWR State: VA Sampling Point: FDP17

Investigator(s): R. Wright / W. Jamerson, 3e Consulting Section, Township, Range:

Landform (hillslope, terrace, etc.): Marsh Local relief (concave, convex, none): Slope (%): 0-1

Subregion (LRR or MLRA): T153C Lat: 37.534129 Long: -75.276500 Datum: NAD 83

Soil Map Unit Name: Chicoteague Series fine silt loam 0-2% slope regularly flooded NWI classification: E2EM1N

Are climatic / hydrologic conditions on the site typical for this time of year? Yes [✓] No [ ] (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes [✓] No [ ]

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes [✓]	No [ ]	**Is the Sampled Area within a Wetland?** Yes [✓] No [ ]
Hydric Soil Present?	Yes [✓]	No [ ]	
Wetland Hydrology Present?	Yes [✓]	No [ ]	

Remarks:

Low marsh.

All mandatory technical parameters for wetland are met; site is low marsh area.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [✓] Surface Water (A1)
- [ ] High Water Table (A2)
- [✓] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [✓] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [✓] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [✓] Saturation Visible on Aerial Imagery (C9)
- [ ] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [✓] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes [✓] No [ ]	Depth (inches):	1 (tidal)
Water Table Present?	Yes [✓] No [ ]	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes [✓] No [ ]	Depth (inches):	0

Wetland Hydrology Present? Yes [✓] No [ ]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Tidal low marsh.

Multiple field indicators of supporting hydrology present; meets parameter.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: FDP17

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 feet)			
1. Spartina alterniflora	95	Y	OBL
2. Salicornia virginica	5	N	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		

50% of total cover: 50 20% of total cover: 20

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x 1 =	100
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = 1.0

Hydrophytic Vegetation Indicators:

- [x] 1 - Rapid Test for Hydrophytic Vegetation
- [x] 2 - Dominance Test is >50%
- [x] 3 - Prevalence Index is ≤3.0[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes [x] No [ ]

Remarks: (If observed, list morphological adaptations below).

Sample area meets the dominance and prevalence index tests; meets parameter.

SOIL

Sampling Point: FDP17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2							Muck	
2-9	5Y 5/1	100					silt lo	
9-18+	5Y4/1	100					F silt lo	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [x] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Organic Bodies (A6) **(LRR P, T, U)**
- [ ] 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- [ ] Muck Presence (A8) **(LRR U)**
- [x] 1 cm Muck (A9) **(LRR P, T)**
- [x] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Coast Prairie Redox (A16) **(MLRA 150A)**
- [ ] Sandy Mucky Mineral (S1) **(LRR O, S)**
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Dark Surface (S7) **(LRR P, S, T, U)**
- [ ] Polyvalue Below Surface (S8) **(LRR S, T, U)**
- [ ] Thin Dark Surface (S9) **(LRR S, T, U)**
- [ ] Loamy Mucky Mineral (F1) **(LRR O)**
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Marl (F10) **(LRR U)**
- [ ] Depleted Ochric (F11) **(MLRA 151)**
- [ ] Iron-Manganese Masses (F12) **(LRR O, P, T)**
- [ ] Umbric Surface (F13) **(LRR P, T, U)**
- [ ] Delta Ochric (F17) **(MLRA 151)**
- [ ] Reduced Vertic (F18) **(MLRA 150A, 150B)**
- [ ] Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- [ ] Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- [ ] 1 cm Muck (A9) **(LRR O)**
- [ ] 2 cm Muck (A10) **(LRR S)**
- [ ] Reduced Vertic (F18) **(outside MLRA 150A,B)**
- [ ] Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- [ ] Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- [ ] Red Parent Material (TF2)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes [x] No [ ]

Remarks:

Multiple field indicators of hydric soil present; meets parameter.

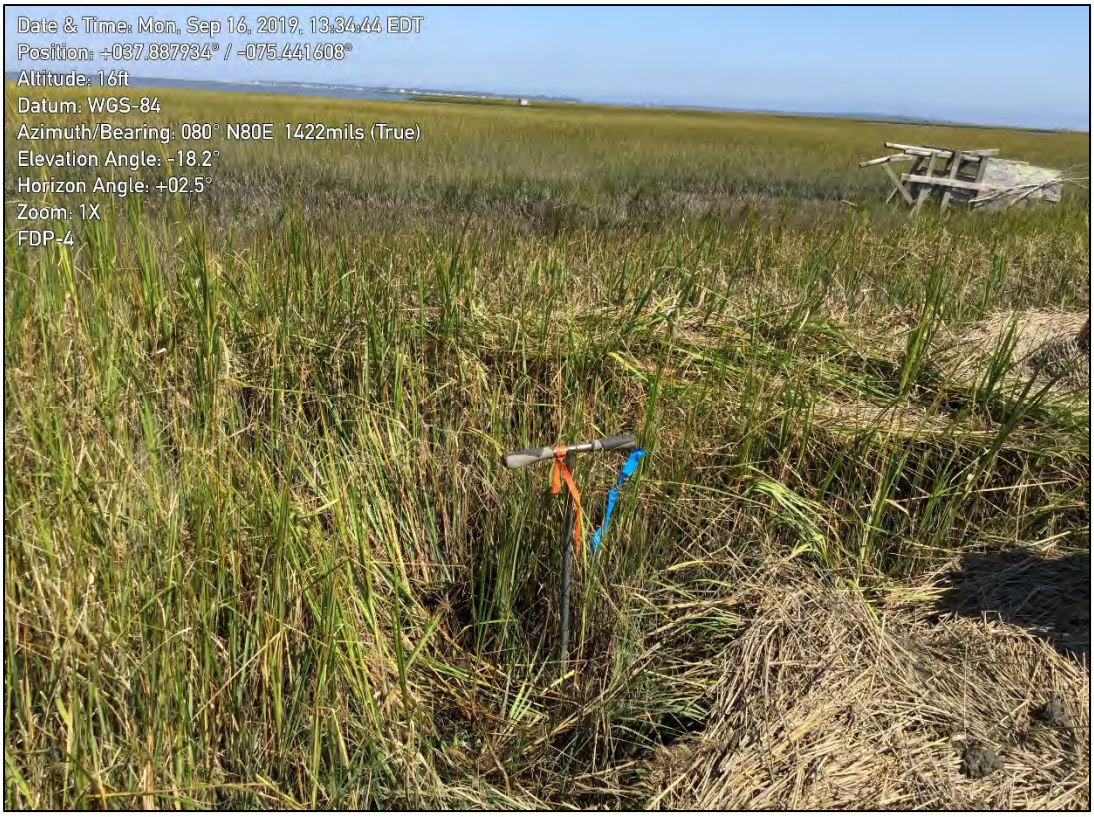
APPENDIX C

Photographs

Photograph 1: UAS Airstrip Wetland Data Point – FDP-1. E2EM1N tidal low marsh Wetland #1.

Photograph 2: UAS Airstrip Upland Data Point– FDP-2. Corresponding upland for E2EM1N tidal low marsh Wetland #1.

Photograph 3: UAS Airstrip Upland Data Point– FDP-3. Corresponding upland for E2EM1P tidal high marsh Wetland #2.



Photograph 4: UAS Airstrip Wetland Data Point – FDP-4. E2EM1N tidal high marsh Wetland #2.

Photograph 5: UAS Airstrip Wetland Data Point – FDP-5. E2EM1N tidal low marsh Wetland #1.

Photograph 6: UAS Airstrip Upland Data Point– FDP-6. Corresponding upland for E2EM1P tidal high marsh Wetland #2.

Photograph 7: UAS Airstrip Wetland Data Point – FDP-7. E2EM1P tidal high marsh Wetland #2.

Photograph 8: Western edge of UAS Airstrip at flag EM1-20 north of Wetland #1 facing southeast.

Photograph 9: North of UAS Airstrip, existing upland dune remnant south of Wetland #2.

Photograph 10: Boresight Antenna Upland Data Point – FDP-8 at bore location. Well drained upland field habitat.

Photograph 11: Boresight Antenna Upland Data Point – FDP-9. Well drained upland forest habitat.

Photograph 12: Boresight Antenna Upland Data Point – FDP-10. Well drained upland forest habitat.

Photograph 13: Existing access road leading to proposed boresight antennae location off Chincoteague Road. The 3e delineation found no WOUS along the access road delineation area, well drained arid-dry upland forest on edges.

Photograph 14: Access road east of a powerline crossing and area leading to proposed boresight antennae location. The 3e delineation found no WOUS along the access road delineation area, moist, moderately well drained and well drained upland forest on edges.

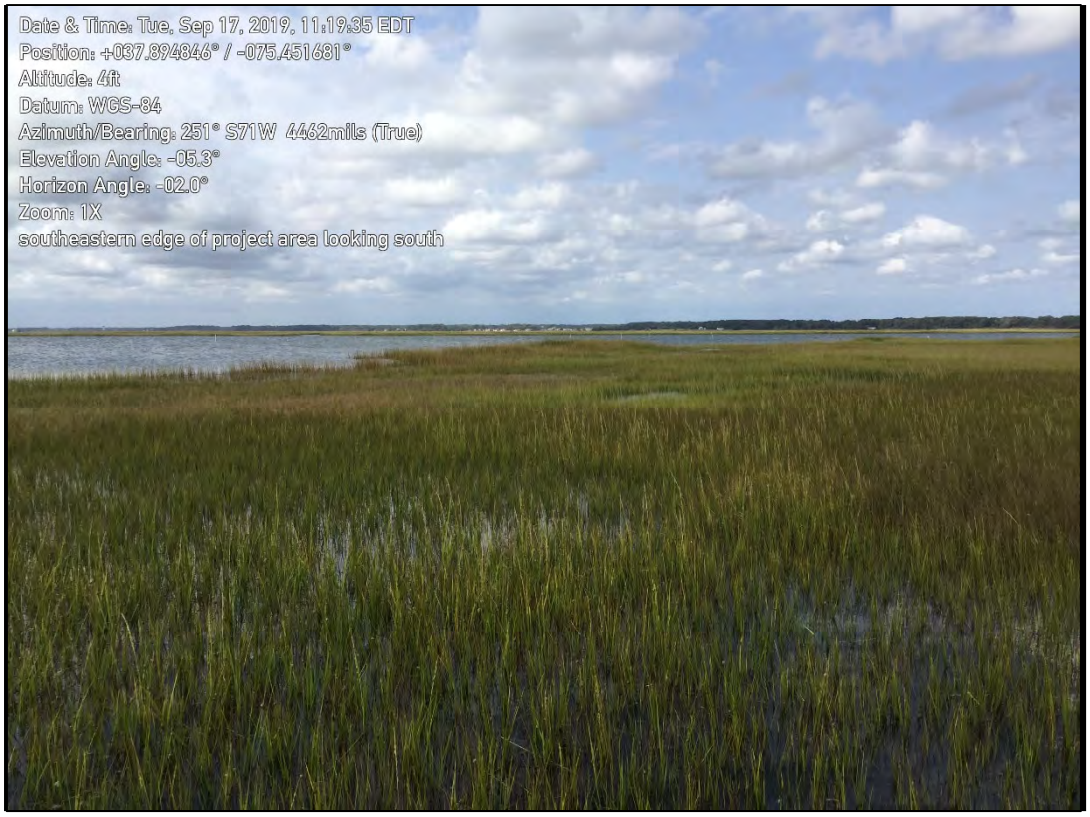
Photograph 15: Powerline crossing of access road leading to proposed boresight antennae location. Grassy-weedy well drained field habitat.

Photograph 16: Northern Terminus work area at Walker Marsh, Wetland Data Point – FDP 13. Area is all low salt marsh habitat.

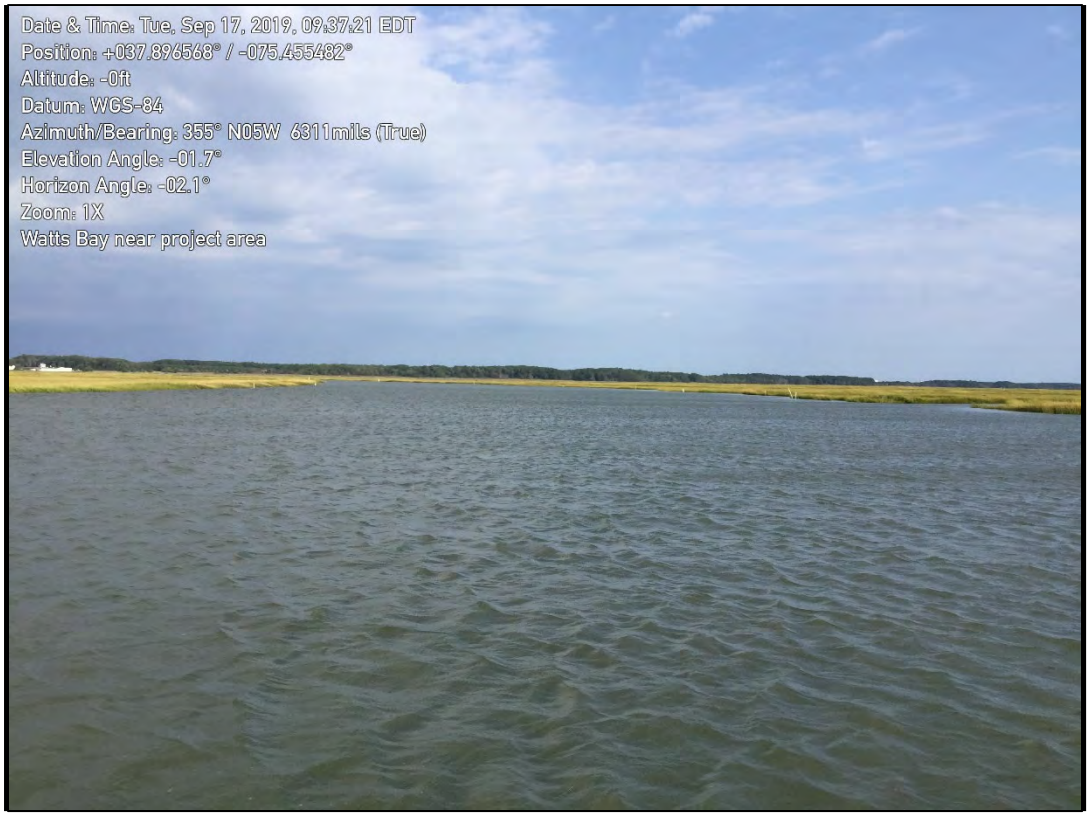
Photograph 17: View of Gut 1 (G1) near mouth to Old Root Narrows on Walker Marsh Wetland Data Point – FDP 14. G1 is shallow open water estuarine habitat; Walker Marsh is all low salt marsh habitat.

Photograph 18: View of Gut 2 (G2) near mouth to Old Root Narrows on Walker Marsh Wetland Data Point – FDP 15. G2 is shallow open water estuarine habitat; Walker Marsh is all low salt marsh habitat. .

Photograph 19: View of Gut 3 (G3) near mouth to Old Root Narrows on Walker Marsh Wetland Data Point – FDP 16. G3 is shallow open water estuarine habitat; Walker Marsh is all low salt marsh habitat.

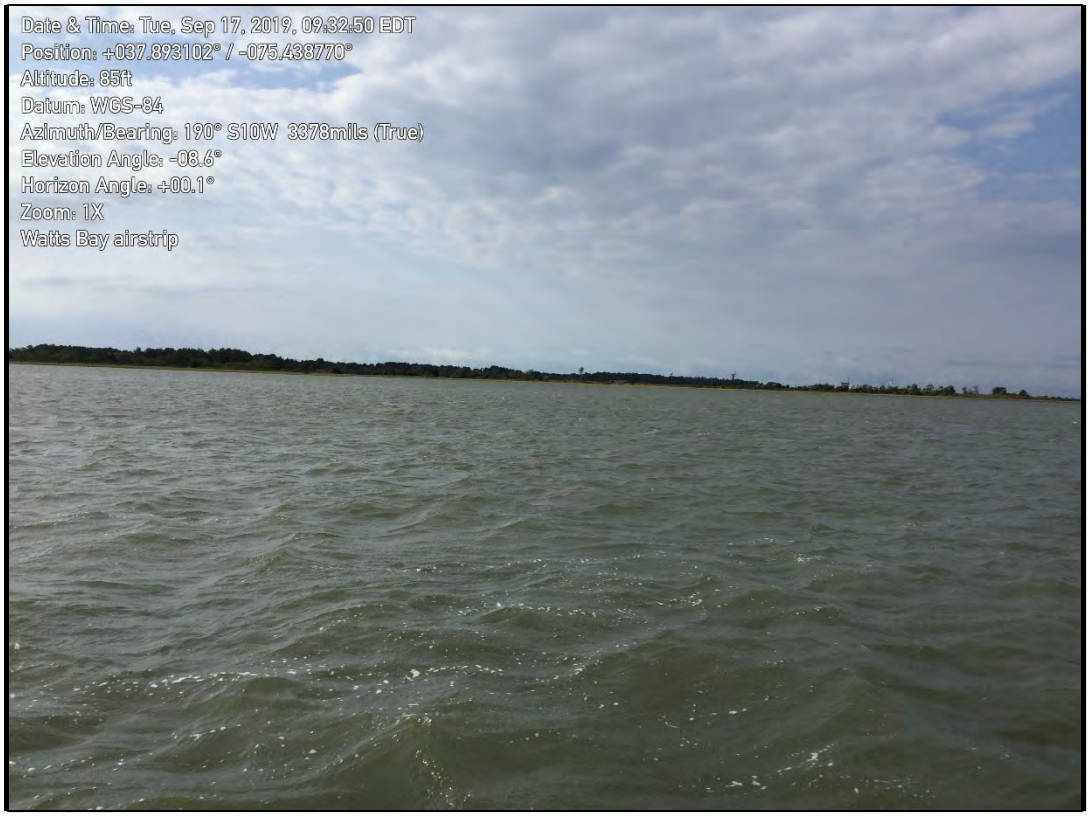


Photograph 20: Southern Terminus work area at Walker Marsh, Wetland Data Point – FDP 17. Area is all low salt marsh habitat.



Photograph 21: High tide view of Old Root Narrows Channel, view northwest from mouth of Gut 2.

Photograph 22: High tide view of Old Root Narrows Channel, view southeast from mouth of Gut 3, viewing oyster rock/bed markers at edge of Walker Marsh.



Photograph 23: Typical view of open waters of Watts Bay, viewing southeast towards the UAS Airstrip (in background), taken southeast of the southern terminus project area.

FEDERAL CONSISTENCY DETERMINATION FOR THE WALLOPS FLIGHT FACILITY MARSH FIBER PROJECT

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION GODDARD SPACE FLIGHT CENTER WALLOPS FLIGHT FACILITY WALLOPS ISLAND, VA 23337

Introduction

This document provides the Commonwealth of Virginia with the National Aeronautics and Space Administration's (NASA) Consistency Determination under the federal Coastal Zone Management Act (CZMA) of 1972, as amended, Section 307(c)(1) and 15 CFR Part 930, subpart C, for the proposed Marsh Fiber Project (Project) involving installation of an underground fiber optic cable between NASA Wallops Flight Facility's (WFF) Main Base and Wallops Island, in Accomack County, Virginia.

NASA has prepared an Environmental Assessment (EA) to analyze potential impacts from the Project. The 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). A description of the Proposed Action, including maps, is provided in the EA.

NASA is the lead agency for preparation of the EA and this Federal Consistency Determination (FCD). Because the proposed fiber optic cable path would go through the Wallops Island National Wildlife Refuge (NWR), which is owned and managed by the U.S. Fish & Wildlife Service (USFWS), the USFWS is a cooperating agency on the EA and on this FCD.

This document provides NASA's certification that the Project is designed to avoid and/or minimize impacts to specific coastal resources as identified by enforceable policies related to fisheries, subaqueous lands, tidal and non-tidal wetlands, dunes, non-point and point source pollution control, shoreline sanitation, air pollution, and land management. Based on the project plans, data, and analysis, NASA finds that the activities associated with the Project are consistent to the maximum extent practicable with the enforceable polices of the Virginia Coastal Resources Management Program. The summary below supports NASA's determination.

Enforceable Policies Comprising Virginia's Coastal Zone Management Program

- **Fisheries Management**. Administered by the Virginia Marine Resources Commission (VMRC) through regulations promulgated through the Virginia Code §28.2-200 through §28.2 – 713 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.** The VMRC management program for subaqueous lands (Code of Virginia §28.2-1200 through §28.2-1213) establishes conditions for granting or denying permits to use state-owned bottomlands based on considerations of potential effects on marine and fisheries resources, wetlands, adjacent or nearby properties, anticipated public and private benefits, and water quality standards established by the VDEQ Water Division.

- **Wetlands Management.** Administered by VMRC, VDEQ, and the Accomack County Wetlands Board, the wetlands management program preserves and protects both tidal and non-tidal wetlands. The tidal wetlands program is administered by the VMRC (Virginia Code §28.2-1301 through §28.2-1320).

- **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 (Virginia Code §28.2-1400 through §28.2-1420).

- **Non-point Source Water Pollution Control.** The Virginia Erosion and Sediment Control Law requires soil-disturbing projects to reduce 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. This program is administered by the VDEQ (Virginia Code §62.1-44.15:51 et seq.).

- **Point Source Water Pollution Control.** The point source program is administered by the State Water Control Board pursuant to the Code of Virginia §62.1-44.15. Point source pollution control is accomplished through the implementation of the National Pollutant Discharge Elimination System permit program established pursuant to §402 of the federal Clean Water Act (CWA) and administered in Virginia as the Virginia Pollutant Discharge

Elimination System (VPDES) permit program. The Water Quality Certification requirements of §401 of the CWA of 1972 is administered under the Virginia Water Protection Permit program.

- **Shoreline Sanitation.** The purpose of this program is to regulate the installation of septic tanks, set standards concerning soil types suitable for septic tanks, and specify minimum distances that tanks must be placed away from streams, rivers, and other waters of the Commonwealth. This program is administered by the Virginia Department of Health (Virginia Code §32.1-164 through §32.1-165).

- **Point Source Air Pollution Control.** The program implements the federal Clean Air Act to provide a legally enforceable State Implementation Plan for the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). This program is administered by the State Air Pollution Control Board (Virginia Code §10.1-1300 through 10.1-1320).
- **Coastal Lands Management.** Administered by VDEQ's Office of Ecology and the Chesapeake Bay Local Assistance Department, the Chesapeake Bay Preservation Act (Virginia Code §§ 10.1-2100 through 10.1-2114) and Chesapeake Bay Preservation Area Designation and Management Regulations (Virginia Administrative code 9 VAC10-20-10 et seq.) guides land development in coastal areas to protect the Chesapeake Bay and its tributaries.

Analysis of the Proposed Project's Consistency with the Enforceable Policies

Policy	Consistent?	Analysis
Fisheries Management	Yes	The Project would not likely result in permanent impacts to finfish and shellfish resources or to the promotion of commercial and recreational fisheries that are administered by the VMRC and VDGIF. Waters adjacent to Project contain public and private shellfish harvesting areas including private oyster grounds, public (Baylor) oyster grounds, and public clamming grounds. There would be short-term, localized effects on finfish and shellfish habitat, particularly the benthic community, from temporary anchoring of barges and the marsh buggy crossing the guts in Walker Marsh. Some local fishing and oyster harvesting activities may be affected by the presences of barges/boats and from work in the surrounding waters of and on Walker Marsh during the 90-day project duration. The proposed Project would not violate conservation provisions outlined in the enforceable policy and would not have impacts on management of fisheries.

Policy	Consistent?	Analysis
Subaqueous Lands Management	Yes	VMRC has reviewed preliminary project documents and found the proposed project will require Subaqueous Lands and Tidal Wetlands permits. Any jurisdictional impacts to Waters of the United States will be reviewed by the VMRC during the Joint Permit Application (JPA) process. Impacts to submerged lands and tidal wetlands have been minimized to the extent practicable through use of horizontal directional drilling (HDD) underneath waterways (Watts Bay, Ballast Narrows and three guts in Walker Marsh). NASA would further minimize impacts to subaqueous lands via avoidance and minimization measures outlined in the EA, which will also be included in the JPA and subsequent permits. There are no Project impacts to beaches or dunes.
Wetlands Management	Yes	Tidal wetlands are located along the fiber optic cable pathway in Walker Marsh. NASA's contractor completed a wetland delineation of the Project areas in September 2019 and received a Preliminary Jurisdictional Determination from the U.S. Army Corps of Engineers (USACE). The Proposed Action would result in 0.63 ha (1.55 ac) of *temporary* direct impacts wetlands and 6.0 m^2 (64 ft^2) or 0.0006 ha (0.0015 ac) of *permanent* impacts to wetlands. Impacts to wetlands have been minimized to the extent practicable through use of HDD and vibratory trenching methods to install most the fiber optic cable. NASA would mitigate temporary wetland impacts by restoring disturbed areas to pre-existing conditions, including re-establishing native vegetation. NASA would obtain a Nationwide Permit (NWP) 12 for Utility Line Activities from the USACE via the Joint Permitting Application (JPA) process. The JPA includes a Mitigation Plan for the unavoidable impacts to state waters and resources from the Marsh Fiber project. A compensatory mitigation plan for permanent impacts is not required for the USACE Nationwide Permit 12 because permanent project impacts are less than 0.04 ha (0.10 ac) and/or 91.4 linear meters (300 linear feet) of WOTUS. NASA would obtain the Clean Water Act permits prior to the start of the project and would adhere to all avoidance and minimization, and mitigation measures stated in the permit.
Dunes and Beaches Management	Yes	No dunes are located within the footprint of the Project area. The Proposed Action would not have an impact on dunes.
Non-point Source Water Pollution Control	Yes	Activities under the Proposed Action have the potential to temporarily increase non-point source runoff to the Virginia waters during construction. NASA would secure a Virginia Stormwater Management Program (VSMP) General VPDES Permit for Discharges of Stormwater from Construction Activities prior to construction. NASA would develop and implement appropriate best management practices to avoid these impacts. The erosion and sediment control plan and Stormwater Pollution

Policy	Consistent?	Analysis
		Prevention Plan (SWPPP) would detail practices to be implemented throughout construction to manage non-point source runoff from the construction areas. For example, NASA's contractor may install turbidity curtains to contain suspended sediment within the three guts where the marsh buggy would enter the water and may install turbidity curtains and/or silt fence around the HDD exit holes to contain sediment and drilling mud.
Point Source Water Pollution Control	Yes	There are no point sources of pollution regulated under Section 402 of the CWA and administered in Virginia as the VPDES permit program within the Project area. However, an inadvertent release of drilling mud could occur during HDD; drilling mud is nontoxic, and any release would be short-term and contained in accordance with the Frac-Out Contingency Plan.
Shoreline Sanitation	Yes	The Project would not include the installation of septic tanks. The SWPPP prepared for the General VPDES permit will include specifications for on-site use of temporary portable sanitation facilities.
Point Source Air Pollution Control	Yes	Minimal impacts to air quality would occur during the construction associated with the installation of the new fiber cable. The activities would not lead to non-attainment to any of the NAAQS.
Coastal Lands Management	Yes	The proposed Project is not located in a Chesapeake Bay Drainage Area and therefore would have no impact on Chesapeake Bay Preservation Area Resources. The Project would not include land development activities that have the potential to impact the Chesapeake Bay or its tributaries.

NASA requests that the Commonwealth's response is sent to:

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Appendix C
Essential Fish Habitat Assessment Worksheet

NOAA FISHERIES
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
Essential Fish Habitat (EFH) Consultation Guidance
EFH ASSESSMENT WORKSHEET

Introduction:

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) mandates that federal agencies conduct an essential fish habitat (EFH) consultation with NOAA Fisheries regarding any of their actions authorized, funded, or undertaken that may adversely affect EFH. An adverse effect means any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

This worksheet has been designed to assist in determining whether a consultation is necessary and in preparing EFH assessments. This worksheet should be used as your EFH assessment or as a guideline for the development of your EFH assessment. At a minimum, all the information required to complete this worksheet should be included in your EFH assessment. If the answers in the worksheet do not fully evaluate the adverse effects to EFH, we may request additional information in order to complete the consultation.

An expanded EFH assessment may be required for more complex projects in order to fully characterize the effects of the project and the avoidance and minimization of impacts to EFH. While the EFH worksheet may be used for larger projects, the format may not be sufficient to incorporate the extent of detail required, and a separate EFH assessment may be developed. However, regardless of format, the analysis outlined in this worksheet should be included for an expanded EFH assessment, along with additional information that may be necessary. This additional information includes:

- the results of on-site inspections to evaluate the habitat and site-specific effects
- the views of recognized experts on the habitat or the species that may be affected
- a review of pertinent literature and related information
- an analysis of alternatives to the action that could avoid or minimize the adverse effects on EFH.

Your analysis of adverse effects to EFH under the MSA should focus on impacts to the habitat for all life stages of species with designated EFH, rather than individual responses of fish species. Fish habitat includes the substrate and benthic resources (e.g., submerged aquatic vegetation, shellfish beds, salt marsh wetlands), as well as the water column and prey species.

Consultation with us may also be necessary if a proposed action results in adverse impacts to other NOAA-trust resources. Part 6 of the worksheet is designed to help assess the effects of the action on other NOAA-trust resources. This helps maintain efficiency in our interagency coordination process. In addition, further consultation may be required if a proposed action impacts marine mammals or threatened and endangered species for which we are responsible. Staff from our Greater Atlantic Regional Fisheries Office, Protected Resources Division should be contacted regarding potential impacts to marine mammals or threatened and endangered species.

Instructions for Use:

Federal agencies must submit an EFH assessment to NOAA Fisheries as part of the EFH consultation. Your EFH assessment must include:

1) A description of the proposed action.
2) An analysis of the potential adverse effects of the action on EFH, and the managed species.
3) The federal agency's conclusions regarding the effects of the action on EFH.
4) Proposed mitigation if applicable.

In order for this worksheet to be considered as your EFH assessment, you must answer the questions in this worksheet fully and with as much detail as available. Give brief explanations for each answer.

Federal action agencies or the non-federal designated lead agency should submit the completed worksheet to NOAA Fisheries Greater Atlantic Regional Fisheries Office, Habitat Conservation Division (HCD) with the public notice or project application. Include project plans showing existing and proposed conditions, all waters of the U.S. on the project site, with mean low water (MLW), mean high water (MHW), high tide line (HTL), and water depths clearly marked and sensitive habitats mapped, including special aquatic sites (submerged aquatic vegetation, saltmarsh, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges), hard bottom habitat areas and shellfish beds, as well as any available site photographs.

For most consultations, NOAA Fisheries has 30 days to provide EFH conservation recommendations once we receive a complete EFH assessment. Submitting all necessary information at once minimizes delays in review and keeps review timelines consistent. Delays in providing a complete EFH assessment can result in our consultation review period extending beyond the public comment period for a particular project.

The information contained on the HCD Consultation website and NOAA's EFH Mapper will assist you in completing this worksheet. Please note that the Mapper is currently being up-dated with new designations and EFH maps and text descriptions for many species are temporarily missing. When you open the Mapper, read the WARNING that pops up when you click on the Greater Atlantic Region. It will direct you to a document with maps and text descriptions for each of the missing New England Species and to the Mapper's Data Inventory where a data layer for all the missing species is available for downloading into GIS software. Once the Mapper is up-dated, you can do a Location Query for your project location, but until then, the only way to easily generate a list of the missing species and life stages is to use your own GIS software. Before you fill out the worksheet, we recommend that you check with the appropriate HCD staff member to ensure that your list is complete and accurate. They will be able to answer any questions that you have.

Also note that a number of new Habitat Areas of Particular Concern (HAPCs) have been designated in the Greater Atlantic Region. HAPC maps will also be added to the Mapper the next time it is up-dated. Currently, they can be viewed by following the instructions on the warning page for the region. We expect the Mapper to be fully up-dated and functional later this spring.

EFH ASSESSMENT WORKSHEET FOR FEDERAL AGENCIES (modified 3/2016)

PROJECT NAME: NASA Wallops Flight Facility Fiber-Optic Cable Installation

DATE: 07/25/2019

PROJECT NO.:

LOCATION (Water body, county, physical address):

Watts Bay and Ballast Narrows, Wallops Island, Accomack County, VA

PREPARER: NASA

Step 1: Use NOAA's EFH Mapper to generate the list of designated EFH for federally-managed species and life stages for the geographic area of interest. Use this list as part of the initial screening process to determine if EFH for those species occurs in the vicinity of the proposed action. The list can be included as an attachment to the worksheet. Make a preliminary determination on the need to conduct an EFH consultation.

1. INITIAL CONSIDERATIONS

EFH Designations	Yes	No
Is the action located in or adjacent to EFH designated for eggs? **List the species:**	☐	☑
Is the action located in or adjacent to EFH designated for larvae? **List the species:** Neonates for sand tiger shark, sandbar shark, and smoothhound shark complex - Atlantic stock	☑	☐
Is the action located in or adjacent to EFH designated for juveniles? **List the species:** Atlantic butterfish, black sea bass, bluefish, clearnose skate, sand tiger shark, sandbar shark, smoothhound shark complex - Atlantic stock, summer flounder, and winter skate	☑	☐

Is the action located in or adjacent to EFH designated for adults or spawning adults? List the species: Atlantic butterfish, Atlantic herring, black sea bass, bluefish, clearnose skate, sand tiger shark, sandbar shark, smoothhound shark complex - Atlantic stock, summer flounder, windowpane flounder, and winter skate	✔	

If you answered 'no' to all questions above, then an EFH consultation is not required - go to Section 5.

If you answered 'yes' to any of the above questions, proceed to Section 2 and complete the remainder of the worksheet.

<u>Step 2</u>: In order to assess impacts, it is critical to know the habitat characteristics of the site before the activity is undertaken. Use existing information, to the extent possible, in answering these questions. Identify the sources of the information provided and provide as much description as available. These should not be yes or no answers. Please note that there may be circumstances in which new information must be collected to appropriately characterize the site and assess impacts. Project plans that show the location and extent of sensitive habitats, as well as water depths, the HTL, MHW and MLW should be provided.

2. SITE CHARACTERISTICS

Site Characteristics	Description
Is the site intertidal, sub-tidal, or water column?	Salt marsh portion of proposed fiber-optic cable alignment is intertidal; bay and narrows portions are subtidal/water column.
What are the sediment characteristics?	Fine-grained material (silts and clays)
Is there submerged aquatic vegetation (SAV) at or adjacent to project site? If so describe the SAV species and spatial extent.	No. According to Virginia Institute of Marine Science SAV Monitoring - Interactive Map, the nearest SAV density (not fully mapped) is located approximately 3 miles (straight line) from the project alignment. (http://web.vims.edu/bio/sav/savwabmap/)
Are there wetlands present on or adjacent to the site? If so, describe the spatial extent and vegetation types.	Project alignment would cross approximately 3,900 feet of tidal salt marsh (Walker Marsh) between Ballast Narrows and Watts Bay. Cable would be installed in marsh by vibratory and open trenching, and hand-holes would be installed at two locations where horizontal directional drilling (HDD) boreholes would exit. Vegetation would be re-established in accordance with NASA WFF vegetation management policies in the small areas impacted by vegetation removal.

Is there shellfish present at or adjacent to the project site? If so, please describe the spatial extent and species present.	The project alignment crosses private oyster ground leases in Ballast Narrows and Watts Bay. Private or public oyster grounds cover the majority of Watts Bay (Virginia Marine Resources Commission, 2019). The Virginia Marine Resources Commission (VMRC) verbally informed NASA by phone call on/around 21 August 2019 that the HDD portion of the project is exempt from subaqueous permitting, no royalties would be required, and the project can proceed in these areas as designed.
Are there mudflats present at or adjacent to the project site? If so please describe the spatial extent.	Mudflats are located adjacent to the Project alignment in Ballast Narrows and Watts Bay. The nearest mudflats are approximately 400 feet from the Ballast Narrows segment and approximately 900 feet from the Watts Bay segment.
Is there rocky or cobble bottom habitat present at or adjacent to the project site? If so, please describe the spatial extent.	No
Is Habitat Area of Particular Concern (HAPC) designated at or near the site? If so for which species, what type habitat type, size, characteristics?	No
What is the typical salinity, depth and water temperature regime/range?	Salinity ranges between approximately 20 and 32 ppt (Suttles et al./USGS 2017, Summary of Oceanographic and Water-Quality Measurements in Chincoteague Bay, Maryland and Virginia, 2014–15). The water depth in Ballast Narrows is approximately -1.32 feet. The water depth in Watts Bay is approximately -3.28 feet (2016 USGS CoNED Topobathymetric Model (1859 - 2015): Chesapeake Bay Region). Water temperature ranges from 0 and 30°C.
What is the normal frequency of site disturbance, both natural and man-made?	Natural site disturbance may occur during storms and higher-than-normal tidal cycles, when the Project area may be inundated with wrack and other debris. Man-made disturbance in the area may consist of motorized small boat traffic, activities at the North Wallops Island UAS airstrip, and rocket launches from the Wallops Flight Facility launch range.
What is the area of proposed impact (work footprint & far afield)?	Project involves installation of a fiber-optic cable by HDD beneath Ballast Narrows and Watts Bay and by vibratory trenching and open trenching in the salt marsh between the narrows and bay (Walker Marsh). Hand-installation of the cable via water jetting would occur in three guts located in Walker Marsh. Area of potential impact is the corridor in which the cable would be installed and adjacent areas. Corridor length would include approximately 9,400 feet to be installed by HDD and 3,900 feet to be installed by trenching and jetting across Walker Marsh. Areas of disturbance of marsh vegetation: access matting-1,900 square feet (sf); HDD work areas-15,000 sf; vibratory trench-49,500 sf; open trench-19,000 sf. Total disturbance would of Walker Marsh would be 85,400 sf (1.96 acres).

<u>Step 3</u>: This section is used to describe the anticipated impacts from the proposed action on the physical/chemical/biological environment at the project site and areas adjacent to the site that may be affected.

3. DESCRIPTION OF IMPACTS

Impacts	Y	N	Description
Nature and duration of activity(s). Clearly describe the activities proposed and the duration of any disturbances.			Project involves installation of a fiber-optic cable by HDD beneath Ballast Narrows and Watts Bay and by vibratory and open trenching in the salt marsh (Walker Marsh) between the narrows and bay. The activity would be short-term and temporary. There would be temporary staging areas at the two HDD borehole exit points for HDD equipment, HDPE conduit, and fiber optic cable. Temporary access mats would be used. Temporary staging at the borehole entry areas would be required for the HDD equipment and slurry boxes. The vibratory trenching machinery would create a temporary opening in the ground for the concurrent direct burial of the fiber optic cable conduit; there is no side cast of excavation material. Water jetting would be used for trenching across three guts in the marsh. Open trenching would be conducted in the areas immediately surrounding three guts. Specialized low-ground-pressure trenching equipment to would be used to minimize compaction of soil and vegetation. Project would be completed in 3 months, including 1 month in Walker Marsh. All work would occur between September and March.
Will the benthic community be disturbed? If no, why not? If yes, describe in detail how the benthos will be impacted.	✔		The benthic community of Ballast Narrows and Watts Bay will not be disturbed because the use of HDD will preclude the need for in-water work in those areas. The benthic community of the salt marsh may be physically impacted within the narrow path where trenching and water jetting would occur, and in the areas where the two HDD boreholes exit. These areas would be re-vegetated as needed, and the benthic community would re-establish through natural processes. Benthic community may be temporarily disturbed by anchoring of a barge at the east and west borehole exit areas on Walker Marsh.
Will SAV be impacted? If no, why not? If yes, describe in detail how the SAV will be impacted. Consider both direct and indirect impacts. Provide details of any SAV survey conducted at the site.		✔	SAV would not be impacted. According to Virginia Institute of Marine Science SAV Monitoring - Interactive Map, the nearest SAV density (not fully mapped) is located approximately 3 miles (straight line) from the project alignment. (http://web.vims.edu/bio/sav/savwabmap/)
Will salt marsh habitat be impacted? If no, why not? If yes, describe in detail how wetlands will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?	✔		Salt marsh would be temporarily impacted by the installation of a fiber-optic cable by trenching across Walker Marsh, the salt marsh island between the narrows and bay. The length of the segment through the marsh would be approximately 3,900 feet, and the width of the corridor in which vegetation would be disturbed by the installation activities would be 14 feet. In addition, small areas on each end of the marsh segment would be impacted where the HDD boreholes exit, as well as the areas of disturbance associated with the open trenching. The total area of marsh potentially affected would be approximately 2 acres. The impacts would be temporary because trenching would immediately bury the cable, the open trench and boreholes would be backfilled, and vegetation would be reestablished in accordance with NASA WFF vegetation management policies and regulatory requirements in areas where vegetation is removed.

Will mudflat habitat be impacted? If no, why not? If yes, describe in detail how mudflats will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?		✔	Mudflat habitat would not be directly impacted because mudflats are not documented within the project path and in-water work would be avoided through the use of HDD.
Will shellfish habitat be impacted? If so, provide in detail how the shellfish habitat will be impacted. What is the aerial extent of the impact? Provide details of any shellfish survey conducted at the site.		✔	Shellfish habitat in the bay and narrows would not be impacted because in-water work would be avoided through the use of HDD. Shellfish habitat may be present in the three guts within Walker Marsh where water jetting would be used to install the cable in the subaqueous bottom. The habitat area that may be temporarily disturbed where these guts are crossed would be small and would re-establish through natural processes.
Will hard bottom (rocky, cobble, gravel) habitat be impacted at the site? If so, provide in detail how the hard bottom will be impacted. What is the aerial extent of the impact?		✔	Not present
Will sediments be altered and/or sedimentation rates change? If no, why not? If yes, describe how.	✔		Sediments may be disturbed by trenching in the salt marsh. However, vibratory trenching does not require excavation of an open trench or side cast, and best management practices (BMPs) would be used to prevent or minimize erosion and corresponding increases in sedimentation and turbidity. Filling of the two borehole exit areas and open trenches with excavated sediment and re-vegetation of the affected areas in accordance with NASA WFF vegetation management policies would ensure that impacts would be temporary. Sedimentation rates would not change.
Will turbidity increase? If no, why not? If yes, describe the causes, the extent of the effects, and the duration.	✔		Turbidity may increase due to trenching activity and borehole exit areas in the salt marsh. However, impacts would be temporary and prevented or minimized through the use of BMPs. Water jetting for installation of conduit in the subqaueous bottom of three guts in the marsh may temporarily increase turbidity in the creeks; turbidity curtains would be used to minimize the migration of disturbed sediments beyond the immediate area of the crossing.

Will water depth change? What are the current and proposed depths?	☐	☑	No
Will contaminants be released into sediments or water column? If yes, describe the nature of the contaminants and the extent of the effects.	☐	☑	Accidental spills of fuel or other hazardous substances would be prevented or minimized through the contractor's adherence to spill prevention and control measures as specified in WFF's Integrated Contingency Plan. The installation contractor would be required to regularly maintain and inspect equipment to prevent the occurrence of leaks or spills. An inadvertent release of drilling mud could occur during HDD. Drilling mud is a viscous fluid consisting mainly of clay (bentonite) in water. It is essentially nontoxic, and any release would be short-term and localized. Potential effects could include increased turbidity from suspended clay particles in the immediate vicinity of the release, which may temporarily interfere with respiration by invertebrates and fish. Conditions would return to a pre-disturbance condition once particles disperse in the water column and/or settle to the bottom.
Will tidal flow, currents, or wave patterns be altered? If no, why not? If yes, describe in detail how.	☐	☑	No in-water work will be performed.
Will water quality be altered? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration of the impact.	☐	☑	BMPs will be employed to prevent possible releases of contaminants, such as oil, fuel, hydraulic fluid, or drilling mud, into the water column from vibratory trenching and drilling equipment. Water jetting for installation of conduit in the subaqueous bottom of three guts in the marsh may temporarily increase turbidity in the creeks; however, turbidity curtains would be used to minimize the migration of disturbed sediments beyond the immediate area of the crossing. Any effects on water quality from inadvertent releases of such substances or increases in turbidity would be localized and temporary.
Will ambient noise levels change? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration and degree of impact.	☑	☐	Ambient noise levels would increase in the vicinity of the equipment used for vibratory trenching and HDD operations. The effects would be temporary and would occur only during limited periods while the equipment is being operated.
Does the action have the potential to impact prey species of federally managed fish with EFH designations?	☑	☐	Prey species may be indirectly affected through their avoidance of noise and vibration and/or increases in turbidity. However, impacts would be temporary and confined to the immediate area of the segment through Walker Marsh during installation.

Step 4: This section is used to evaluate the consequences of the proposed action on the functions and values of EFH as well as the vulnerability of the EFH species and their life stages. Identify which species (from the list generated in Step 1) will be adversely impacted from the action. Assessment of EFH impacts should be based upon the site characteristics identified in Step 2 and the nature of the impacts described within Step 3. NOAA's EFH Mapper should be used during this assessment to determine the ecological parameters/ preferences associated with each species listed and the potential impact to those parameters.

4. EFH ASSESSMENT

Functions and Values	Y	N	Describe habitat type, species and life stages to be adversely impacted
Will functions and values of EFH be impacted for:			
Spawning **If yes, describe in detail how, and for which species. Describe how adverse effects will be avoided and minimized.**		✔	Project area does not provide spawning habitat for EFH species.
Nursery **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**		✔	Only neonates of sandbar, smoothhound, and sand tiger sharks may use the area as nursery habitat. There would be limited in-water work associated with jetting in the guts, and potential turbidity effects from trenching in the salt marsh would be limited in duration and small in extent. Turbidity curtains would be used to minimize the spread of turbidity beyond the immediate area.Therefore, nursery habitat for these species would not be significantly affected. The proposed project will incorporate a time-of-year (TOY) restriction between April 1 and August 31 to avoid impacts on the eastern black rail (Laterallus jamaicensis jamaicensis), a small, marsh-dwelling migratory bird proposed for listing by the USFWS as threatened under the Endangered Species Act (ESA) and known to occur on and near WFF. Adherence to this measure would also minimize the potential for effects on nursery habitat during the project.
Forage **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**		✔	Adults and juveniles of Atlantic butterfish, black sea bass, bluefish, clearnose skate, sand tiger shark, sandbar shark, smoothhound shark complex - Atlantic stock, summer flounder, and winter skate and adults of Atlantic herring and windowpane flounder potentially forage in the Project area in the shallow, brackish habitats of Ballast Narrows and Watts Bay. Potential turbidity effects from trenching in the salt marsh would be limited in duration and extent. Similarly, water jetting across three guts in the marsh may increase turbidity in the creeks temporarily; however, turbidity curtains would be used to minimize the spread of turbidity beyond the immediate area of the crossing. Therefore, food sources available to these species would not be reduced, and foraging habitat for these species would not be significantly affected.
Shelter **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**		✔	Adults and juveniles of Atlantic butterfish, black sea bass, bluefish, clearnose skate, sand tiger shark, sandbar shark, smoothhound shark complex - Atlantic stock, summer flounder, and winter skate and adults of Atlantic herring and windowpane flounder potentially find shelter in the Project area in the shallow, brackish habitats of Ballast Narrows and Watts Bay. Potential turbidity effects from trenching in the salt marsh would be limited in duration and extent. Similarly, water jetting across three guts in the marsh may increase turbidity in the creeks temporarily; however, turbidity curtains would be used to minimize the spread of turbidity beyond the immediate area of the crossing. Therefore, sheltering habitat for these species would not be significantly affected.

Will impacts be temporary or permanent? Please indicate in description box and describe the duration of the impacts.			Direct, minor, and temporary impacts from earth disturbance and associated erosion, turbidity, and sedimentation. The temporary area of disturbance on Walker Marsh is anticipated to be 2 acres (1.96 acres). Best management practices would be used to prevent or minimize impacts. Temporary impacts would cease upon installation of the cable. The proposed project will incorporate a TOY restriction between April 1 and August 31 to avoid impacts on the eastern black rail. Adherence to this measure would further limit the portion of the year in which impacts may occur to an approximately 3-month period between September and March.
Will compensatory mitigation be used? If no, why not? Describe plans for mitigation and how this will offset impacts to EFH. Include a conceptual compensatory mitigation plan, if applicable.	☐	☑	No compensatory mitigation is proposed. Applicable BMPs would be used to minimize temporary adverse effects.

<u>Step 5</u>: This section provides the federal agency's determination on the degree of impact to EFH from the proposed action. The EFH determination also dictates the type of EFH consultation that will be required with NOAA Fisheries.

Please note: if information provided in the worksheet is insufficient to allow NOAA Fisheries to complete the EFH consultation additional information will be requested.

5. DETERMINATION OF IMPACT

Federal Agency's EFH Determination		
Overall degree of adverse effects on EFH (not including compensatory mitigation) will be: **(check the appropriate statement)**	☐	**There is no adverse effect on EFH or no EFH is designated at the project site.** **EFH Consultation is not required.**
	☑	**The adverse effect on EFH is not substantial. This means that the adverse effects are either no more than minimal, temporary, or that they can be alleviated with minor project modifications or conservation recommendations.** **This is a request for an abbreviated EFH consultation.**
	☐	**The adverse effect on EFH is substantial.** **This is a request for an expanded EFH consultation.**

Step 6: Consultation with NOAA Fisheries may also be required if the proposed action results in adverse impacts to other NOAA-trust resources, such as anadromous fish, shellfish, crustaceans, or their habitats as part of the Fish and Wildlife Coordination Act Some examples of other NOAA-trust resources are listed below. Inquiries regarding potential impacts to marine mammals or threatened/endangered species should be directed to NOAA Fisheries' Protected Resources Division.

6. OTHER NOAA-TRUST RESOURCES IMPACT ASSESSMENT

Species known to occur at site (list others that may apply)	Describe habitat impact type (i.e., physical, chemical, or biological disruption of spawning and/or egg development habitat, juvenile nursery and/or adult feeding or migration habitat). Please note, impacts to federally listed species of fish, sea turtles, and marine mammals must be coordinated with the GARFO Protected Resources Division.
alewife	Anadromous -- adults and juveniles potentially may pass through the Project area when migrating between offshore waters and freshwater spawning areas. Project includes no in-water work that would adversely affect this species. Localized, temporary turbidity from jetting, trenching and HDD borehole exits in the salt marsh would be unlikely to adversely affect the species.
American eel	Catadromous -- juveniles potentially may pass through the Project area before maturing and entering freshwater streams and rivers. Project includes no in-water work that would adversely affect this species. Localized, temporary turbidity from jetting, trenching and HDD borehole exits in the salt marsh would be unlikely to adversely affect the species.
American shad	Anadromous -- adults and juveniles potentially may pass through the Project area when migrating between offshore waters and freshwater spawning areas. Project includes no in-water work that would adversely affect this species. Localized, temporary turbidity from jetting, trenching and HDD borehole exits in the salt marsh would be unlikely to adversely affect the species.
Atlantic menhaden	Larvae, juveniles, and adults potentially may occur in the Project area. Project includes no in-water work that would adversely affect this species. Localized, temporary turbidity from jetting, trenching and HDD borehole exits in the salt marsh would be unlikely to adversely affect the species.
blue crab	All life stages potentially may occur in the Project area. Project includes no in-water work that would adversely affect this species. Localized, temporary turbidity from jetting, trenching and HDD borehole exits in the salt marsh would be unlikely to adversely affect the species.
blue mussel	Not present in project area due to lack of suitable habitat.
blueback herring	Anadromous -- adults and juveniles potentially may pass through the Project area when migrating between offshore waters and freshwater spawning areas. Project includes no in-water work that would adversely affect this species. Localized, temporary turbidity from jetting, trenching and HDD borehole exits in the salt marsh would be unlikely to adversely affect the species.

Eastern oyster	Waters in the Project area provide habitat for all life stages of the eastern oyster, and extensive oyster beds are present in the area. Project includes no in-water work that would adversely affect this species. Localized, temporary turbidity from jetting, trenching and HDD borehole exits in the salt marsh would be unlikely to adversely affect the species.
horseshoe crab	Not present in project area due to lack of suitable habitat.
quahog	Potentially present in muddy sand substrates in the Project area. Project includes no in-water work that would adversely affect this species. Localized, temporary turbidity from jetting, trenching and HDD borehole exits in the salt marsh would be unlikely to adversely affect the species.
soft-shell clams	Potentially present in muddy sand substrates in the Project area, although water depths may be too shallow. Project includes no in-water work that would adversely affect this species. Localized, temporary turbidity from jetting, trenching and HDD borehole exits in the salt marsh would be unlikely to adversely affect the species if present.
striped bass	Anadromous -- adults and juveniles potentially may pass through the Project area when migrating between offshore waters and freshwater spawning areas. Project includes no in-water work that would adversely affect this species. Localized, temporary turbidity from jetting, trenching and HDD borehole exits in the salt marsh would be unlikely to adversely affect the species.
other species:	

Useful Links

National Wetland Inventory Maps

EPA’s National Estuaries Program

Northeast Regional Ocean Council (NROC) Data

Mid-Atlantic Regional Council on the Ocean (MARCO) Data

Resources by State:

Maine
Eelgrass maps

Maine Office of GIS Data Catalog

Casco Bay Estuary Partnership

Maine GIS Stream Habitat Viewer

New Hampshire
New Hampshire's Statewide GIS Clearinghouse, NH GRANIT

New Hampshire Coastal Viewer

Massachusetts
Eelgrass maps

MADMF Recommended Time of Year Restrictions Document

Massachusetts Bays National Estuary Program

Buzzards Bay National Estuary Program

Massachusetts Division of Marine Fisheries

Massachusetts Office of Coastal Zone Management

Rhode Island
Eelgrass maps

Narraganset Bay Estuary Program

Rhode Island Division of Marine Fisheries

Rhode Island Coastal Resources Management Council

Connecticut

Eelgrass Maps

Long Island Sound Study

CT GIS Resources

CT DEEP Office of Long Island Sound Programs and Fisheries

CT Bureau of Aquaculture Shellfish

Maps CT River Watershed Council

New York

Eelgrass report

Peconic Estuary Program

NY/NJ Harbor Estuary

New Jersey

Submerged Aquatic Vegetation mapping

Barnegat Bay Partnership

Delaware

Partnership for the Delaware Estuary

Center for Delaware Inland Bays

Maryland

Submerged Aquatic Vegetation mapping

MERLIN

Maryland Coastal Bays Program

Virginia

Submerged Aquatic Vegetation mapping

WFF Marsh Fiber Environmental Assessment

Appendix D
Agency Coordination

Appendix D

Agency Coordination Correspondence Index

DATE	FROM	TO	SUBJECT
September 26, 2019	National Oceanic and Atmospheric Administration – Protected Resources Division	NASA	Response to Request for Consultation under Section 7 of the ESA
September 27, 2019	U.S. Fish and Wildlife Service	NASA	Concurrence of Effects under Section 7 of the ESA
October 10, 2019	National Oceanic and Atmospheric Administration – Habitat Conservation Division	NASA	Response to Request for Review of EFH Assessment
October 16, 2019	Virginia Department of Historic Resources	NASA	Concurrence of Effects to Historic Properties

Suzie Richert

From: Brian D Hopper - NOAA Federal <brian.d.hopper@noaa.gov>
Sent: Thursday, September 26, 2019 9:45 AM
To: Bruner, Douglas W. (WFF-2500)
Cc: nmfs.gar.esa.section7@noaa.gov; kimberly.damon-randall@noaa.gov; David.L.Obrien@noaa.gov; Miller, Shari A. (WFF-2500); Simko, Marianne F. (WFF-200.C)[LJT AND ASSOCIATES, INC.]; Suzie Richert; Doug Fraser; Carver, Craig
Subject: Re: NASA_Marsh Fiber_NOAA Section 7 Consultation letter

Hi Doug,

Your email and attached letter dated September 17, 2019, regarding NASA's proposal to install a fiber optic cable from the U.S. Fish and Wildlife Service (USFWS) Wallops National Wildlife Refuge (Wallops NWR) to Wallops Island requested concurrence with a determination regarding potential effects on federally listed threatened and endangered species under our jurisdiction.

Although four species of sea turtles and Atlantic sturgeon originating from five listed Distinct Population Segments (DPS) are known to occur along the coastal waters of Virginia, based on the activities associated with the project, the location of the project, and information you provided in your email and letter, we believe that these species will not be exposed to any direct or indirect effects of the action. Therefore, we do not believe a consultation in accordance with section 7 of the Endangered Species Act (ESA) is necessary. As such, no further coordination on this activity with the NMFS Protected Resources Division is necessary at this time. Should there be additional changes to the project plans or new information become available that changes the basis for this determination, further coordination should be pursued. Please contact me (brian.d.hopper@noaa.gov), should you have any questions regarding these comments.

Regards,
-Brian

On Tue, Sep 17, 2019 at 9:14 AM Bruner, Douglas W. (WFF-2500) <douglas.w.bruner@nasa.gov> wrote:

> Dear Ms. Damon-Randall,
>
> The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) proposes to install a fiber optic cable, referred to as the “Marsh Fiber,” from the U.S. Fish and Wildlife Service (USFWS) Wallops National Wildlife Refuge (Wallops NWR) to Wallops Island. NASA is preparing an Environmental Assessment (EA) in compliance with NEPA to analyze the potential effects of the proposed action on the environment.
>
> Attached to this correspondence is a letter that provides information about the proposed project and to request your concurrence with our determination regarding potential effects on federally listed threatened and endangered species under NOAA jurisdiction in the proposed project area.
>
> Please feel free to contact Shari Miller or me if you have questions regarding the project or effects determination.

Very respectfully,

Doug Bruner

Environmental Engineer

Code 250, Medical and Environmental Management Division

NASA Wallops Flight Facility

Building F-160, Rm C-166

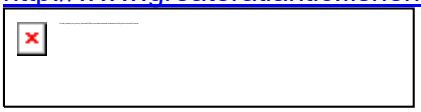
Wallops Island, Virginia 23337

douglas.w.bruner@nasa.gov

Office (757) 824-2441

--

Brian D. Hopper
Protected Resources Division
NOAA Fisheries
Greater Atlantic Regional Fisheries Office
200 Harry S Truman Parkway
Suite 460
Annapolis, MD 21401
410 267 5649
Brian.D.Hopper@noaa.gov
http://www.greateratlantic.fisheries.noaa.gov/



Suzie Richert

From: Case, Rachel <rachel_case@fws.gov>
Sent: Friday, September 27, 2019 11:35 AM
To: Miller, Shari A. (WFF-2500)
Subject: Re: [EXTERNAL] NASA_USFWS Section 7 Consultation Letter

Good morning,

Thank you, Shari. We have no further comments or concerns regarding this project.

Have a great weekend.

On Fri, Sep 27, 2019 at 11:07 AM Miller, Shari A. (WFF-2500) <shari.a.miller@nasa.gov> wrote:

> Good morning, Rachel.
>
> Please find attached the revised Species Conclusion Table for NASA's proposed Marsh Fiber project. Please call me at 757.824.2327 if you have any question or would like to discuss this further.
>
> *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
>
> https://code200-external.gsfc.nasa.gov/250-wff/
>
> *"There is nothing better than a friend. Unless it is a friend with chocolate." — Linda Grayson*
>
> **From:** rachel_case@fws.gov <rachel_case@fws.gov> **On Behalf Of** Virginia Field Office, FW5
> **Sent:** Thursday, September 26, 2019 11:09 AM
> **To:** Bruner, Douglas W. (WFF-2500) <douglas.w.bruner@nasa.gov>
> **Subject:** Re: [EXTERNAL] NASA_USFWS Section 7 Consultation Letter

Douglas,

I attempted to send an e-mail to you on the September 23rd regarding your project submission. It appears that there has been some difficulties with delivery. The previous e-mail stated:

Thank you for your project submission. After reviewing your documents, I did have a question about the Species Conclusion Table (SCT). You have made a may affect determination for the piping plover and red knot; however, it appears from the notes/documentation column of the SCT that you believe this project is not likely to adversely affect these species. I wanted to clarify these determinations.

Please disregard this e-mail if this information has reached you.

Regards,

Rachel

On Tue, Sep 17, 2019 at 9:16 AM Bruner, Douglas W. (WFF-2500) <douglas.w.bruner@nasa.gov> wrote:

> Dear Virginia Field Office Staff,
>
> The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) proposes to install a fiber optic cable, referred to as the "Marsh Fiber," from the U.S. Fish and Wildlife Service (USFWS) Wallops National Wildlife Refuge (Wallops NWR) to Wallops Island. NASA is preparing an Environmental Assessment (EA) in compliance with NEPA to analyze the potential effects of the proposed action on the environment.
>
> Attached to this correspondence is a letter that provides information about the proposed project and the species and critical habitat considered in our review and our determination of effects on federally listed threatened and endangered species in the proposed project area. The purpose of this letter is to inform your office of the project and to request your concurrence with our determination.
>
> Please feel free to contact Shari Miller or me if you have questions regarding the project or effects determinations.
>
> Very respectfully,

Doug Bruner

Environmental Engineer

Code 250, Medical and Environmental Management Division

NASA Wallops Flight Facility

Building F-160, Rm C-166

Wallops Island, Virginia 23337

douglas.w.bruner@nasa.gov

Office (757) 824-2441

--

Rachel Case
Biological Science Technician
Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, Virginia 23061
804-824-2416

Species Conclusions Table

Project Name: NASA Wallops Flight Facility Fiber Optic Cable Installation ("Marsh Fiber")

Date: 09/26/2019

Species / Resource Name	Conclusion	ESA Section 7	Notes / Documentation
Northern long-eared bat (*Myotis septentrionalis)*	Suitable habitat potentially present	No effect	Relying upon the findings of the 1/5/2018 Programmatic Biological Opinion for the Final 4(d) Rule on the Northern long-eared bat and Activities Excepted from Take Prohibitions to fulfill project-specific Section 7 responsibilities. No trees would be removed as part of the Proposed Action. Noise levels from Horizontal Directional Drilling (HDD) operations and equipment would increase during project activities with disturbances to mature trees adjacent to the boresight antenna. No Myotis guild detected during 2017-2018 bat acoustic and netting surveys (Barr, 2018.) Due to a time of year restriction (TOYR) that NASA will implement on the project for other species, no work would be done between April 1 and August 31, which includes the Northern long-eared bat pup season (June 1 to July 31).
Eastern black rail (*Laterallus jamaicensis jamaicensis*)	Species not present Suitable habitat present	Not likely to adversely affect	Species has recently been documented at WFF and suitable habitat is present at and near the facility (Walker Marsh) (NASA 2019). As the species is proposed by USFWS for listing as threatened, NASA has included the Eastern black rail in the Species Conclusions Table for the proposed project. Through informal conference with USFWS conducted on 8/16/2019, NASA will incorporate a TOYR between April 1 and August 31 into the proposed project to avoid potentially adverse effects on the species. Therefore, NASA anticipates that the species would not be present during project activities.

Species / Resource Name	Conclusion	ESA Section 7	Notes / Documentation
Bald eagle (*Haliaeetus leucocephalus*)	No bald eagle nests within 660 feet of project area (CCB 2019) No bald eagle roosts within 3 miles of the project area (CCB 2019)	No effect	Two active bald eagle nests exist on Wallops Island (NASA 2018). Multiple other documented bald eagle nests are in the vicinity of WFF and the project area (CCB 2019). The closest bald eagle nest to the project area is on Wallops Island more than 0.5 mile southeast of the proposed project's eastern terminus. The next closest bald eagle nest is in Wallops Island NWR more than 0.5 mile northeast of the proposed project's western terminus. Other bald eagle nests at or in the vicinity of WFF are more than 1 mile from the project area. NASA holds permit number MB50674C-0 (12/01/2017 - 11/30/2019) for eagle nest take on the east end of the Wallops Island unmanned aerial system (UAS) airstrip.
Piping plover (*Charadrius melodus*)	Species not present Suitable habitat potentially present	Not likely to adversely affect	Regularly nests and forages on Wallops, Assateague, and Assawoman Island beaches (NASA 2018; USFWS 2016, USFWS 2019). No beaches would be directly disturbed by the proposed action; NASA proposes to use HDD under the shoreline of the Wallops National Wildlife Refuge and the west side of Wallops Island (HDD is not likely to affect species). Therefore, proposed activities would not occur near documented piping plover nests on Wallops Island. Due to TOYR that NASA will implement on the project for the Eastern black rail, no work would be done between April 1 and August 31. Therefore, NASA anticipates that the species would not be present during project activities.
Red knot (*Calidris canutus rufa)*	Species not present Suitable habitat present	Not likely to adversely affect	Regularly forages on Wallops, Assateague, and Assawoman Island beaches during northerly spring migration (NASA 2018, USFWS 2019). Activities in the proposed action would not occur on beaches at or near red knot habitat. No beaches would be directly disturbed by the proposed action; NASA proposes to use HDD under the shoreline of the Wallops National Wildlife Refuge and the west side of Wallops Island (HDD is not likely to affect species). Therefore, proposed activities would not occur near documented red knot foraging areas on Wallops Island. Due to TOYR that NASA will implement on the project for the Eastern black rail, no work would be done between April 1 and August 31. Therefore, NASA anticipates that the species would not be present during project activities.

Species / Resource Name	Conclusion	ESA Section 7	Notes / Documentation
Roseate tern (*Sterna dougallii dougallii*)	Species not present Suitable habitat present	No effect	Rarely observed along the U.S. coast south of New Jersey; may transit through oceanic areas east of the action area during seasonal migration (Nisbet 1984).
Green sea turtle (*Chelonia mydas)*	No suitable habitat present	No effect	HDD unlikely to affect species; bore pits and equipment access to handholes not located in nesting habitat. NMFS Protected Species Division responded via email on 9/26/19 to NASA's request for Section 7 consultation for the Marsh Fiber Project with the following: "*Although four species of sea turtles and Atlantic sturgeon originating from five listed Distinct Population Segments (DPS) are known to occur along the coastal waters of Virginia, based on the activities associated with the project, the location of the project, and information you provided in your email and letter, we believe that these species will not be exposed to any direct or indirect effects of the action. Therefore, we do not believe a consultation in accordance with section 7 of the Endangered Species Act (ESA) is necessary.*"
Hawksbill sea turtle (*Eretmochelys imbricata)*	No suitable habitat present	No effect	Most unlikely sea turtle species in ROI; only two observations in Virginia since 1979 (Mansfield 2006). HDD unlikely to affect species; bore pits and equipment access to handholes not located in nesting habitat. NMFS Protected Species Division responded via email on 9/26/19 to NASA's request for Section 7 consultation for the Marsh Fiber Project with the following: "*Although four species of sea turtles and Atlantic sturgeon originating from five listed Distinct Population Segments (DPS) are known to occur along the coastal waters of Virginia, based on the activities associated with the project, the location of the project, and information you provided in your email and letter, we believe that these species will not be exposed to any direct or indirect effects of the action. Therefore, we do not believe a consultation in accordance with section 7 of the Endangered Species Act (ESA) is necessary.*"

Species / Resource Name	Conclusion	ESA Section 7	Notes / Documentation
Kemp's Ridley sea turtle (*Lepidochelys kempii*)	No suitable habitat present	No effect	Second most prevalent sea turtle species in ROI. Traditionally nests in Mexico; however, first Virginia nest discovered in 2012 at Virginia Beach (USFWS 2012); with a second nest at False Cape in summer 2014 (Virginia Department of Game & Inland Fisheries, unpublished data). Generally found in more sheltered, shallower water habitats than other sea turtle species (Ogren 1989). HDD unlikely to affect species; bore pits and equipment access to handholes not located in nesting habitat. NMFS Protected Species Division responded via email on 9/26/19 to NASA's request for Section 7 consultation for the Marsh Fiber Project with the following: "*Although four species of sea turtles and Atlantic sturgeon originating from five listed Distinct Population Segments (DPS) are known to occur along the coastal waters of Virginia, based on the activities associated with the project, the location of the project, and information you provided in your email and letter, we believe that these species will not be exposed to any direct or indirect effects of the action. Therefore, we do not believe a consultation in accordance with section 7 of the Endangered Species Act (ESA) is necessary.*"
Leatherback sea turtle (*Dermachelys coriacea)*	No suitable habitat present	No effect	Nesting unlikely; only one individual demonstrating nesting behavior documented on Assateague Island in 1996 (Rabon et al. 2003); generally considered oceanic, however will forage in coastal areas if prey species are available in high densities (Eckert et al. 2006). HDD unlikely to affect species; bore pits and access routes to bore pits not in nesting habitat. NMFS Protected Species Division responded via email on 9/26/19 to NASA's request for Section 7 consultation for the Marsh Fiber Project with the following: "*Although four species of sea turtles and Atlantic sturgeon originating from five listed Distinct Population Segments (DPS) are known to occur along the coastal waters of Virginia, based on the activities associated with the project, the location of the project, and information you provided in your email and letter, we believe that these species will not be exposed to any direct or indirect effects of the action. Therefore, we do not believe a consultation in accordance with section 7 of the Endangered Species Act (ESA) is necessary.*"

Species / Resource Name	Conclusion	ESA Section 7	Notes / Documentation
Loggerhead sea turtle (*Caretta caretta*)	No Suitable habitat present	No effect	Most prevalent sea turtle species in ROI; periodically nests on Wallops and Assateague Island beaches (NASA 2018; USFWS 2016). Loggerhead nests have been observed on Wallops Island beaches as recently as 2016 (NASA 2019). Greatest in-water concentrations over continental shelf (Shoop and Kenney 1992); however, species is also found in deeper waters (Mansfield et al. 2009). HDD unlikely to affect species; bore pits and equipment access to handholes not located in nesting habitat. NMFS Protected Species Division responded via email on 9/26/19 to NASA's request for Section 7 consultation for the Marsh Fiber Project with the following: "*Although four species of sea turtles and Atlantic sturgeon originating from five listed Distinct Population Segments (DPS) are known to occur along the coastal waters of Virginia, based on the activities associated with the project, the location of the project, and information you provided in your email and letter, we believe that these species will not be exposed to any direct or indirect effects of the action. Therefore, we do not believe a consultation in accordance with section 7 of the Endangered Species Act (ESA) is necessary.*"
Seabeach amaranth (*Amaranthus pumilus*)	Species not documented at NASA WFF No suitable habitat present	No effect	No documented occurrences on Wallops Island (NASA 2017); closest documented occurrence has been at Assateague Island (USWFS 2012) north of the action area.
Critical Habitat	No critical habitat	No effect	

References:

Barr, E. 2018. Post-WNS Survey of Bats at NASA Wallops Island Flight Facility: Contract/Grant G16AC00327, 2018 Final Report. November.

Center for Conservation Biology (CCB). 2019. CCB Mapping Portal. Accessed on August 26, 2019 at https://ccbbirds.org/maps/#eagles.

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National Aeronautics and Space Administration (NASA). 2017. *Environmental Resources Document (External Version – Redacted) for National Aeronautics and Space Administration Goddard Space Flight Center, Wallops Flight Facility, Wallops Island, Virginia*. Accessed on July 25, 2019 at https://code200-external.gsfc.nasa.gov/250-wff/documents.

Mansfield, K.L. 2006. Sources of Mortality, Movements and Behavior of Sea Turtles in Virginia. Doctoral Dissertation. College of William and Mary School of Marine Science.

Mansfield, K. L., V.S. Saba, J.A. Keinath, & J.A. Musick. 2009. Satellite tracking reveals a dichotomy in migration strategies among juvenile loggerhead turtles in the Northwest Atlantic. Marine Biology, 156(12), 2555-2570.

National Aeronautics and Space Administration (NASA). 2018. Wallops Island Protected Species Monitoring Report. WFF Environmental Office, Wallops Island, VA.

National Aeronautics and Space Administration (NASA), 2019. Wallops Flight Facility Site-wide Programmatic Environmental Impact Statement, Final. May. https://code200-external.gsfc.nasa.gov/250-wff/site-wide_eis.

National Marine Fisheries Service. 2019. Email from Mr. Brian Hopper, NMFS Protected Resources Division to Mr. Doug Bruner, NASA WFF on September 26. Email provided in response to NASA's request for NMFS review of protected species under Section 7 of the Endangered Species Act.

Nisbet, I. C. 1984. Migration and winter quarters of North American Roseate Terns as shown by banding recoveries. Journal of Field Ornithology, 1-17.

Ogren, L. H. 1989. Distribution of juvenile and subadult Kemp's ridley turtles: Preliminary results from the 1984-1987 surveys. In Proceedings from the 1st Symposium on Kemp's ridley Sea Turtle Biology, Conservation, and Management. Sea Grant College Program, Galveston, TX (Vol. 116).

Rabon Jr., D. R., Johnson, S. A., Boettcher, R., Dodd, M., Lyons, M., Murphy, S., and Stewart, K. 2003. Confirmed leatherback turtle (*Dermochelys coriacea*) nests from North Carolina, with a summary of leatherback nesting activities north of Florida. Marine Turtle Newsletter, 101, 4-8.

Shoop, C. R., and R. D. Kenney. 1992. Seasonal distributions and abundances of loggerhead and leatherback sea turtles in waters of the northeastern United States. Herpetological Monographs, 43-67.

U.S. Air Force (USAF). 2017. Environmental Assessment for Construction and Operation of an Instrumentation Tower at Wallops Island, Virginia. Prepared by AECOM.

U.S. Fish and Wildlife Service (USFWS). 2012. Back Bay National Wildlife Refuge Annual Sea Turtle Program Report.

USFWS. 2016. Revised Biological Opinion Wallops Flight Facility Proposed and Ongoing Operations and Shoreline Restoration. June.

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

October 10, 2019

Mr. Douglas Bruner
Environmental Engineer
National Aeronautics and Space Administration
Goddard Space Flight Center
Wallops Island Facility
Attn; 250.W
Wallops Island, Virginia 23337

Re. Wallops Island Underground Fiber Optic Cable, Marsh Cable, EFH Assessment

Dear Mr. Bruner:

We have reviewed your essential fish habitat assessment (EFH) for the installation of an underground fiber optic cable from the Wallops Flight Facility (WFF) across Ware Bay and its associated marsh islands to Wallops Island, located in Accomack County, Virginia.

Magnuson Stevens Fishery Conservation and Management Act (MSA)
The Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires federal agencies such as NASA to consult with us on any action or proposed action authorized, funded, or undertaken by the agency that may adversely affect EFH identified under the MSA. The EFH regulations, 50 CFR Section 600.920, outline that consultation procedure.

EFH is defined by the MSA as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity". The designation and conservation of EFH seeks to minimize adverse effects on habitat caused by fishing and non-fishing activities. The WFF and Wallops Island project area is designated as EFH for various life stages of eleven (11) federally managed species including: Atlantic butterfish (*Peprilus triacanthus*), Atlantic sea herring (*Clupea harengus*), black sea bass (*Centopristis striata*) bluefish, (*Pomatomus saltatrix*), clearnose skate (*Raja eglanteria*), winter skate (*Leucoraja ocellata*), summer flounder (*Paralichthys dentatus*), windowpane flounder (*Scopthalmus aquosus*), sandbar shark (*Carcharhinus plumbeus*), Atlantic smoothhound shark complex (*Mustelus spp.*) and sand tiger shark (*Carcharias taurus*).

Although the HDD portions of the project are not likely to directly affect EFH, there are other project elements that may. The excavation of open trenches for the installation of 3 ft. long by 3 ft. wide by 3 ft. deep concrete-polymer hand hole enclosures, used to connect the HDD portions of the cable to the vibratory trenched portion of cable, excavating to -7 ft. below the marsh surface, to connect the cable installed via vibratory trenching with the cable to be jetted below the three tidal guts, and the temporary placement of excavated sediment on marsh substrate all

have the potential to impact the marsh and water quality including increased turbidity and reduced dissolved oxygen levels.

Proposed Best Management Practices

NASA has proposed to incorporate several best management practices (BMPs) into the project to minimize direct and secondary impacts to aquatic resources. We support the proposed BMPs and request that the following are incorporated into the project design and implementation:

1. Contain sediment and drilling mud with turbidity curtains and other erosion and sediment control measures in areas the HDD drill surfaces.
2. Develop a frac-out contingency plan outlining emergency procedures to follow should drilling muds escape the bore hole.
3. Restore pre-construction contours and re-establish appropriate native vegetation at the two hand hole and three tidal gut excavation areas and temporary storage areas on Walker marsh following NASA WFF vegetation management policies, including the monitoring and adaptive management of re-established vegetation areas.
4. Use upstream and downstream turbidity curtains during hand jetting of the cable across the three tidal guts to contain resuspended sediment in the immediate work area.

Provided these BMPs are incorporated into the project design and implementation we have no objections to the proposed installation of the fiber optic cable and have no conservation recommendations to provide.

Please note that a distinct and further EFH consultation must be initiated pursuant to 50 CFR 600.920(j) if new information becomes available or if the project is revised in such a manner that affects the basis of our determination above.

This EFH determination does not address threatened and endangered species under the purview of NOAA Fisheries Service. We understand you received an email response from Mr. Brian Hopper, NOAA Protected Resources Division (brian.d.hopper@noaa.gov, 410-573-4592) that due to the proposed construction activities and location of the project, consultation with us under Section 7 of the endangered species act is not necessary.

Thank you for the opportunity to review the EFH assessment for the Wallops Island Underground Fiber Optic Cable project. If you have any questions please do not hesitate to contact David O'Brien in our Gloucester Point, VA field office at 804-684-7828 (david.l.o'brien@noaa.gov).

Sincerely,

Karen M. Greene
Mid-Atlantic Field Offices Supervisor

Cc: B. Denson, NAO Corps
H. Badger, VMRC
L. Varnell, VIMS
J. Gironda- NESDIS

Suzie Richert

From: Laura Lavernia <Laura.Lavernia@dhr.virginia.gov>
Sent: Wednesday, October 16, 2019 12:41 PM
To: Miller, Shari A. (WFF-2500)
Subject: [EXTERNAL] Geotechnical Borings for Marsh Fiber (DHR File No. 2019-3371) | e-Mail #03586

Dear 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
Office of Review and Compliance
Division of Resource Services and Review
Phone: (804) 482-8097
Laura.Lavernia@dhr.virginia.gov